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Veronique Matteredne, Marie-Pierre Ruas, Marine Bretin-Chabrol, Pascal Luccioni

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# MANAGING ARABLE WEEDS

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**Authors :** Véronique Matteredne, Marie-Pierre Ruas, Marine Bretin-Chabrol, Pascal Luccioni

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## Greek and Latin terms that most frequently appear in the corpus

herbe (fr.), *herba* (la.), βοτάνη (gr.)

ῥλη (gr.)

ivraie (fr.), *lolium* (la.), αἶρα (gr.), ζιζάνιον (gr.)

chardon (fr.), centaurée (fr.), cirse (fr.), *carduus* (la.)

avoine (fr.), *avena* (la.), βρόμος (gr.)

égllope (fr.), égllops (fr.), *aegilops* (la.), αἰγίλωψ (gr.)

hièble (fr.), *ebulus* (la.)

ciguë (fr.), *cicuta* (la.)

plante des marais (fr.), *ulua* (la.)

chicorée (fr.), *intiba* ou *intuba* (la.)

bardane (fr.), *lappa* (la.)

cuscute (fr.), *orobanche* (la.), ὀροβάγχη (gr.), λεόντειος πόα (gr.)

sécurigère (fr.), *pelecinum* (la.), ἄρακος πελεκῖνος (gr.)

tribule (fr.), *tribulus* (la.)

ronce (fr.), *rubus* (la.)

## Related themes

adventices ; phytonymes ; labourage, hersage, sarclage

## Principal references

Théophraste, *Recherches sur les plantes*, 8, 8, 3-5 ; Caton, *De l'agriculture*, 37, 2 et 5 (cité par Pline, *Histoire naturelle*, 17, 55) ; Virgile, *Géorgiques*, 1, 150-159 (liste reprise par Pline, *Histoire naturelle*, 18, 153) ; Pline, *Histoire naturelle*, 18, 153 et 155 ; Columelle, *De l'agriculture*, 2, 11 ; Palladius, *Traité d'agriculture*, 2, 4-9 ; 4, 2-6 ; 5, 1 et 3 ; Palladius, *Traité d'agriculture*, 9, 4 ; *Géoponiques*, 2, 43

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## 1. WEEDS: THE AGE-LONG COMPANIONS OF CROPS

Since the beginning of the development of agriculture, wild species have found secondary habitats in cultivated spaces shaped by human activity (slash-and-burn and clearing practices, ploughing, hoeing, etc.), where their populations were able to subsist and thrive, sustained by additional supplies of nutrients and by the strategies implemented to control the development of competitive species. Owing to their biological and phenological traits adapted to open, regularly disrupted, primary habitats, and their yearly life cycle similar to that of domesticated species, they were particularly suited to spaces modified by human communities for agricultural purposes. Thus, types of vegetation specific to cultivated fields emerged in primary domestication centres (Jauzein, 2001a). These specific vegetation groups expanded and evolved quickly when new domesticated cereal and pulse crops from the

Fertile Crescent were introduced in North-Western Europe by Linear Pottery Culture populations who thus contributed to their propagation. By the beginning of the historical period, the range of plants cultivated as field crops was set, except for a few varieties; most subsequent additions are plants destined for gardens and orchards. The umbrella term “weed” refers to wild species growing in the same habitats as cultivated species without having been purposefully introduced to these habitats, and generally has pejorative connotations—hence the phrase “beneficial weed”, used in everyday language and in agronomical or horticultural contexts to underline new perceptions of the plants to which it refers. In-depth studies of these groups of plants resulted in the identification of several classes: segetal plants found in crops and weeds in hoed crops and gardens, similar to ruderal species growing in ruins and on wasteland. Eighty to ninety percent of field flora consists of plants that use seeds to reproduce by forming a seedbed at the surface of the soil. The remaining ten to twenty percent are persistent plants propagating through vegetative reproduction with underground buds and specialised organs (Jauzein, 1997). In the recent past, phytosanitary treatments have greatly curbed the propagation of segetal plants, and many species were identified as critically endangered: out of 25 taxa, 16% were extinct at the start of the twenty-first century and 24% were in sharp decline (Jauzein, 2001b). After the Second World War, the mechanisation of agriculture eradicated many species of crop weeds commonly found in Antiquity, as did the disappearance of fallowing practices and the diminution of crop rotation. These practices sustained diversity through the continuity of seed stocks, which later became less rich. In the interest of conserving both flora and fauna heritages, campaigns now advocate the protection of segetal plants.

Because of the impact of contemporary practices on the historical evolution of these plants, the reconstitution of the diversity of crop weeds in Antiquity is a difficult task, and yet it is possible to build a partial image from the carpological evidence of carbonised seeds and fruit in archaeological sites. These fragile remains are sometimes well preserved, and in large volumes, especially within the remains of stored produce destroyed by fire: many species of weeds, involuntarily harvested with a crop, may survive when grain is stored before undergoing cleaning treatments. During these treatments, the harvested matter is sorted to separate waste from produce destined to human or animal consumption; however, the large seeds of some wild plants are difficult to sieve out of stored grain, and produce intended as complementary feeding for cattle is not always cleaned as thoroughly as that intended for human consumption. Thus, archaeological evidence is much more abundant for some species than others, depending on the impact of human intervention on the harvested produce.

