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# The Ethics of Plant Flourishing and Agricultural Ethics: Theoretical Distinctions and Concrete Recommendations in Light of the Environmental Crisis

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**Abstract:** Many activities towards plants are directly related to environmental crisis issues. However, our actions towards plants are little theorized in philosophy and ethics. After a brief presentation of the history, state of the art, and current issues of plant ethics, I critically illustrate how the theoretical threads of current ethics should be clarified, and, more importantly, contextualised, to promote the application of concrete measures. Particular attention is paid to the ethics of plant flourishing as applied to different fields and types of plants. The treatment of wild and ornamental plants is, thus, explicitly distinguished from that of improved agricultural varieties, themselves distinguishable according to modes of cultivation. I thus propose and discuss several recommendations and concrete courses of action to promote an ethics of plants, while pointing out its limitations.

**Keywords:** plant ethics; environmental ethics; philosophy of the life sciences; plant biology; agriculture



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## 1. Introduction

How can we ethically think and regulate our practices in our relations with plants<sup>1</sup>? Acting in favour of plants requires a form of ethical openness to plant life, yet it is often deemed impossible, irrelevant, absurd, or even laughable [1–4]. Similarly, considerations for plants are sometimes deemed incompatible with, or harmful to, animal ethics, from which they would distract us [5]. However, animal, plant, and environmental ethics benefit from being more integrated. Even if the treatment of animals, because of their capacity to suffer, must be thought out at a distinct level, many unreflective activities toward plants have a direct impact on the quality of animal life, animal well-being, ecosystem preservation, and, more generally, the current environmental crisis.

After a brief presentation of the history, state of the art, and current issues of plant ethics, I critically illustrate how the theoretical threads of current ethics should be clarified, and, more importantly, contextualised, to promote the application of concrete measures. Particular attention is paid to the ethics of plant flourishing as applied to different fields and types of plants. The treatment of wild and ornamental plants is, thus, explicitly distinguished from that of agricultural varieties, themselves distinguishable according to modes of cultivation. I thus propose and discuss several recommendations and concrete courses of action to promote an ethics of plants, while pointing out its limitations.

## 2. The Exclusion and Inclusion of Plants in Theoretical Approaches to Ethics

Despite what some may say, plants are not neutral entities with respect to our moral intuitions and behaviours [6]<sup>2</sup>. Many of our practices actually include consideration for plants. Then, how can we explain this difficulty in combining plants and ethics?

The long Western religious and philosophical tradition of *scala naturae*, or of a chain of beings (consisting of a hierarchy of species), explains the reluctance to attribute “dignity” to non-human and, even more so, to non-animal living beings [7–10]. One of the first attitudes responsible for their exclusion<sup>3</sup> from morality, already present in Genesis (chapters 1 and 2),

consists of not even recognising the living (and, therefore, potentially respectable) nature of plants—neither animated by divine breath nor named like animal species, plants are not objects of a specific creation, either. This attitude extends even to modern philosophy and botany of the 18th century—either the plant is reduced to the mineral world and the earth that gives rise to it or it is opposed to “true” life, animate, sensitive, and animal [11].

This moral exclusion of any intrinsic consideration for plant life has, however, also been a source of questioning, even perplexity. Thus, in the fifth century AD, Saint Augustine<sup>4</sup>, following Aristotle, challenged the too literal interpretation of *Genesis*, suggesting that plants were not alive. However, Augustine’s recognition of plant life had potential moral implications that led him to discuss the scope of the first commandment:

“In the commandment, “Thou shalt not kill,” there is no limitation added nor any exception made in favor of any one, and least of all in favor of him on whom the command is laid! And so some attempt to extend this command even to beasts and cattle, as if it forbade us to take life from any creature. But if so, why not extend it also to the plants, and all that is rooted in and nourished by the earth? For though this class of creatures have no sensation, yet they also are said to live, and consequently they can die; and therefore, if violence be done them, can be killed” [12] (I, p. 20).

Immediately, Augustine countered this ethical proposition of respect for all forms of life with the argument that beings deprived of reason are not capable of society with us. From this, it follows that “[they] are therefore by the just appointment of the Creator subjected to us to kill or keep alive for our own uses” [12] (I, p. 20). Thus, since Antiquity, Western thought has determined that plants should only be taken into account morally for what they can bring to other (human) beings worthy of moral consideration. This determination has laid the foundations for the strictly instrumental value of plants, contrasting dominant ratiocentrism (i.e., only human reason guarantees moral consideration) and the possibility of pathocentrism (i.e., animal sensibility would be sufficient) or even biocentrism (i.e., all living things have intrinsic value).

Yet, from the 20th century on, this traditional morality has been evolving. At least since Christopher Stone’s famous article “Should Trees Have Standing?” [13,14], the contemporary relationship to natural objects in the West has made possible a serious ethical and legal thinking about plants. Indeed, with the dawn of the twenty-first century, the question of plants’ worth and their kind of value gradually became an issue that could no longer be ignored in a situation of an ecological crisis. According to Odparlik [15], especially since the 1980s onwards, the perception of plants in public opinion has slowly evolved from seeing them as machine-like creatures to really living beings with specific needs, bringing plants closer to the possibility of direct moral consideration. Odparlik pointed out several stages to this process. Beginning in the 1960s, environmental changes made the public aware of the interconnectedness of all species. Henceforth, English-speaking environmental philosophers and ethicists [16,17] (had to take plants into account in the context of conservation and ecological restoration. By going beyond animal sentience, pleasure, and pain, ethical principles were able to include all organisms. Moreover, continuing advances in plant physiology have rendered the boundary between plant and animal worlds much less obvious than before. In the same way, genetics has highlighted the common origin of all organisms, including plants, and has enabled hybridisation technologies, exchanges of genetic material, including between kingdoms, giving rise to the creation of plant GMOs.

After the second half of the twentieth century, biotechnology, which sometimes broke completely with more traditional techniques, involved plant ethics, as is obvious in the case of GMOs (and the recent CRISPR-CAS transgenesis method). Even if Monsanto insists on the continuity with former agriculture and argues that the GMOs it produces are biotechnology in the same way as beer brewing or farmer’s selection, the transgenesis used is a complete qualitative break with these traditional techniques, because it allows *creating* variability where it was only possible to *select* it [18] (pp. 195–196), threatening the integrity of species and ecosystems. Other issues were raised with the (policy of) conservation

of seeds and varieties, the automation and robotisation of agricultural processes [19–21], and the patentability of life [22]<sup>5</sup>. Ethical issues concern, for example, the variability and preservation of the genetic heritage of certain varieties, the risks of unintended transformations accompanying genetic modification, alterations in ecological relationships with the environment, the dispossession of farmers of their plant resources, the loss of traditional agricultural skills, etc.

