OneSTOP

BIODIVERSITY BUILDING BLOCKS FOR POLICY

Is One Health Plant-Blind?

Why plant health is missing from One Health and why it matters for policy

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KEY MESSAGES

One Health is currently plant-blind.
Plants are largely treated as passive environmental background, creating both a **critical gap and a structural bias** towards animal- and pathogen-focused approaches.

This weakens prevention and leads to suboptimal responses.
By overlooking plants as active determinants of health, current frameworks risk missing key ecological drivers and prioritising reactive crisis management over resilience.

Plant systems underpin health across multiple pathways.
From food security and primary healthcare to ecosystem stability, microbiomes, and disease dynamics, plant diversity is foundational to human and animal health.

The problem is systemic, not just scientific.
Plant-blindness is reinforced by governance structures, underrepresentation of plant expertise, declining taxonomic capacity, and limited integration of biodiversity data in monitoring systems.

Integrating plants strengthens One Health.
Including plant indicators, investing in taxonomy and biodiversity data, and recognising plant-driven health risks (e.g. invasive species) are essential steps towards a more preventive, operational One Health approach.

Funded by the European Union

EXECUTIVE SUMMARY

The One Health approach recognises the interdependence of human, animal and environmental health, yet its implementation remains incomplete. In current policy and monitoring frameworks, plants are largely treated as a passive component of the environment rather than as dynamic determinants of health. This policy brief identifies this “plant-blindness” as a critical governance and implementation gap that not only limits the inclusion of plant systems, but also introduces a bias towards animal- and pathogen-focused perspectives in health policy and monitoring. This bias is reflected in the limited recognition of plants as active components of ecosystems, as well as in gaps in plant diversity data and declining taxonomic expertise in health-oriented systems[1]. This form of “plant-blindness” is not unique to One Health, but reflects a broader and well-documented tendency to overlook plants in science, policy, and public perception[2].

Plants clearly underpin food security and nutrition, but their influence on human health goes much further. Plants contribute to primary healthcare through medicinal resources, regulate air and water quality, and shape plant-associated and soil microbiomes that influence the health of ecosystems, animals and people. At the same time, plant systems, whether natural or man-made, can also be associated with health risks, through exposure to agrochemicals or potential invasive alien species.

Despite this, plant health and plant diversity are rarely included in One Health indicators, risk assessments or decision-making processes. This omission is reinforced by declining taxonomic capacity and the limited integration of taxonomic data into monitoring infrastructures, constraining our ability to detect, understand and act upon biodiversity–health relationships.

As a result, One Health policies tend to prioritise reactive responses to crises rather than preventive, resilience-based approaches. Strengthening the role of plants on healthy environments and ecosystems—and the knowledge systems needed to appropriately address, manage and monitor them—is essential to make One Health more operational.

1. THE PROBLEM: ONE HEALTH WITHOUT PLANTS

One Health is often described as an integrated approach linking human, animal, and environmental health[3]. Yet in practice, "environment" is frequently reduced to chemical and physical (abiotic) factors such as climate and pollution. Plants—despite forming the structural and functional basis of most ecosystems—are rarely addressed as health actors in their own right. This gap is reinforced by the broad and often ambiguous use of the term "environment", which can obscure the role of ecosystems as dynamic biological systems in which plants are central components.

This omission has consequences. By focusing primarily on pathogens, animals, and human health outcomes, while neglecting the ecosystems that underpin them, One Health interventions may tend to be reactive rather than preventive. The result is a framework that manages crises (pandemics, food shortages, ecosystem collapse) instead of building resilience to avoid them. Moreover, this omission does more than limit prevention; it can lead to ineffective or misdirected responses by failing to account for underlying ecological processes.

Plant-blindness is not merely an absence of knowledge, but primarily a governance and implementation gap that also introduces a systematic bias in how health challenges are framed and addressed. By overlooking plants as active components of health-supporting ecosystems, policy processes tend to prioritise animal- and pathogen-focused perspectives. Consequently, plant expertise, plant indicators, and plant-based solutions remain critically underrepresented. Declining taxonomic capacity and limited integration of biodiversity data infrastructures further reduce the visibility of plant diversity in monitoring systems, reinforcing both the gap and the bias.