Another source of evidence consists of the waste generated by cleaning treatments, when farmers attempted to burn the residue of threshing, winnowing, or sifting operations. Many carpological remains from Antiquity provide this type of evidence on the flora of cultivated fields.

Roman farmers would ignore or deal with the wild plants growing in their fields according to the plants' levels of proliferation and competition with cultivated species; some of these plants even produced toxic seeds that had to be eliminated in post-harvest treatments to avoid cases of food poisoning. The best known among such plants are corncockle (*Agrostemma githago* L.)—even in quantities as low as 0.5% of the total weight, its seeds can render flour toxic—and darnel (*Lolium temulentum*), whose seeds are often infested by a parasitic ascomycetous fungus belonging to the same family as ergot (*Clavicipitaceae*).

## 2. ARCHAEOLOGICAL EVIDENCE

Some species, imported from Asia in varieties genetically distinct from their wild ancestors, or domesticated in Europe, first appeared in crops as weeds. Carpological remains of these species are very isolated, usually consisting of a few specimens among large amounts of grain from other species grown as food. Such species, including oat and rye, were overlooked for centuries and considered as sporadic, undesirable plants, until they became crops in their own right and sought-after food sources. Such a change in use, but not in nature, is called secondary domestication. Rye, for instance, was present in Gaul as early as the third millennium BCE, but the first evidence of its use as a significant crop is found in Northern Gaul during the Roman period (Zech-Matterne and Bouby, 2020). From the start of the Common Era, mentions of rye grown as a crop in the Paris Basin and the Rhône valley become increasingly frequent, and rye was found in Southern France in a few remains of stored grain. This species acquired its high-profile status only during Medieval times, when it became part of the alimentation of all social classes, including very wealthy circles (Ruas, 1992; Van Zeist *et al.*, 1994).

It is possible to follow the evolution of the representation of certain species in Gaul, from being barely attested during the Metal Ages, to the increasingly numerous mentions and remains from the Roman Era. Noteworthy among such species are corncockle (*Agrostemma githago*), scarlet pimpernel (*Lysimachia arvensis*), stinking chamomile (*Anthemis cotula*), parsley-piert (*Aphanes arvensis*), field gromwell (*Buglossoides arvensis*), shepherd's purse (*Capsella bursa-pastoris*), carrot bur parsley (*Caucalis platycarpus*), thistle (*Carduus* spp.), knapweed (*Centaurea* spp.), spear thistle (*Cirsium* spp.), greater celandine (*Chelidonium majus*), fumitory (*Fumaria officinalis*), black henbane (*Hyoscyamus niger*), Venus'-looking-glass (*Legousia speculum-veneris*), Scotch thistle (*Onopordon*

*acanthium*), orlaya (*Orlaya grandiflora*), poppy (*Papaver argemonel dubium/rhoeas*), black nightshade (*Solanum nigrum*), sow thistle (*Sonchus* spp.), chickweed (*Stellaria media*), and hedge parsleys such as Japanese hedge parsley, particularly *Torilis japonica*. These plants, mostly native to Asia, arrived in Europe alongside domesticated species. Most of them are annual species, autumn flowering, with a preference for neutral or alkaline soils, and are known as winter therophytes. Through selection, their morphology became gradually similar to that of the cultivated plants among which they grew to ensure survival, a phenomenon known as “Vavilovian mimicry” (McElroy, 2014). Marling practices may have contributed to the alkalisation of soils and promoted the success of these species.

Some species are not observed in Gaul before Antiquity and are not considered spontaneous plants. These foreign species are not native to the areas in which they were discovered, and are not able to naturalise in their new habitat. Species such as muskweed (*Myagrurn perfoliatum*), cowherb (*Vaccaria hispanica*), or cornflower (*Centaurea cyanus*), found at the lower end of the Rhône Valley, provide small but tangible clues about the circulation of grain stocks originating from southern lands. A similar phenomenon may be observed in the propagation of wingless insects feeding on stored grain, such as the wheat weevil (*Sitophilus granarius*). With the progressive development of urban areas and the settlement of *oppida* in Northern Gaul in the second, and maybe even third, centuries BCE, feeding large populations comprising craftsmen and social classes other than farmers became challenging (Malrain, 2021), even more so immediately after the Roman conquest of Gaul, when food was also required for the troops stationed along the Rhine. There was an added difficulty that the hinterlands were not able to produce sufficient resources (Reddé, 2011; Kooistra et al., 2013). The supply system for grain and other basic foodstuffs became more organised with the advent of the Imperial Era, as is indicated by the large increase in storage capacity between the Iron Age and the Roman era (Ferdrière, 2019), when large grain storage buildings in urban areas and warehouses of the horrea type in particular began to develop (Reddé, 2019).