Western contemporary society thus inherits a deep-rooted religious and philosophical moral tradition excluding plants, which is difficult to reconcile with the ethical consequences of current techno-scientific issues. On the one hand, there is little or no moral consideration for individual plants, while, on the other hand, biotechnological and ecological mutations now push us to emphasise the value of plant formations and ecosystems, assimilated to environments or biomes, toward which our moral and legal responsibility extends. As a result, in the 21st century, there is a diversity of ethical behaviours towards plants in Western society, not to mention non-Western cultural perspectives [10,23,24]<sup>6</sup>. The literature of recent years has, therefore, increasingly focused on the reasons and justifications for including plants in the philosophical and moral sphere [3,10,18,25–29].

According to Larrère [30], Pellegrino [6], Hiernaux [31,32], and Kallhoff et al. [33], we can structure plant ethics along the lines of the following theoretical orientations:

- *Instrumental*: traditional perspective, according to which, it is morally necessary to take plants into consideration due to the irreplaceable benefits that they provide to humans and animals (food, pleasure, heating, etc.) [34]. The reduction of the plant world to the “ecosystem services” they provide us with is a new avatar of this idea [35].
- *Centred on life in general*: plants would have intrinsic value as living beings or manifestations of life, along with all living things, e.g., in Attfield [16,36,37], Goodpaster [38], and Sterba’s [39] theories of biocentrism.
- *Centred on the plant as a unit of organization*: plants are said to have value by virtue of their self-interest [40] (p. 108), [41] or the goals they achieve [42] as goal-directed systems [17,38,43,44]. Similarly, physiologists, at least since Darwin, and, more recently, plant neurobiologists [28,45,46] have recognised the sensitivity of plants to multiple stimuli, which, while not necessarily associated with an ability to feel pain (i.e., pathocentrism: [47]) as some suggest [48,49], justifies adapting our behaviours [3,10,50].
- *Ecocentric*: plants have value as essential components of an ecosystem and its healthy functioning [16,40] (chap. 5), [51,52] (chap. 3, 4), [53].
- *Personal or psychic*: plants have value as “non-human persons” based on other cultures [54] (pp. 325–326) [10,23] or the study and interpretation of so-called intelligent plant behaviours [28,45] (though not ratiocentrism in the classical or modern Western sense).
- *Relational*: what is good or bad is how we relate to and behave toward plants (but not necessarily what we do to them) from the perspective of an ethics of care, virtue, or flourishing [55–57].

Debates about the intrinsic value of plants, including their ecological or instrumental value, inform us about the reasons for taking them into consideration, for protecting them, or for restricting some of our actions. However, they inform us very little about *how* to proceed. The relational approach has the advantage of allowing us to study existing practices in a concrete way without presupposing a strong moral theoretical framework. How can (or should) we act to show more respect to the plant world? The question concerns individual plants, but also various crops, species, and, more generally, landscapes and ecosystems. An ethical approach to plants, therefore, requires a context, which is often lacking in moral approaches, including those that take into account “the” vegetable kingdom or “the plants”. Indeed, in the case of plants, does it make sense to defend a right or a value of the whole (the biological species, the community, the ecosystem, the biome) without moral consideration for each (the “individual” organisms)? Conversely, can we be concerned only with the value of individual plants without recognising moral duties toward ecosystems [32]<sup>7</sup>? The biological diversity of plants depends on their species,

their way of life, and their environment, which is why I defend here that vegetality, in all its manifestations and at all its scales, cannot be treated in a universal way on the moral level, as is humanity. Proposing a universal declaration of plant rights like that of human rights, or even universal moral principles toward plants, may be inherently problematic for reasons I develop below. However, this lack of universalism does not mean that more contextualised ethical and legal measures should not be encouraged to respect and protect plants.

### 3. Plant Ethics and Agricultural Ethics

A coherent and effective plant ethics can hardly be developed without taking into account the fundamental distinction between, on the one hand, agricultural plants, and, on the other hand, wild and ornamental plants.

Of course, ornamental plants are cultivated, but they differ from agricultural plants in that they fulfil an end that is not that of food or economic yield<sup>8</sup>. This purpose is generally aesthetic (but not necessarily—it can be ecological, for example, if I cultivate in my garden a variety known to attract insects). Horticulture, though it aims at producing beautiful plants, is, nevertheless, part of agriculture, because its primary goal remains production and sale, for which the aesthetic value of plants is a means. Once sold, the status of horticultural plants generally changes to that of an ornamental plant (unless it is sold to an intermediate grower or wholesaler and remains in the economic circuit of production). Finally, wild plants, from which humans derive food or economic interest by gathering (or forest gardening in some traditional cultures), occupy an intermediate situation between “strictly” wild plants and cultivated plants. However, they remain on the side of wild plants as long as the benefits obtained are secondary and opportunistic and not set up as priority objectives dependent on care and techniques, in which case plants become cultivated. The “wild” feature of plants is thus not essential but relative to the directly utilitarian features (food, economic, aesthetic) of other plants.

Ethical literature does not really theorise these distinctions and even maintains a form of universalist confusion (vegetality as a concept implicitly parallel or equivalent to humanity), which can hinder the implementation of concrete recommendations or discredit the very enterprise of a plant ethics (think of the famous “argument” of carrot cries<sup>9</sup> that would prevent us from eating plants). This leads me to distinguish between a general plant ethics and an agricultural ethics that is only partially included in it. This, in turn, requires us to look at our specific relationships to various plants in order to ethically regulate our practices and then determine *how* to adapt them.