2. PLANTS AS A FOUNDATION OF HUMAN HEALTH

Plants are the primary source of human nutrition, yet One Health discussions often focus on diets rather than on the ecological systems that make healthy diets possible. At the level of food production systems, monoculture-based agriculture prioritises short-term yield gains but reduces ecological and agricultural resilience, increasing vulnerability to pests, diseases, and climate extremes[4].

Crop wild relatives—wild plant species genetically related to cultivated crops—are a critical but underutilised resource[5]. They provide genetic traits for disease resistance, drought tolerance, and nutritional quality. The history of crops such as bananas illustrates how reliance on genetically uniform varieties can lead to systemic failure, with direct consequences for livelihoods, nutrition, and health[6]. Protecting plant genetic diversity is therefore a preventive health measure, not merely a conservation goal[7].

Plants also play a key role in healthcare. In many regions, medicinal plants are used for common ailments such as coughs, colds, and minor infections. This is particularly important in isolated or resource-limited communities, where access to formal healthcare may be delayed or limited[8].

Despite their widespread use, medicinal plants are often excluded from One Health discussions due to concerns about efficacy or standardisation. While these concerns are valid, ignoring medicinal plants altogether overlooks their role in primary healthcare and their potential contribution to prevention and early intervention. Moreover, many modern pharmaceuticals originate from plant compounds, highlighting the blurred boundary between "traditional" and "modern" medicine.

3. PLANT DIVERSITY AS A DRIVER OF ECOSYSTEM RESILIENCE

Healthy ecosystems buffer environmental shocks, regulate water, stabilise soils, and dampen population fluctuations. They also serve as a critical defense against biological invasions. Plant diversity is central to these functions.

Simplified ecosystems, characterised by low plant diversity, are less tolerant to change[9]. This is evident at the ecosystem level in intensively managed landscapes dominated by large-scale monocultures, where reduced plant diversity increases vulnerability to

pest outbreaks and environmental stress, while also diminishing ecosystem services such as pollination and soil regulation.

Simplified ecosystems are also more susceptible to biological invasions, as reduced competition from native species can facilitate the establishment and spread of invasive alien species, further degrading ecosystem functioning[10].

Invasive alien plants can negatively affect human health through multiple pathways. They can alter local environments in ways that favour the spread of disease-carrying insects, increasing health risks -such as malaria transmission- for surrounding populations. They can indirectly contribute to reduced food security, while some species cause direct health problems, such as skin irritation, burns, or other toxic reactions.

In contrast, functionally diverse plant communities provide redundancy and stability. They underpin complex food webs, reduce the risk of collapse, and maintain ecosystem functions that directly or indirectly support health[11].

Monitoring and maintaining this diversity requires robust plant data and taxonomic expertise, without which key changes in ecosystem composition and functionality may go undetected.

4. NATURE-BASED SOLUTIONS AND HIDDEN PLANT LABOUR

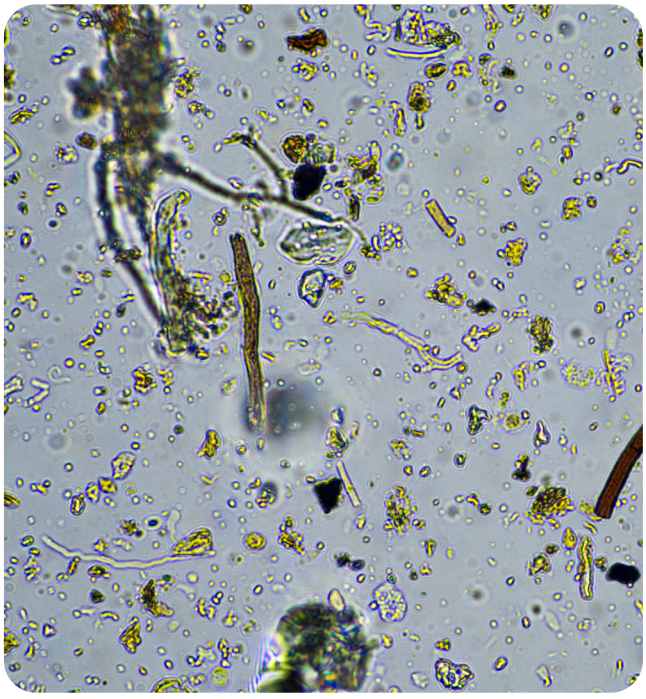
Nature-based solutions are increasingly promoted in policy. For example, beaver reintroduction is often highlighted for improving water quality and reducing flood risk. Beavers are framed as ecosystem engineers, and rightly so. However, the water purification and flood buffering effects attributed to beavers are largely mediated through vegetation: plants slow water flow, trap sediments, and absorb nutrients.