### 3. THE PERCEPTION OF CROP WEEDS IN ANCIENT TEXTS

#### a. Crop weeds: An unidentified category in Antiquity, between spontaneous herb and harmful invader

The modern category of “weeds” in its pejorative sense, and that of “crop weed”, unwanted plants competing with crops in a field, are not clearly defined in Antiquity. They can be placed at the cross-section of two groups: harmful plants that may affect crops negatively<sup>1</sup>, and plants growing spontaneously in a given area.

Cato provides a list of herbs to be removed from cultivated land in a chapter introduced by the periphrasis *Quae mala in segete sint*, “Those that are bad in crops”. This chapter also denounces bad agricultural practices (such as working decaying soil), and includes a list of soil-exhausting crops.<sup>2</sup> Virgil describes problems affecting wheat, encapsulated in the term *labor*—the “pain” or “suffering” of wheat—and ranging from diseases such as rust, to infestations of crop weeds and damage caused by birds or adverse weather.<sup>3</sup> In Pliny, this list occurs in a chapter devoted to the “diseases” of grains, *de morbis*<sup>4</sup>—a wide category in which he includes the “degeneration” of wheat into oat,<sup>5</sup> weather damage, harmful animals and substances, and genuine diseases such as rust.<sup>6</sup> He does specify, in paragraph 153, that undesirable plants are not “grain diseases”, but “plagues of the land itself”, *ipsius terrae pestes*. Thus, Roman authors tend to highlight, in the category of “pests”, functional (threats to the harvest) and interactive (the identification of an opponent against which the farmer must fight) elements, wholly independent of the physical nature of the risk (animal, plant, diseases of the seed, weather, harmful human practice, or the association of several of these risk factors). This is reflected in the use of predicative periphrases to convey the overarching nature of the category through a pejorative adjective (*malus*, less commonly *noxius*), or through a verb denoting harm or aggression (*noceo*, *offendo*). The same type of functional lists occurs in passages describing problems affecting threshing floors.<sup>7</sup> Spontaneous plants are mentioned through the generic term *herba* (plural *herbae*, “herbs”), which are only very rarely described as *malae* (“bad”) in Latin texts. Among authors of technical works, only Cato uses the phrase *mala herba*,<sup>8</sup> and it occurs in Pliny, in a quotation of Cato.<sup>9</sup> Elsewhere, it is found with the meaning of “weed” in Propertius’ *Elegies* 2, 6, 35 and in the poem *Aetna*, 9, of unknown authorship; and later, it is adopted as a moral metaphor by Christian authors such as Saint Augustine.<sup>9</sup> *Mala herba* can also refer to a plant used in a magical ritual, a “maleficent plant”, for instance in Tibullus, *Elegies*, 1, 2, 53.

Thus, spontaneous herbs are not usually qualified as good or bad in themselves. Some contexts even highlight their usefulness: for example, the observation of spontaneous plants provide clues as to the quality of the soil. Columella<sup>11</sup> notes that the presence of spontaneous trees and herbs such as rushes, reeds, and danewort indicates soil suitable for the cultivation of wheat—although these plants must first be cleared away.<sup>12</sup> Weeds removed from cultivated fields can also be used as bedding<sup>13</sup> or forage for cattle,<sup>14</sup> or mixed with manure to produce fertiliser;<sup>15</sup> even ryegrass seeds can be added to the barley mashes used to fatten poultry.<sup>16</sup> Indeed, for ancient authors, a weed is not necessarily a “bad plant”, but rather, a plant found in the wrong place at the wrong time—an idea similar to that developed by Thorsten Fögen in relation to pests in the scientific note “Pests and diseases”. What is more, the term *herba* is sometimes used by agronomists to refer to some cultivated plants such as alfalfa, *herba medica*,<sup>17</sup> or to

a transitional stage in the growth of cultivated cereals, a use equivalent to the French phrase “blé en herbe”—wheat before it comes to seed.<sup>18</sup>

Dans les *Géoponiques* (2, 10, 25), on rencontre le terme (n. pl.) αὐτοφυῆ qui désigne la végétation spontanée, par opposition aux espèces plantées (τὰ φυτευθέντα) : là encore, nous ne sommes pas tout à fait dans notre catégorie moderne de « mauvaise herbe » ou d’adventice. Dans les *Géoponiques* encore, le terme qui est employé pour désigner les herbes qui gênent le cultivateur en envahissant les champs, c’est βοτάνη (*Géoponiques*, 2, 43 : titre), un terme très générique qui désigne l’herbe en général, les plantes herbacées.