Several authors [57–59] have drawn on the practice of (amateur) gardening and the ethics of care to analyse the virtues and the pitfalls of good or bad relationships with plants. Indeed, care is not limited to morally symmetrical relationships (think of a baby’s parent, a caregiver for the elderly, etc.) or interpersonal ones, but it is possible toward various entities, as long as the entity’s needs are readable, concrete actions can be provided for its protection and flourishing, and the entity responds to the care provided as a sentient being [57]. Plants, as well as entire biotopes (a forest, a meadow, etc.), fulfil these conditions. From this perspective, plant ethics do not lie in plants as such (whose value should be respected unconditionally as living beings, for example), but in the caring relationship that lies *between* humans and plants (which can be more or less caring and effective and, thus, good or bad). This implies cultivating an ethics of virtues (humility, attention, patience, openness to learning, etc.). Working toward the flourishing of plants requires sensory experience and attention to their condition in order to respond effectively. In turn, plants’ flourishing provides aesthetic satisfaction to the gardener. Schörghener [57] believed that someone who simply mechanically cares for their plants, following a protocol to the letter, achieves poorer results than someone in a true care logic, where relationships are cultivated. This distinction is illustrated between human-scale gardening and agro-industry, where contact with plants would be lost at the expense of the division of labour, significant technological mediation, and automated acts performed by robots.

Caring for plants and living actively with them is also about caring for soils, ecosystems, and flourishing physically and psychically as a person [60]. Traditional Japanese “forest bathing” physiologically decreases stress and blood pressure, and stimulates immunity; a tree-filled environment accelerates recovery in hospitals; children living and playing surrounded by trees develop fewer attention disorders and less asthma; and green urban spaces decrease crime and increase the longevity of seniors [61–69]. More and more species cannot survive without our help, whether they are endangered wild species or cultivated species with very specific needs, especially in terms of growth and reproduction. For all these reasons, cultivating plant ethics of care would respond to societal and environmental issues. Proponents of relational plant ethics emphasise the “refusal to regulate the human relation to plants on the basis of commodity-economic logic” [25] (p. 185) [59]. Organic farming, agroforestry, and permaculture, through their holistic view of our relationship to the plant world, likely contribute to such ethics [70–73]. Their goal is not just to instrumentalise plants, to produce and to sell, but to grow plants well and treat the ecosystems, soils, animals, and humans who live off them well.

Relational ethics is, thus, a path to follow in developing plant or agricultural ethics from the point of view of the meaning of action (how and what to do). It combines modes of attention, techniques, and more or less ethical attitudes at the level of the relationship (of care or cultivation) to plants and at the level of its consequences. Authors such as Schörghumer [57], Gremmen and Block [20], Houle [74], and Odparlik [15] considered that in the framework of a relational (or care) ethics, we can partly bring the success of the ethical relationship back to the flourishing of plants as plants. Such plants flourishing is itself systematically referred to in Kallhoff’s [55] normative criteria that define it.

The Aristotelian-inspired teleological perspective of Kallhoff’s [55,56] relational ethics is based on a recognition of the good toward which plants strive in flourishing. It is based on three dimensions:

1. Plants’ ability to manage the stresses of their environment (their vitality).
2. The accomplishment of plants’ typical life cycle, including their proliferation (growth and reproduction).
3. The expression of typical plant traits [55] (p. 687)<sup>10</sup>.

Gremmen and Block [20] add a fourth dimension to plant flourishing:

4. Plants must be able to fulfil their ecological role.

According to Kallhoff, the biological interests of plants, even if they are not of the order of feeling, are similar to the wellbeing sought by animals avoiding suffering and seeking pleasures. They can thus be considered as useful ends, guiding the regulation of our relations to plants<sup>11</sup>. Therefore, it seems legitimate to ask *how* these four criteria can guide our concrete relationships with plants in the direction of greater respect. In the following section, I present concrete practices and recommendations that show *how* our behaviours can fit into such a plant ethics, mainly with regard to wild and ornamental plants. The agricultural issue is dealt with separately in the last section.

#### 4. Wild and Ornamental Plants: Recommendations and Concrete Measures

In the following, I examine and discuss concrete ways of taking into consideration the flourishing of plants on an individual, everyday moral level, as well as on a legal and political level. Although little known and improvable, there are tendencies, including institutional ones, that can be put to the test of plant ethics applied to the field of wild and ornamental plants, on the scale of organisms, species, or biotopes.

Pragmatically, legal aspects play an important role, but they are not self-sufficient for reasons both intrinsic and extrinsic to the law. Extrinsicly, they are not sufficient because of the lack of information about existing laws that affect plants and their habitats. Although there are laws for the protection of ancient (or veteran) trees and hedges, species, and endangered environments (at national and international levels), without school and citizen education on the subject of these laws, respecting them remains difficult. With all the best

will in the world, it is not possible to act individually to protect endangered species without being able to recognise them and know their environment. Each citizen cannot, obviously, learn every law and the entire list of protected species (or ancient individuals) with their characteristics<sup>12</sup>. That is why communities and local authorities should systematise the censuses and promote pictorial information panels *in places frequented by the public*<sup>13</sup> where these species grow. Panels should mention species' conservation status and rules in force (prohibition of picking, trampling, walking outside the paths, etc.). Similarly, informative brochures could be distributed to private landowners, on whose property legally protected species may be growing. Unfortunately, many protected species are neglected by the public authorities themselves, due to a lack of political will or means<sup>14</sup>. In concrete terms, the census and monitoring work necessary for the application of laws would require more botanists specialised in taxonomy, yet this essential profession is paradoxically less and less valued as it is neglected in favour of funding the field of experimental biological research [75] (p. 412). In 2009, systematist Dennis Woodland estimated that there were about 3000 taxonomic botanists in the world, whereas at least 18,000 are needed, given that most ecosystems have not yet been inventoried and are being destroyed more quickly than they can be studied [75] (p. 478). Education of citizens and training of professionals seem essential, therefore, for the respect of the most vulnerable plants. However, taxonomic expertise is only one means of action among others, because ecosystems are sometimes destroyed after being inventoried and studied. At the same time, hybrid collectives (not composed solely of experts) promote participatory research and management that sometimes prove to be very useful for the consideration and preservation of plant environments [76].