This illustrates a broader pattern of plant-blindness. Animals are visible and charismatic, while plants perform essential regulatory functions in the background. When plants are overlooked, policies risk misidentifying how ecosystem services are generated and sustained[2].

5. PLANTS, MICROBIOMES, AND INVISIBLE HEALTH PATHWAYS

Emerging research shows that environmental microbiome diversity influences human microbial exposure, with implications for immune function and disease risk. Soils host some of the most diverse microbial communities on Earth and form a key interface between plant communities and microbial exposure pathways. Plant communities play an important role in shaping these microbiomes through their effects on soils, microclimates and habitat structure, while microbial communities in turn influence plant growth and composition[12].

Forests with diverse plant communities tend to host richer microbial assemblages than simplified or degraded systems, increasing the diversity of microbial exposure pathways for humans and animals[13]. Despite this, both soil systems and plant communities remain underrepresented in One Health monitoring frameworks, limiting our ability to capture these indirect but potentially important links between biodiversity and health.



6. WHY PLANT-BLINDNESS PERSISTS

Several factors contribute to the marginalisation of plants in One Health:

- Institutional separation between health, agriculture, and environmental sectors
- A historical focus on pathogens and animals as direct disease vectors
- Limited inclusion of plant scientists and botanists in One Health governance
- Insufficient integration of biological invasions as determinants of health threats
- Difficulty translating plant diversity into immediate health metrics
- Insufficient investment in taxonomy and biodiversity data systems
- These barriers are interconnected and require coordinated policy responses.

7. POLICY RECOMMENDATIONS

To strengthen One Health and align it with long-term prevention and resilience, policymakers should:.

Explicitly include plant health in One Health frameworks
Define plant health and plant diversity as core components of health systems, not indirect environmental factors.

Integrate plant indicators into health monitoring systems
Include metrics such as crop genetic diversity, vegetation diversity, and ecosystem integrity as part of health risk assessments.

Invest in plant biodiversity as a health intervention and support knowledge systems
Support conservation of crop wild relatives, diverse agroecosystems, and natural vegetation as preventive health measures, alongside taxonomic expertise and biodiversity data infrastructures.

Integrate alien plant-driven health risks
Frameworks must recognize invasive plants as active health stressors that trigger direct pathologies and create habitat conditions for disease vectors. Prioritizing native plant diversity and monitoring biological invasions is essential to building the “biotic resistance” required for systemic disease prevention.

Strengthen interdisciplinary governance
Ensure that plant scientists, botanists, ecologists and biodiversity experts are represented in One Health advisory and decision-making bodies.

Support research linking plant diversity to health outcomes
Prioritise research that translates plant and ecosystem data into actionable health insights.

Leverage and align existing initiatives and organisations
Build on projects such as the B3 project (**https://b-cubed.eu/**) and the OneSTOP project (**https://onestop-project.eu/**) to ensure that plant health and plant diversity are fully integrated into One Health data systems and indicators.

PLANTS SHAPE DISEASE DYNAMICS: INSIGHTS FROM VECTOR ECOLOGY

Health policies often focus on pathogens and their vectors, but plant communities also influence disease transmission.

Recent research[14] shows that plant availability and diversity affect mosquito survival, feeding behaviour and habitat use. In dryland ecosystems, interactions between malaria vectors and plants can influence vector persistence and disease dynamics.

This demonstrates that disease risk is not determined by pathogens and hosts alone, but also by the surrounding vegetation.

Policy relevance

Integrating plant community data into vector monitoring can improve disease risk assessment and support more preventive, ecosystem-based health strategies.