Similarly, the categories of “weeds” and “crop weeds” are absent from Greek texts in our corpus. The primary meaning of the term ὕλη (“wood”, as a material) may be widened to “material”, “forest”, etc., and even to “spontaneous woody vegetation”; these meanings are not quite equivalent to “weed”.<sup>19</sup> In the *Geoponica* (2, 10, 25), the term αὐτοφυῆ (n. pl.) refers to spontaneous plants, in contrast to species that have to be planted (τὰ φυτευθέντα)—but still this is not an exact parallel to the modern categories of “weeds” or “crop weeds”. βοτάνη (*Geoponica* 2, 43: title) designates, in a wide sense, herbaceous plants that interfere with the farmer’s work when they invade fields.

## b. Identification of undesirable species and of associated threats

In the absence of well-defined categories for “weed” and “crop weed”, mentions of species relevant to these categories are usually scattered throughout the texts. Theophrastus, and later Pliny and Paxamos (quoted in the *Geoponica*), seem to be the only authors to establish lists of plants that would later be called “segetal”. In these lists, each cultivated species is linked to a rival species, rather systematically by Pliny and Paxamos who simplify Theophrastus’ more nuanced observations. Theophrastus mentions ryegrass (which he considers generally as a degeneration of wheat), aegilops (which grows among barley), hairy vetch (in lentils), crownvetch (in red peas), dodder (especially in ervil), cleavers (especially in lentils), and broomrape (which grows under Pyrenean dead-nettle and fenugreek).<sup>20</sup> Pliny’s list (18, 155) includes only broomrape (lat. *orobanche*), growing in chickpea (*cicer*) and ervil (*erium*); ryegrass—to which he refers by a name borrowed from Greek, *aera*—growing in wheat (*triticum*); aegilops (*aegilops*), in barley (*hordeum*); crownvetch (*pelecinum*, borrowed from Greek), in lentils (*lens*). Paxamos’ list is very similar.<sup>21</sup>

A few other plants are named in relation to open field crops: in Cato (37, 1–5), danewort (*ebulus*), hemlock (*cicuta*), a type of marsh plant (*uluā*), and oat (*auenā*), linked to cereal crops, *frumenta*;<sup>22</sup> in Virgil (*Georgics* I, 150–154, a list reused by Pliny, 18, 153), thistles, centaury, plume thistles (*carduus*), burdock (*lappa*), caltrop (*tribulus*), ryegrass (*lolium*), and oat (*auenā*) are mentioned. Other species are mentioned more sporadically by agronomists in discussions of the clearing of virgin land, or without any mention of cultural context: chicory, or maybe chondrilla (*intiba* or *intuba*), rush (*iuncus*), fern (*filix*), brambles (*rubus*). There are no allusions to poppies or corncockle in Latin texts dealing with the removal of spontaneous unwanted herbs.

Moreover, the authors of the texts included in our corpus do not always explain how weeds are harmful, nor describe the risks that each plant poses to crops or to human and animal consumers. It is unclear whether they have noticed the decrease in productivity resulting from cultivated plants and crop weeds competing for water and light, the possibility of disease transmission between weeds and crops, the additional work required for sorting operations, or the contamination of grain stocks and produce such as flour or forage, whose quality may decrease to the point of endangering consumer health.<sup>23</sup> Neither Cato nor Varro, for instance, provide any explanation for the removal of some undesirable herbs, but present the necessity of this practice as self-evident. Among the authors included in our corpus, only Theophrastus and Pliny, whose works are more theoretical, truly address these issues.

The theme of plants competing for resources, however, is first discussed by Xenophon: “What if, he said, weeds (ὕλη) proliferate, choke up the wheat and steal its food (τὴν τροφήν), just as useless drones steal what the bees, through their work, have set aside as food?”<sup>24</sup> Theophrastus also developed this theme in the context of cleavers and lentils (*Historia plantarum*, 8, 8, 4).

The notion of a physical fight between the two types of plant is more common, and expressed through images of battle, conquest, and domination. Theophrastus concludes his discussion of weeds by explaining that they generally become dominant because of the weakness of the invaded plants, as is the case of broomrape provoking the desiccation of fenugreek.<sup>25</sup> In the *Georgics* (1, 152), Virgil suggests, rather than develops, the notion of the competition between plants, in the expression *intereunt segetes, subit aspera silua*, “crops perish; tough plants take their place”. Pliny resorts to a military metaphor—“a white herb [. . .] invades the fields”<sup>26</sup>—and, in his list of crop weed varieties, emphasises, like Theophrastus before him, the manner in which dodder fatally constricts and suffocates chickpea and ervil.<sup>27</sup> Disease transmission is suggested by Pliny in the case of *ateramum* or *teramum*, which he believes provokes the death of the broad bean plant if it is exposed to wind while wet.<sup>28</sup> This phenomenon is also sometimes interpreted as a gradual transformation through which grain sown among a species considered

as inferior degenerates because of the weather and of the nature of the soil,<sup>29</sup> rather than being analysed as a result of competition between plants belonging to two distinct species. In addition, Columella defends the practice of hoeing by arguing that failing to hoe results in decreased amounts of harvested produce.<sup>30</sup>

Finally, authors describe the inconvenience or dangers arising from the consumption of crop weed species by cattle. The white herb described by Pliny, and resembling foxtail millet, is fatal for cattle, according to Pliny himself.<sup>31</sup> He also warns (18, 156) that ryegrass, whose seeds may be ground with grain into flour used for making bread, is dangerous for humans, and causes dizziness. Paxamos gives a similar warning at *Geoponica*, 2, 43.