Deleterious attitudes toward plants are often the result of ignorance or lack of interest. Botanists like Aline Raynal-Roques [77] (p. 267) and, especially, Francis Hallé [78] have denounced the superficial management of parks and gardens. Raynal-Roques explained that, too often, trees are planted only for their aesthetic value, much too close to buildings or to each other. The small conifer that used to look good in the front garden of the post office has become a behemoth in a few years, blocking the windows and clogging the gutters with its thorns, then it is cut down in the prime of life because its growth is against our interests. This lack of foresight is caused by ignorance of the planted species' lifestyles. Hallé [78] also criticises the practice of pruning city trees repeatedly, sometimes every year. Trees in an urban context are already weakened by the concrete (or paved) and polluted environment, and pruning is, therefore, responsible for chronic exhaustion and wounds that are more difficult to heal. These are sources of diseases and fungi responsible for the decline of trees (their loss of vitality). According to Hallé, pruning is extremely traumatic, unnecessary, and undesirable from the trees' point of view (except in special cases). Let us add that the practice of planting monospecific rows of trees, or even clones, along avenues, parks, or parking lots, also raises questions on the biological, ecological, and ethical levels. Limiting genetic and ecological diversity and its expression facilitates the spreading of pests, fungi, and diseases, while standardising age and species-specific weaknesses (since all trees age at the same rate). Consequently, it is not uncommon that a diseased tree prompts the political authorities to cut down the entire row, invoking the precautionary principle. Similarly, (public) works are sometimes carried out without any consideration for the trees—they may be unnecessarily felled for convenience, be injured, or wither away as a result of soil compaction or concreting.

What can be done to promote ornamental plant flourishing ethics? Practical measures can be taken to prevent rather than "cure" poor plant health by ensuring regular monitoring of the health of trees or by using protective devices that prevent damage to the trees during works. Protective devices made of rubber and boards are placed around the trunks, protective enclosures can be provided for longer works, construction machines must not circulate above the development zone of trees' roots<sup>15</sup>, but follow previously defined routes, etc. More than recommendations, these good practices can become constraining municipal regulations with sanctions and reparations at the end (following the example of the city of Charleroi)<sup>16</sup>. If attention and temporary protections are brought to trees in construction

sites, remarkable or ancient trees can be differently signalled and protected permanently. The latter, consisting of possible guy-wires and an enclosure with an information panel, should be generalised in places frequented by the public, especially when degradation or vandalism has already been observed.

More generally, rather than seeking aesthetic harmony in urbanistic habitats, cities should think of their avenue plantings in terms of ecological synergies and diversity. From the perspective of plant ethics, the aesthetic aspect should be considered only after the plants' vital needs can be guaranteed<sup>17</sup>—according to Schörghenmeyer [57], the flourishing of cultivated plants is, in a way, the reward for investing in a healthy and effective care relationship. Limiting the consideration of plants to their aesthetic dimension alone actually amounts to fetishism [3], since by making plants a symbol of beauty, the organism is reduced to an abstract idea at the expense of its concrete biological nature.

For the sake of plant ethics, Hallé and Raynal-Roques, like other professionals in the field, have recommended a more rational and scientific, rather than aesthetic management of plants, especially in an urban context. Architects, urban planners, builders, gardeners, landscapers, designers, and policymakers have a responsibility in this regard. Education in plant biology and information about the living conditions and needs of the species being considered for planting is a minimum to consider. In the same way that raising a pony in a Parisian studio does not seem like a good idea, planting an Atlas cedar in one's city backyard is also inconsiderate, even dangerous in the long run. At this level, each person is individually responsible for the plants they choose for their garden or even for their home. Is the plant invasive? Does it require more light than my apartment offers? Is it a tropical plant with special needs, etc.?

At the public level, censuses and (legal) protections of ancient trees, along with social control of natural environments can be encouraged<sup>18</sup>. The political will and citizens' or collectives' demands for biodiversity protection may also suggest adding some environments or species to the protected lists, as well as the promulgation or amendment of (local) regulations, or laws, that are not very effective for intrinsic reasons.

Indeed, there may also be intrinsic reasons as to why plant-specific laws cannot work effectively in the spirit of plant ethics. For example, if laws are unclear about the entities or conditions under which a plant is protected, enforcement may be made difficult or impossible. Laws do not generally dictate that the local reappearance of a previously extinct (or unnoticed) species in a territory is given protective treatment (since only those species actually recorded at a given time are subsequently protected). A subspecies or a local variety may also fall outside the scope of a law that is too specific or too imprecise. Another intrinsic problem with legal measures concerns the fines set and the actual prosecution of violations. The amounts to be paid are not necessarily a deterrent to criminal behaviour against plants, especially for large farmers or wealthy property developers. Landowners with multi-million-euro holdings or projects may well budget for fines for the possible uprooting of protected ancient trees or hedges, if not for the destruction of protected species. For example, in Belgium, transactional fines amount to 1000 euros per felling of an ancient tree ("remarkable tree") and to 25 euros per uprooting of a current m<sup>2</sup> of ancient ("remarkable") hedge<sup>19</sup>. The agricultural or building land, once freed from disturbing plants, even at the cost of sanctions, will in any case yield much more, especially in the long term. For a farmer, the bet can be risky<sup>20</sup>. The calculation is much more interesting in the case of a property developer, since a building surface of 30 m<sup>2</sup> recovered by the felling of an ancient tree corresponded, in Belgium in 2019, on average to 4500 euros (that is to say 3500 euros of profits minus the possible expenses of felling). However, the real gain is much more significant if the felling of an ancient tree on a small building plot allows the construction of a new house, sold, for example, for 400,000 euros, and which would otherwise have been impossible to build (the sums are even greater in the case of a large building)<sup>21</sup>. Similarly, a private individual willing to pay 15,000, 30,000, or even 50,000 euros for the building of a swimming pool in his garden will probably not see any serious financial inconvenience in paying a 1000-euro fine for the destruction of the tree or

the hedge that would hinder his project<sup>22</sup>. Moreover, the indiscriminate felling of (ancient) trees is sometimes attributable to the public authorities themselves (road works<sup>23</sup>, or an error of judgement when a wide load passes by<sup>24</sup>). The current legal provisions for the protection of ancient trees and hedges do not seem to be very dissuasive (depending on the legislation and the countries), which makes their effectiveness relative. The treatment of non-ancient trees is even less regulated.

As for the laws regarding the protection of species and environments provided for in environmental codes, they seem to be more dissuasive. For example, in France, “undermining the conservation of non-cultivated plant species” is now punishable by two years of imprisonment and a fine of 15,000 euros [79] (Law of August 8, 2016, Article L415-3). An alignment of the laws for the protection of ancient trees and hedges on the amounts and, especially, the sanctions provided for by the laws protecting species deserve to be thought about. However, the avenues to be considered do not necessarily involve a hardening of the sanctions in financial terms (although this would undoubtedly be useful); they could also involve, for example, possible penalties of community service linked to ecological restoration, which could certainly be more dissuasive for wealthy individuals. Another avenue is to rethink some agricultural (or urban planning) policies in terms of incentives, such as providing compensation payments for the preservation of legally protected plants on private land. Similarly, if the presence of an ancient tree or hedge in a pasture that a farmer wishes to convert into a field represents a loss of  $X$  m<sup>2</sup> of crops, and that same number of m<sup>2</sup> would earn him a certain sum per year, this sum could be paid as compensation in exchange for a commitment to preservation. Another possibility is to extend the right of pre-emption by public authorities to lands on which there are ancient trees or hedges. In this way, authorities could systematically acquire, as a priority, the concerned parcels (not necessarily the entire land) put up for sale<sup>25</sup>.