PLANTS AS DIRECT HEALTH RISKS: THE CASE OF RAGWEED IN EUROPE

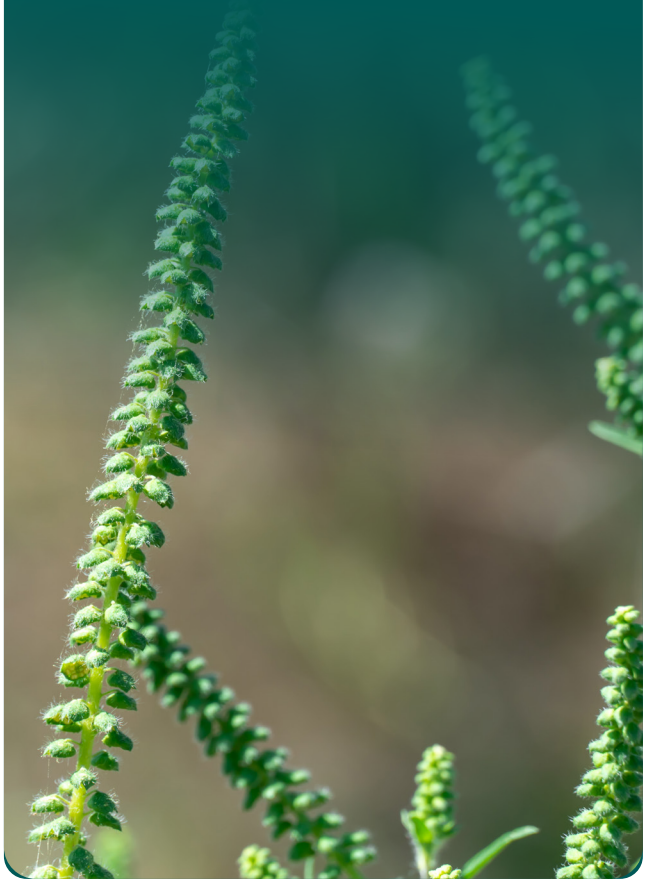
Plants are not only part of the environmental context of health, they can be direct drivers of disease.

Ragweed (*Ambrosia artemisiifolia*), an invasive plant spreading across Europe, produces highly allergenic pollen that affects millions of people and imposes significant healthcare costs.

Biological control measures have shown that managing plant populations can directly reduce allergy burden at scale[15].

Policy relevance

Invasive alien plants should be monitored and managed as health-relevant organisms—alongside pathogens and vectors—within One Health frameworks.



MEDICINAL PLANTS: AN OVERLOOKED PILLAR OF PRIMARY HEALTHCARE

In many parts of the world, medicinal plants are used as first-line treatments (World Health Organization, 2013) for common ailments such as coughs, colds, digestive issues and minor infections, particularly where access to formal healthcare is limited or delayed.

Some medicinal plants, such as ginger (Zingiber officinale), are widely recognised and used across regions. At the same time, primary healthcare in many communities depends on locally specific species that remain underrepresented in formal health and monitoring systems. Examples include Stachytarpheta jamaicensis, which is used in the Caribbean and Latin America. This reflects the close link between local biodiversity and everyday health practices.

Despite their widespread use, these plant-based healthcare systems are rarely considered in One Health frameworks, where the focus remains on formal healthcare systems and pharmaceutical interventions.

Policy relevance

Recognising the role of plant-based primary healthcare can support prevention, improve access to care, and highlight the importance of conserving locally relevant plant diversity and knowledge systems.

EUROPEAN PROJECTS ADVANCING INTEGRATED ONE HEALTH APPROACHES

Plants are not only part of the environmental context of health, they can be direct drivers of disease.

Recent European research initiatives demonstrate important progress towards more integrated approaches. For example, the OneSTOP project is advancing the operationalisation of One Health through integrated data systems and cross-sector collaboration, while the B3 project is improving the accessibility and policy relevance of biodiversity data workflows. These developments create a strong foundation to further integrate plant health and plant diversity into One Health frameworks.

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Funded by the European Union

B3 (101059592) and OneSTOP (101180559) receive funding from the European Union's Horizon Europe Research and Innovation Programme . Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the EU nor the EC can be held responsible for them.