### c. Ancient agricultural practices adopted to limit the proliferation of undesirable herbs

To limit the proliferation of certain herbs, farmers must employ targeted methods. Soil preparation in cultivated fields includes **ploughing** (verbs *aro*, *proscindo*, *offringo*, *itero*); this practice prevents the growth of weeds by rooting out undesirable plants and stopping the propagation of the seeds of annual plants, if it is scheduled in accordance with a strict work calendar. Indeed, Varro explicitly states that fields must be ploughed (*proscindere*) before the spring (*uere*) sowing, “so that the plants which may have grown on it are rooted out before any of their seeds should fall upon the ground”.<sup>32</sup> Columella adds that furrows should be numerous and close together, the better to destroy growing weeds by cutting off their roots in multiple places.<sup>33</sup> Pliny notes that this procedure is necessary on **fallow land** (*nouale*);<sup>34</sup> this echoes Xenophon’s lengthy discussion of the importance of leaving land fallow (ἡ νεός, “fallow land”) for the eradication of weeds.<sup>35</sup> Although Roman agronomists never explicitly link the process of sorting seeds before sowing to eliminate any seeds of plants considered weeds (ryegrass, for instance),<sup>36</sup> the choice of the verb *purgo*, “to purify” to describe this procedure suggests that agronomists had this goal in mind.<sup>37</sup>

Once the fields are sown, they can be **harrowed** (verbs *liro*, *deliro*, *occo*; noun *occatio*)<sup>38</sup> before the seeds germinate, but ancient authors consider this procedure necessary only if the land was not suitably prepared in the first instance, and that harrowing only removes herbs that should have been eliminated by the quality and density of preparatory ploughing.<sup>39</sup> Therefore, **hoeing** and **weeding** seem to have been the main methods adopted to maintain fields while preserving seedlings only. In Latin texts, **hoeing**, a procedure implying the use of a tool and fulfilling functions other than to remove unwanted plants, is signified through the use of the verb *sario* (or *sarrio*), and the nouns *sartio*, *sarculatio* (the act of hoeing), and *sarculum* (a hoe), while **weeding** corresponds to the verb *runco*<sup>40</sup> and noun *runcatio*, an action that can be performed with a tool or by hand.<sup>41</sup>

**Hoeing**, *sartio* or *sarculatio*, is performed just after the seeds germinate, when seedlings have emerged from the ground and have produced four to five leaves depending on the species.<sup>42</sup> It loosens the soil by breaking down the crust formed during winter,<sup>43</sup> while earthing up the cereals so that they may grow shoots,<sup>44</sup> and removing any herb that may have grown among the crop. This operation cannot be carried out by hand; a tool able to turn over the surface of the soil (hoe) must be used.

**Weeding**, *runcatio*, takes place when the cereals are “jointed” (*in articulo*), i.e., when they have developed nodes during the bolting stage.<sup>45</sup> The primary function of weeding is to remove weeds while leaving the seedlings intact.<sup>46</sup> An isolated occurrence of the noun *runca*, -ae, f. is found in Columella, as a synonymous of *herba*, a use that announces the modern idea of “weed”.<sup>47</sup>

Other verbs are sometimes chosen by the authors to indicate if the weeds should be cut<sup>48</sup> or rooted out.<sup>49</sup> Cutting is ineffective for weeds such as ferns, because it fortifies rather than destroys them.<sup>50</sup> Cato (*De agricultura*, 37, 5) also recommends rooting out common wild oats: *auenamque destringas*. In meadows, where ploughing is also necessary,<sup>51</sup> the procedure is assimilated to a “purification” (verbs *(ex)purgo*, *depurgo*),<sup>52</sup> during which plants seen as undesirable because of their excessive proliferation, or because they have thorns, are removed.<sup>53</sup> Pliny recommends paying particular attention to rattles, which produce dangerous capsules, and to field horsetail, although he does not specify why it is undesirable.<sup>54</sup> Palladius alludes to a technique used to fully renovate the grass in a field: this may be the **slash-and-burn** method, which resorts to fire to destroy invasive herbs down to their roots, and improve the fertility of pastures.<sup>55</sup> The growth of weeds on threshing floors is prevented by working the soil and spreading leas.<sup>56</sup>

### d. The question of hoeing: A debate between practical knowledge and ethical representations of agricultural work requirements.