More concretely, what can we all do on a personal level? Generally speaking, all ethicists who have considered the case of plants, even the most conservative ones (see [1]), advocate at least avoiding any arbitrary degradation of plants that constitutes a morally reprehensible act. ECNH [1] gave the example of an individual who enjoys cutting down wildflowers while walking. In this spirit, my grandmother, who took us to pick wild daffodils and hyacinths in the woods, also taught us not to pull up the bulbs and to replant them when we inadvertently dug them up. Intuitively, then, our practices incorporate, as disproportionate or arbitrary harm, the damaging or killing of a wild plant for no reason, or even for its flower alone when avoidable. However, we must also recognize, following several authors [2,3], that cases where the destruction of plants cannot be legitimised for non-arbitrary reasons are very rare, if not non-existent. Non-arbitrary reasons include at least all scientific (laboratory experiments, etc.) and agricultural uses that still represent our privileged and dominant relationships with plants. Only wild and ornamental plants seem to have their capacity to flourish guaranteed in relation to much stricter instrumental reasons. This explains why the gathering of certain wild plants is forbidden, even for the purpose of eating them, whereas eating a cultivated carrot is not morally reprehensible. This leads us to question the relevance of an ethics of plant flourishing for agricultural varieties and to consider agricultural ethics.

## 5. Plant Flourishing and Agriculture

Insofar as neither Kallhoff [55,56], nor the above-mentioned authors who have endorsed her criteria for plant flourishing ethics, expound it, I explain that thinking about plant ethics from the point of view of the aforementioned four criteria, assimilated to the end of flourishing, is realistic only in the case of ornamental and wild plants. Indeed, the criteria of flourishing seem to me, as they stand, impossible to transpose onto agricultural ethics, for reasons that are both theoretical and material. By making plant flourishing and the gardening relationship a model of plant ethics, cultivated ornamental plants seem to serve as the universal model for thinking about all plants (cultivated and wild) in general. While this model can probably be transposed to some extent onto the relationship we may

have with wild and ornamental plants, as I suggested above, it does not seem to work for agricultural varieties.

Agriculture, through its breeding practices and its pursuit of yield and efficient means of production, is, almost by definition, alienating and not fulfilling for plants<sup>26</sup>. In its current dominant version, it consists of restricting plant autonomy to create “agricultural artefacts” [80] (p. 510) according to a “pre-established set of specifications” [81] (p. 264) based on human interests and profitability [77] (p. 62) and not on the good of the plants, which, once “improved”, lose “their biological efficiency [which] makes their possibilities of survival under natural conditions very uncertain” [77] (p. 62). The ways in which cultivated plants exist and our relationships with them have been profoundly transformed: the very being of cultivated plants, their nature, genotype, norms of response, and relationships to the world are generally no longer similar to those of wild plants [3,25,82]. From an ethical perspective, this means that the utilitarian relationship and, thus, the instrumental (food and use) value of plants is the very foundation of agricultural practice, making attempts to promote universalist ethics based on the interests and intrinsic value, but also plant flourishing, problematic, almost as a matter of principle<sup>27</sup>. Despite Gremmen and Block’s [20] attempt to explicitly apply Kallhoff’s [55] ethics to the agricultural context, its techniques are incompatible with the four dimensions of plant flourishing.

1. The first dimension, *plant vitality*, is seriously compromised by modern agriculture, as crop plants have been selected for specific, stable traits (such as grain dehiscence), implying that their variability and, thus, their ability to adapt to a hostile and changing environment are counter-selected [83]. Many varieties suffer, as a collateral effect of their selection, the inability to respond properly to certain stresses (predators, diseases, drought, etc.). Asexual reproduction techniques by vegetative propagation and grafting accentuate this loss of viability in the mid- and long-term by preventing the natural coevolution of plants with their predators by creating cumulative imbalances detrimental to plants [18] (p. 52).
2. The second dimension of plant flourishing is even more problematic: a cultivated plant is almost always killed before the end of its growth or before *the completion of its life cycle*. For example, lettuce is systematically picked before going to seed, broccoli before flowering, carrot is harvested annually even though it is a biennial, etc.
3. In the same way, the third dimension is also foreclosed, because many cultivated plants do not express (or no longer express) *typical characteristics of their species*. This third dimension seems to depend directly on the second—it is indeed difficult to understand how a plant can fully express its typical characteristics without completing its full life cycle, and vice versa. Pruning techniques, control of the soil, habitat, luminosity (in greenhouses), fertiliser inputs, etc. often prevent horticultural varieties from expressing all the typical characteristics of their species (either flowering is prevented in favour of foliage, or, on the contrary, it is forced to the detriment of the development of the vegetative system, for example). The constraint on the plants’ life cycle is sometimes integrated into plant biology itself by agricultural selection or GMO techniques. For example, cultivated banana plants have become incapable of producing seeds—they are sterile varieties reproduced vegetatively. Kallhoff [84], Koechlin [2], and Marder [26] argued that technologies that prevent plants from producing seeds should be criticised as instantiations of the unworthy or disrespectful treatment of plant life. However, even in nature, wild plants do not necessarily express their “typical” characteristics, depending on their environment, and climate and may, for example, reproduce vegetatively rather than by producing seeds. The hindrance to the expression of typical characteristics of a species should, therefore, be distinguished according to whether it is contingent and reversible or absolute, as in the case of certain GMOs (e.g., terminator gene strategy).
4. Finally, all agricultural and horticultural plants cultivated outside their endemic area are likely to fail to *fulfil their ecological roles* (even if they can sometimes substitute for a local species). Moreover, the effect of the current dominant large monocultures,

including endemic varieties, limits the presence of other species in the plants' original ecosystem and, thus, reduces their ecological interactions almost to zero while multiplying the presence of its pathogens. Land consolidation, pesticides, chemical fertilisers, and the selection of plants that are greedy for them (in order to optimise their growth) have eliminated auxiliary species<sup>28</sup> and disfavoured natural mycorrhizal symbiosis [85]. Note, however, that alternative practices, such as agroforestry, permaculture, or animal associations in crops, are particularly sensitive to this last dimension by developing multispecific crop sites, which are human-sized and favour interactions (including with wild plants) through crop rotation, co-cropping, or the reintroduction of hedgerows.

In summary, in the dominant paradigm of contemporary industrial agriculture, the ability of crop plants to respond to their environment is reduced and optimised by selection to match a very specific environment, in which their development is directed (weed-free, fertiliser-supplemented, pest- and disease-treated, or even irrigated farmland), in contrast to the plants' initial capacity for varied adaptation to the threats of their environment (their vitality). Moreover, selection and cultivation methods often go against the expression of the typical characteristics of a species and against the accomplishment of its life cycle and its ecological interactions. Are we, therefore, forced to resign ourselves to an alternative that consists either in excluding agriculture from ethics or in assuming the immorality of plant exploitation? In reality, this alternative, which is not an alternative, is reductive: either everything is allowed or nothing is allowed, but with necessity being the law, indifference makes everything acceptable. Such a position does not inform us on how and what to do. I simply think that the weight of humans' (and animals') interests versus plants' interests (their flourishing) is not, and should not be, the same in the case of wild, ornamental, and agricultural species. Kallhoff's [55,56] flourishing plant ethics is, therefore, arguably applicable to ornamental varieties in gardens, or even to the preservation of wild species, but seems inappropriate for agriculture, at least given the dominant agricultural practices today<sup>29</sup>.

The ontology of wild and cultivated plants is not the same, and our relations, good or bad, with them must be specified accordingly. These relations between wild and cultivated plants still differ more than between wild and domestic animals, since, in pathocentric utilitarian ethics, the animal's capacity to suffer must be taken into account in both cases (which can lead consistently to both the immorality of hunting wild animals and the condemnation of all forms of farming). The utilitarian criteria of suffering and welfare, by contrast, do not apply to plants at all [34]. Yet, as we have seen, in the case of plants, flourishing cannot play this role of universal moral standard either, as the exploitation of cultivated plants (unlike that of farmed animals) is absolutely unavoidable<sup>30</sup>. Moreover, plant needs and interests may manifest themselves in different ways in different species, with the consequence that "ethically inspired decisions cannot postulate the abstract conceptual unity of 'the plant'; they must, rather, take into account the singularity of each species with its unique temporality and non-generalisable existential possibilities" [26] (p. 36).

Not all agricultural (and animal husbandry) practices are ethically equal. From a relational point of view, some attitudes have more beneficial consequences than others—for humans, for plants, for animals, for soils, for other species, etc. Moreover, even perfectly ethical agriculture (based on criteria to be determined) would probably not be sufficient to establish a more general plant ethics consistent with our expectations and ways of dealing with wild and ornamental plants. Firstly, quantitatively, because only a few species are cultivated according to our interests<sup>31</sup>. Secondly, qualitatively, because agriculture is not a substitute for the preservation of plants in their natural environment, since it preserves neither the perennial organisms, nor the ecological relationships of plants (with pollinators, soils, etc.), nor the inherent characteristics of species.

These developments naturally lead us to propose avenues for general plant ethics that are partly distinct from agricultural ethics, which should be discussed in a more specific way. However, agriculture has never really been a field of philosophical thinking, despite

its universality and timelessness, because it historically depends on the sphere of needs, daily life, and the work of peasants and not of intellectuals<sup>32</sup>. Until very recently, the impact of our agricultural practices was not considered ontologically and ethically. According to Sylvie Pouteau [83,86] (even if the 18th century is the century of agriculture, a radical change took place only after the First World War with the possibility of producing nitrogenous chemical fertilisers (synthetic nitrates). Plants no longer lived in continuity with the soil, but became dependent on external contributions, like farm animals. Domestication, also by controlling reproduction, has blocked the characteristic lines of plants. Mechanized agriculture, the Green Revolution, and GMOs have reinforced the technical character of cultivated plants. Conversely, human populations have also become largely dependent on improved plant varieties and, thus, ultimately on the owners of the breeding and cultivation technologies inherent in them. Pouteau [86] explained that the advent of hydroponics and the biotechnological steps that followed, at their origin, by way of reaction, came from a philosophy and ethics of agriculture that developed through the birth of organic farming. This ties in with the idea that agriculture, through permaculture for example, only has an ethical hold on the ecological dimension, and very little on plant flourishing as such. Moreover, the flourishing of wild and ornamental plants should not be thought of as that of clearly localised (subjective) animal individuals with a programmed state of accomplishment, but, first and foremost, as a dynamic, plastic, and adaptive process, open to the environment [31]. As a result, agricultural ethics are often about the soil, territory management, shared spaces, etc. However, Pouteau [83] pointed out that ethical considerations related to GMO plants, pesticide use, etc. are most often reduced to the human perspective only. Therefore, we need to reinvent more inclusive narratives to develop an agricultural ethics that is also concerned with our relationship to plants through movements such as organic farming, permaculture, shared gardens, peasant struggles for seeds, the patentability of life, and so forth.

In matters of agriculture and, by extension, of agricultural ethics (and, more generally still, of plant ethics), this should draw our attention to the fact that the question is probably not what I am allowed or forbidden to do with plants in absolute terms, but how to privilege practices that are healthier than others. While killing a human person against his or her will is probably always immoral in and of itself, universally, the same may not be true for animals and certainly not for plants at the base of the food chain. As Marder [26] wrote in his article “Is it ethical to eat plants?”, the question is obviously not “Can I eat plants?”, but rather “How do I eat them?” and, thus, “How do I grow them?” Marder, thus, denounced not agriculture as such, as if it were immoral in itself, but the practices of agro-capitalism that are alienating for plants, but also for humans, by developing at the expense of the practices of autonomy, solidarity, and cohabitation through the local appropriation of the means of production. By proclaiming itself the only way to fight world hunger, agribusiness politically legitimises its practices of total instrumentalisation of plants (and humans) and creates a false alternative between feeding on them or respecting them. The current dependence of agriculture on capitalism and on science and technology thus makes agricultural ethics a political issue. More fundamentally, we are what we eat, because the way we consume reflects our attitude and our position in the living world:

“If there were a single recipe for respectful eating practices, it would have prescribed the following: to remember at all times that the beings we eat or experience are much more than storehouses of calories or of information and that they have a whole range of other potentialities irreducible to providing us with nourishment, including everything that falls under the category of ‘food for thought’” [26] (p. 33).