Columella reports that a debate arose among his predecessors about the usefulness of hoeing: “When the sowing is finished, one must consider hoeing; on this topic, authors do not agree. Some say that it is pointless, because it would uncover the roots of the cereals, or even cut them, and plants could be killed by frost if the weather turned cold after hoeing has been performed; they believe that weeding and cleaning, at the right time, is sufficient. However, several authors sanction hoeing, as long as it is not performed in the same manner and at the same period

in all fields.”<sup>57</sup> Columella devotes a whole chapter to this issue, which he examines case by case; he provides his own opinion, in keeping with his objective to found his teachings upon his own experience and the rational examination of data: farmers must consider criteria such as quality of the soil, climate, weather, nature of the cultivated species and development stage to decide whether a procedure is needed. Columella recommends hoeing certain crops, such as durum wheat, emmer wheat, and barley (*triticum, adorem, hordeum*),<sup>58</sup> as well as common millet and foxtail millet (*milium et panicum*)—he has already explained, in a previous chapter, that these plants benefit particularly from hoeing.<sup>59</sup> He also states that all pulses must be hoed, apart from lupine,<sup>60</sup> whose single root is too easily severed by tools; what is more, this plant is capable of defending itself against weeds.

In his discussion of the usefulness of hoeing for beans, Columella contradicts Celsus explicitly, and reveals another aspect of his conception of agricultural work: he lends it a moral dimension, which he links to monetary considerations: “Many believe that beans should not be hoed, because they can easily be pulled apart from other plants by hand when they have reached maturity, and because the unwanted plants can be set aside as forage. Even Cornelius Celsus shares this opinion, and mentions it among other advantages of this pulse when he states that, on a single field, it is possible to make hay after the beans have been harvested. But I think only a very bad farmer would allow herbs to grow in his crops, for the harvest will be much less plentiful if hoeing is not performed. Neither should a wise farmer prioritise animal forage rather than food for human consumption since the former may be acquired more specifically, too, by taking care of his meadows.. For these reasons, I believe that beans should be hoed, not just once, but three times.”<sup>61</sup> Columella approaches the issue by highlighting financial stakes—hoeing beans would allow farmers to harvest a greater quantity of a product more valuable than forage—but he develops his arguments in general terms, *sed mihi uidetur pessimi agricolae committere, ut satis herba proueniat*: “beans” have been replaced by “sown crops” in general. He paints a moral portrait of the worst type of farmer, caught in an act of negligence: *committere* is used here with the pejorative meaning of “to commit a crime”, “to expose oneself to”.

Unlike Celsus, who suggests that spontaneous plants that are harmless to crops are better left alone—a choice suggestive of some modern practices of crop management concerned with the preservation of a form of biodiversity—Columella echoes another school of thought, according to which farmers and gardeners are assessed according to the tidiness and cleanliness of their fields, insofar as they reflect their diligent work. The regular use, by Roman agronomists, of words belonging to the family of *purgo*, “to purify”, to refer generally to the variety of procedures performed to control weeds, is a tell-tale sign of the importance of this value in rural Roman society.<sup>62</sup>

## NOTES

1. Thorsten Fögen proposes a study of this category of plants in the scientific note “Pests and diseases”.
2. Cato, *De agricultura*, 37, 2, and 37, 5.
3. Virgil, *Georgics*, 1, 150–159.
4. Pliny, *Natural History*, 18, 148, 149–156.
5. Pliny, *Natural History*, 18, 149: *uitium*. See the scientific note “Identification of cereals other than wheat” and “Sorting grain and seeds”. See also Luccioni, 2020.
6. Pliny, *Natural History*, 18, 154: *malum . . . noxium*. See scientific note “Pests and diseases”.
7. Cato, *De agricultura*, 91; Varro, *Res rusticae*, 1, 51, 1; Virgil, *Georgics*, 1, 180.
8. There is no single word in French that is equivalent to the English “weed”; the phrase “mauvaise herbe” is used instead, even if today’s French tend to use the term “adventice”. [translator’s note]
9. Cato, *De agricultura*, 50, 1, quoted by Pliny, *Natural History*, 18, 243. Pliny repeats the phrase at 18, 258.
9. Saint Augustine, *Sermons to the people*, 229J, in *Sancti Augustini Sermones post Maurinos reperti*, ed G. Morin, in: *Miscellanea Agostiniana*, vol. 1, Rome, 1930, p. 583.
11. Columella, *De re rustica*, 2, 2, 14 and 20. See also Palladius, *Opus agriculturae*, 1, 5, 2.
12. Columella, *De re rustica*, 2, 2, 8 and 13; 2, 4, 1. Palladius, *Opus agriculturae*, 6, 3.
13. Cato, *De agricultura*, 37, 2.
14. Columella, *De re rustica*, 2, 11, 6.
15. Columella, *De re rustica*, 2, 14, 6–7 and 9.
16. Varro, *Res rusticae*, 3, 20–21.

17. See for instance [Columella, \*De re rustica\*, 10, 27–28](#); [Palladius, \*Opus agriculturae\*, 5, 1 and 3](#).
18. [Virgil, \*Georgics\*, 1, 90; 112; 251](#). [Ovid, \*Metamorphoses\*, 8, 290](#). [Seneca, \*Letters to Lucilius\*, 124, 11](#); [Pliny, \*Natural history\*, 18, 157](#).
19. See [Theophrastus, \*Historia plantarum\*, 3, 1, 5 and 5, 8, 2](#), for examples of the term used in this sense.
20. [Theophrastus, \*Historia plantarum\*, 8, 8, 3–5](#).
21. [Geoponica, 2, 43](#).
22. [Morlon and Munier-Jolain, 2012](#).
23. In earlier works, oat is always considered exclusively as a weed. This is reflected in the plural phrase *steriles avenae*, found in [Cato \(\*De agricultura\*, 37, 5\)](#) and [Virgil \(\*Ecloques\* 5, 37; \*Georgics\* 1, 154\)](#). The cultivation of oat is first attested in [Columella, \*De re rustica\*, 2, 10, 24 and 32](#), as a forage plant. See “oat” in the *Technical Dictionary*, and the scientific note “[Identification of cereals other than wheat](#)”.
24. [Xenophon, \*Oeconomicus\*, 17, 14](#): Τί γάρ, ἔφη, ἂν ὕλη πνίγη συνεξορμῶσα τῷ σίτῳ καὶ διαρπάζουσα τοῦ σίτου τὴν τροφήν ὥσπερ οἱ κηφῆνες διαρπάζουσιν ἄχρηστοι ὄντες τῶν μελιτῶν ἃ ἂν ἐκείναι ἐργασάμεναι τροφήν καταθῶνται; (Translation P. Chantraine, *Les Belles Lettres*, 1949).
25. [Theophrastus, \*Historia plantarum\*, 8, 8, 5](#).
26. [Pliny, \*Natural History\*, 18, 153](#): *occupans arua*, possibly Bermuda grass, although it is not fatal for cattle, according to J. André, in [Pline l’Ancien, 1972](#), ad loc.
27. [Theophrastus, \*Historia plantarum\*, 8, 8, 4](#). [Pliny, \*Natural history\*, 18, 155](#): *est herba quae cicer enecat et eruum circumligando se*. [Geoponica, 2, 43](#).
28. [Pliny, \*Natural History\*, 18, 155](#); however, this plant does not exist, but is a result of his misreading [Theophrastus, \*Historia plantarum\*, 8, 8, 6–7](#), and [De causis plantarum, 4, 12, 8](#). The Latin terms refer to two properties of the bean itself: it is usually “easy to cook”, but being exposed to wind during threshing can render it “difficult to cook”.
29. [Theophrastus, \*Historia plantarum\*, 8, 8, 3](#): ryegrass is a result of the degeneration of wheat and barley. [Pliny, \*Natural History\*, 18, 149](#): degeneration of wheat into oat caused by humid soil and wet weather. See the scientific note “[Sorting grain and seeds](#)”; [Luccioni 2020](#).
30. [Columella, \*De re rustica\*, 2, 11, 6](#): *frugibus enim plurimum detrahitur si relinquitur runca*.
31. [Pliny, \*Natural History\*, 18, 153](#): *pecori quoque mortifera*.
32. [Varro, \*Res rusticae\*, 1, 27, 2](#): *quae sunt ex ea enata, priusquam ex iis qui seminis cadat, ut sint extradicata*.
33. [Columella, \*De re rustica\*, 2, 4, 1](#). See also [Pliny, \*Natural history\*, 18, 176](#): *hoc utilitatem habet, quod inuerso caespite herbarum radices necantur*.
34. [Pliny, \*Natural History\*, 18, 176](#): *nouale est quod alternis annis seritur*, “fallow land is sown every other year”. *nouale*, *-is*, n. is a variant of *noualis*, *-is*, f. See [Virgil, \*Georgics\*, 1, 71](#); [Columella, \*De re rustica\*, 2, 2, 14](#). Both terms may also refer to a field “that was sown before it was renewed by a secondary ploughing” ([Varro, \*Res rusticae\*, 1, 29, 1](#)). Fallow land can also be designated by the term *ueruactum*, *-i*, n., the literal meaning of which is “ploughed in the spring” ([Cato, \*De agricultura\*, 27](#); [Varro, \*Res rusticae\*, 1, 44](#); [Columella, \*De re rustica\*, 2, 4, 2](#)). About leaving a land fallow to cleanse it, see [Sigaut, 1973, 24–27](#).
35. [Xenophon, \*Oeconomicus\*, 16, 12–15](#).
36. See the scientific note “[Sorting grain and seeds](#)”.
37. [Cato, \*De agricultura\*, 2, 3](#).
38. [Varro, \*Res rusticae\*, 1, 29, 2](#). [Pliny, \*Natural history\*, 18, 180](#).
39. [Columella, \*De re rustica\*, 2, 4, 2](#).
40. [Cato, \*De agricultura\*, 37, 5](#): *frumenta face bis sarias runcesque*; [Columella, \*De re rustica\*, 2, 10, 27 and 2, 11, 9](#): *subiungenda deinde est sartioni runcatio*; [Pliny, \*Natural History\*, 18, 184](#).
41. In our French translations, we have adopted “binage” (hoeing) to render *sartio*, and “sarclage” (weeding) to render *runcatio*, even though the French term “sarclage” is derived from *sartio*. This translation choice is founded on the etymological analysis of “sarcler” provided by François Sigaut ([Sigaut, 1973, 27–28](#), our translation): “In a strict sense, ‘sarcler’ means ‘rooting out weeds by hand’ (latin *sarire*)”—even though modern uses of “sarcler” and “sarclage” tend to imply the use of a tool (i.e., ‘sarcloir’, ‘hoe’). On the contrary, “binage” and “biner” refer exclusively to operations performed with a tool, which is also the case of *sario* and *sartio*. See Lachiver, 1997 (our translation) *s.v.* “biner”: “gardening term. In a vegetable patch, the action of breaking down the surface of the soil to a depth of a few centimetres with a light hoe, to aerate the soil and allow water to penetrate, and to remove the weeds that may have grown since the last sowing or transplanting. Maxim: hoeing once is better than watering twice’.” *s.v.* “sarclage”: “agricultural term. Procedure aiming to destroy weeds while loosening the surface of the soil. In the nineteenth century, ‘sarclage’ was still performed when wheat was 20 to 25 centimetres tall.”
42. [Columella, \*De re rustica\*, 2, 11, 4](#): *in iis autem locis, ubi desideratur sartio, non ante sunt adtingendae segetes, etiam si caeli status permittat, quam cum sata sulcos contexerint. Triticumque et adreum, cum quattuor fibras habere coeperint (..) recte sarientur*.
43. [Pliny, \*Natural History\*, 18, 184](#): *sarclatio induratam hiberno rigore soli tristitiam laxat temporibus uernis nouosque soles admittit*.
44. [Columella, \*De re rustica\*, 2, 11, 2](#): *nam in agris siccis et apricis, simul ac primum sartionem pati queant segetes, debere eas permota terra adobruui, ut fruticare possint*.