In a similar vein, Matthew Hall [10] (p. 114) drew our attention to the fact that the Kwaikiutl and Tlingit Indians of the North American west coast turn to plants for permission to be gathered [87] (p. 241), not because it would be wrong to kill and consume them per se, but because it is wrong to disregard what we owe them as if it were taken for granted and owed to us as “superior” beings. This attitude is, of course, in fundamental contrast to the Western tradition, which sees animals, and especially plants, as means

whose sole end is to be “subjected to us to kill or keep alive for our own uses” (to use Augustine’s words) (see also [8]).

Without developing agricultural ethics as such, I think I have shown why it should be partly distinct from a plant ethics that would concern more generally wild and ornamental plants, whose ecological interactions, as well as interests, flourishing, and even intrinsic value can be defended more specifically<sup>33</sup>. Nevertheless, there is probably not a set of necessary and sufficient criteria to define a wild plant from a cultivated plant. Rather, there is a continuum of characteristics that tends toward one pole or the other and may evolve over time. These categories of plants are not essentialised and fixed, but depend, above all, on the relations that we maintain with them. Moreover, the treatment of cultivated plants should not be thought of or disconnected from that of wild plants because of the close links between agriculture and its consequences for ecosystems.

## 6. Conclusions

Plant ethics are best thought of in terms of actions and recommendations to be implemented in specific situations. These situations are varied, both from the point of view of the plants themselves (a seaweed or a sequoia) and of our relations with them. This is why plants, and consequently plant ethics, are difficult to universalise, a difficulty that implies, at minimum, the distinction between agricultural, wild, and ornamental plants. If criteria for an ethics of plant flourishing can be used as guidelines in the field of ornamental and wild plants, they should not be absolutised and need to be deeply rethought in order to be applied to agricultural domains. Indeed, an ethical perspective focused on the good of the plant as an end encounters internal limitations in its application to agriculture, which considers plants primarily, if not exclusively, as means.

Having said this, what are the summary recommendations I can offer? First of all, respect the laws and regulations in effect when walking, doing business, or doing private work. In the absence of rules, promote them in obviously unethical situations that require it. Learn about the local flora, especially when the information is available in situ. It is good to help in the census of rare species, ancient trees, or hedges and to encourage citizen watch. Participate in public inquiries prior to any urban planning project to see if they impact protected or sensitive plants or ecosystems. Communicate and raise awareness of these issues among the general public and personal circles. It is vital to support the initiatives of collectives<sup>34</sup>, to draw attention to abuses, to submit concrete ideas, and to put pressure on the public authorities that have the power of decision and legislation. Finally, in forestry and agriculture, an ethical and political analysis specific to cultivated plants is necessary. Nevertheless, individual measures can be adapted as well, notably by encouraging awareness and responsibility in our production and consumption patterns of wood, fibre, and vegetables. Whether in our own gardens [88] or through our purchases, organic farming, permaculture, agroforestry, promotion of seasonal products, and short circuits are all avenues with a positive effect on plant ecology. However, all these recommendations must be closely linked to the basic human rights and needs that must be guaranteed. As Attfield [37] wrote, one cannot decree in the name of living ethics that firewood should be banned among poor populations that currently have no other alternative for survival. Deforestation and, more broadly, environmental degradation is indeed closely linked to poverty [89] (p. 359–377) and to increases in national debt [90]. However, even in this case, ensuring the renewal of forests for the future (if not their conservation) is an ethical principle, for which rich importing countries have a direct economic and political responsibility [37].

In conclusion, from a relational perspective of plant ethics, the question is not “What moral status do plants have?” but “What do they need and what can I do for them?” [58]. This questioning of our practices must also be collective, political across a variety of areas of everyday life, and not limited to abstract ethical theories. Questioning our relationship to plants requires questioning ourselves as individuals, with our means, in a given socio-economic situation, but also our culture, our vocabulary, our habits, our forms of life.

Coekelberg [58] thus spoke of a moral geography, where others prefer the term integral ecology [91], because, in order to change our relationships to plants, the entire relational constellation of humans must change. Likewise, concern for plants, for example in the ecofeminism developed by some African countries, can be a driver of this change. Plants do not have a fixed place or status; our relation to them depends on an anthropological, cultural, social, and psychological history. More than ever, in the Anthropocene era, the different forms of life, whether human, animal, plant, or technological, are intertwined. Philosophers and anthropologists such as Haraway [92], Lowenhaupt Tsing [93], and Myers [94] have captured the centrality of plant life in these issues by questioning our era as the Planthropocene or Plantatiocene. From the mastery of agriculture in 9000 BC to the capitalist agribusiness of the 21st century, our (technical) relations to plants have profoundly shaped the Earth, the economy, politics, and ecology. How, then, could contemporary ethics not be concerned with plants?

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## Notes

- 1 The generic term “plants” includes here all autotrophic photosynthetic taxonomic groups: algae, mosses, ferns, seed plants and flowering plants.
- 2 For example, in a thought experiment in which one asks to destroy an uninhabited planet or a planet populated only by plants, the subjects of the experiment choose to save the plants [95].
- 3 The exclusion of plant life is not necessarily intentional, but rather a blind spot that stems from more general approaches to knowledge and appropriation.
- 4 Augustine of Hippo (354–430) is one of the Fathers of the Church whose writings constitute a reference to the official interpretation of Christian dogma and morality.
- 5 In her book, Hermitte explains that, following the American law, the patentability of plants is since 2015, a fact acquired by the European law under the pressure of the agricultural industrialists without there being sufficient political interest to counter them. Note here the updated use of the strategy of excluding plants from the field of life: “The EPO [European Patent Office] states that ‘a plant defined by single recombinant DNA sequences is not an individual plant grouping to which an entire constitution can be attributed [ . . . ]. It is not a concrete living being or grouping of concrete living beings but an abstract and open definition embracing an indefinite number of individual entities defined by a part of its genotype or by a property bestowed on it by that part (EPO, Gr. Ch. rec., 20 déc. 1999. *Novartis*, G 1/98) [22] (p. 48).
- 6 For example, Buddhism promotes the idea that plants as well as animals, even if they do not suffer, deserve our compassion and protection from violence [96] (p. 64–72), as does Jainism, a stream of Hinduism whose vegetarian diet based on the fruits and renewable parts of plants avoids killing them [10] p. 86–98, p. 80–82).
- 7 Obviously, this question also arises for animals. However, the case of plants makes this interdependence between individual organisms and their ecosystemic whole more obvious and also more problematic (see [32] for details).
- 8 Food yield may or may not be economic (e.g., if there is only personal consumption) and economic yield may exist without being food (e.g., wood).
- 9 For the history of this expression, see Grellet [97]
- 10 This flourishing ethics also has the advantage of being applicable to humans, animals or plants, although the conditions of flourishing of each are different. Thus plants grow, open up and reproduce according to an organisation that has nothing random about it. The accomplishment of their life cycle, which can be empirically attested, is the finality of a good life for plants which acts according to their interests and avoids what is detrimental to them.
- 11 However, Kallhoff [56] considers that plants’ interests are not sufficient to provide them with moral status as such, and that not preserving some plants’ interests is therefore not necessarily immoral. Instead, she defends a “pre-moral” conception of her theory.

- 12 The international CITES convention on the prohibition of trade in endangered species lists 33191 protected plant species worldwide (compared to 6666 animal species) [98]. At the national level, for example, 124 plant species are legally protected in Belgium, 450 in France, 5752 in the USA.
- 13 Sometimes the opposite reasoning prevails, arguing that keeping the presence or location of a rare species secret is probably the best way to protect it from collectors and traffickers. However, in a place frequented by the public, the risk of collection and unintentional or ignorant destruction is probably greater. For example, in some Brussels woods, pannels inform the public of the presence of wild garlic (*Allium ursinum*) and prohibe of collecting it.
- 14 See for example this Belgian case [99].
- 15 “Indeed, trees have a root system that extends well beyond the projection of the crown on the ground. Trees make the most of their resources, both above and below ground. If the main roots, called anchor roots, are generally located under the crown, the rest of the root system, allowing trees to feed, extends much further. Neglecting this primordial fact invariably leads to the premature death of trees, and examples are unfortunately still too numerous” [100] (p. 32).
- 16 Règlement Communal de préservation des arbres lors de chantiers publics ou privés (2010) [Municipal regulations for the preservation of trees during public or private works] [101].
- 17 The aesthetic aspect of plants should not, however, be opposed to plant ethics, because the beauty of some plants can be an important factor in the value we attribute to them and thus in their preservation. Let us recall that for Kant and his *Critique of Judgement*, values and aesthetic judgements are close to moral judgements.
- 18 The Direction of Monuments and Sites of the Brussels Region [102], for example, provides the public with brochures to raise awareness of the inventory of remarkable trees. This brochure includes a contact form to be filled in with the data of “your” tree in order to examine its application.
- 19 Arrêté du Gouvernement wallon modifiant le Code wallon de l’Aménagement du Territoire, de l’Urbanisme et du Patrimoine en ce qui concerne les amendes transactionnelles, Article 449: 15, 16, 17 [Order of the Walloon Government amending the Walloon Code of Town and Country Planning, Urbanism and Patrimony with regard to transactional fines] [103].
- 20 Potato yields can reach up to 70 tons per hectare. If we consider that an ancient tree occupies 30 m<sup>2</sup>, this gives us an estimated yield loss of up to 210 kg of potatoes per harvest. We can estimate the average price of potatoes for the last three years at 200 euros per ton, so a harvest on 30 m<sup>2</sup> represents up to 42 euros. By calculating over 20 or 30 years, the farmer could hope to recuperate the amount of the fine, since the prices of the crops increase over time with inflation: he could then make a net profit.
- 21 For a genuine example see [104].
- 22 For the kinds of swimming pools and their costs: [https://www.guide-piscine.fr/prix-piscine-entree/prix-d-un-piscine-entree-1115\\_A](https://www.guide-piscine.fr/prix-piscine-entree/prix-d-un-piscine-entree-1115_A) (accessed on 19 October 2021).
- 23 For a genuine example implying public railway works see [105].
- 24 For a genuine example of a wide loan see [106].
- 25 This measure, which might seem at first sight to be a restriction of individual liberties, is in reality only a concrete way of ensuring that existing laws are respected.
- 26 Even in traditional, wild, organic, kinds of agriculture, permaculture, etc., where yield is not necessarily the only objective, any agriculture seeks a minimum yield necessary for food. Agriculture without yield becomes pleasure gardening and the agricultural plant becomes an ornamental plant.
- 27 Atfield [37] seems aware of this problem, which arises in a somewhat similar way between biocentrism and the necessary exploitation of forests.
- 28 The routine use of insecticides, for example, unintentionally led U.S. plant breeders to choose a corn that was unable to attract the natural predator of the Western corn rootworm (*Diabrotica virgifera*) that was threatening it. Having become resistant, the rootworm caused an estimated \$1 billion in annual losses [28] (pp. 103–104).
- 29 The only agricultural varieties that might have their four flourishing dimensions respected are possibly horticultural varieties or plants grown solely for their fruits (such as grapes, fruit trees, squash, peas, etc.). These varieties should be old and resistant so that their vitality/viability is not greatly compromised by agricultural breeding. Moreover, they should be cultivated without constraining their typical spontaneous development (but often they are pruned, forced, etc.), and they should be allowed to die a natural death after a full life cycle (but they are often uprooted after harvest, or when they age and become less productive in the case of perennial plants). Finally, an ecological perspective (e.g., permaculture) should be adopted to ensure ecological integration and minimal intervention.
- 30 In this regard, it should be noted that the movement for an International Convention on the Rights of Trees recognises in its preamble the difference in treatment involved in the professional exploitation of trees [107].
- 31 The world’s diet is based primarily on 14 species of cultivated plants: 80% of the calories consumed by humans come from 6 plants: wheat, rice, corn, potato, sweet potato, and cassava [80] (p. 513). The total number of plant species is currently estimated to be over 400,000.
- 32 It is only very recently, with the mechanization of agriculture and currents such as agroecology, that peasants have gained access to a form of education and that their work is no longer necessarily incompatible with that of intellectuals.

- 33 None of these theoretical possibilities necessarily implies a form of egalitarianism between all entities endowed with value (humans, animals, plants, etc.).
- 34 For example, here is a non-exhaustive list of collectives working on good tree management practices: <http://www.arboresco.eu/liens.aspx> (accessed on 19 October 2021).

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