45. Pliny, *Natural History*, 18, 184: *runcatio, cum segetes in articulo est, euolsis inutilibus herbis, frugum radices uindicat segetemque discernit a caespite*. Columella, *De re rustica*, 2, 11, 10.
46. Varro, *Res rusticae*, 1, 30, 1: *segetes runcari, id est herbam e segetibus expurgari*. Columella, *De re rustica*, 2, 11, 9. See also Pliny, *Natural History*, 18, 169: *pauci runcant—botanison uocant, “Some pull out the weeds—they call it ‘weeding’.”* (in Egypt).
47. Columella, *De re rustica*, 2, 11, 6 (two occurrences). This hapax, noted by Ernout and Meillet, 1997, *s.v. rumco*, and preserved by W. Lundström in his edition of Columella’s work, is well attested in the manuscript tradition for the first occurrence, but competes with *runcatione* in the second instance.
48. Virgil, *Georgics*, 1, 155: *assiduis herbam insectabere rastris*.
49. Cato, *De agricultura*, 37, 2: *ex segeti uellito ebulum, cicutam et circum salicta herbam altam uluamque*.
50. Columella, *De re rustica*, 2, 2, 13: *iunci et graminis perniciis repastinatio est, filicis frequens extirpatio*.
51. Columella, *De re rustica*, 2, 17, 3–4; Pliny, *Natural History*, 18, 258.
52. Cato, *De agricultura*, 50, 1; Varro, *Res rusticae*, 1, 29, 1; Columella, *De re rustica*, 2, 17, 1.
53. Cato, *De agricultura*, 50, 1; Columella, *De re rustica*, 2, 17, 1.
54. Pliny, *Natural history*, 18, 259: *nummulus and equisaetum*.
55. Palladius, *Opus agriculturae*, 9, 4.
56. Cato, *De agricultura*, 91; Varro, *Res rusticae*, 1, 51, 1.
57. Columella, *De re rustica*, 2, 11, 1, summarised by Pliny, *Natural History*, 18, 184–186, and Palladius, *Opus agriculturae*, 2, 9.
58. Columella, *De re rustica*, 2, 11, 4; Pliny, *Natural History*, 18, 184; Palladius, *Opus agriculturae*, 2, 9.
59. Columella, *De re rustica*, 2, 9, 18: *frequentem tamen exigunt sartionem et runcationem ut herbis liberentur*; Pliny, *Natural History*, 18, 185; Palladius, *Opus agriculturae*, 4, 2–6.
60. Columella, *De re rustica*, 2, 11, 4–5: *excepto tamen lupino*; Pliny, *Natural History*, 18, 185; Palladius, *Opus agriculturae*, 2, 9.
61. Columella, *De re rustica*, 2, 11, 6–7. Palladius (*Opus agriculturae*, 2, 9) shares this opinion, but Pliny rejects it (*Natural History*, 18, 185), without alluding to the debate.
62. Bretin-Chabrol and Luccioni, 2015.

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