(ISSN: 2602-4047)

Mercan, G., & Varol Selçuk, Z. (2025). Plant Blindness: An Invisible Barrier to Sustainable Development Goals (SDGs)?, *International Journal of Eurasian Education and Culture , 10(29), 37-66.*

DOI: http://dx.doi.org/10.35826/ijoecc.2868

Article Type (Makale Türü): Research Article

PLANT BLINDNESS: IS IT HINDERING SUSTAINABLE DEVELOPMENT GOALS (SDGs)?

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Received: 11.10.2024 *Accepted: 15.02.2025* *Published: 01.03.2025*

ABSTRACT

Plant blindness, defined as a cognitive deficiency in recognizing the significance of plants in ecosystems, poses a substantial challenge to ecological awareness and sustainability efforts. While it is often perceived as a minor perceptual bias, its broader implications for achieving the Sustainable Development Goals (SDGs) remain underexplored. Despite their fundamental role in carbon cycling, soil fertility, water management, and food security, plants remain largely overlooked in environmental policies and education systems. This study reveals a critical yet overlooked barrier to sustainable development: plant blindness. Despite the undeniable role of plants in shaping ecosystems, sustaining economies, and ensuring human well-being, they remain marginalized in conservation policies, public awareness, and educational curricula. This study investigates the relationship between plant blindness and SDGs, assessing how this phenomenon may hinder sustainability progress. Specifically, we evaluate its impact on achieving Zero Hunger (SDG 2), Climate Action (SDG 13), Life on Land (SDG 15), and Clean Water and Sanitation (SDG 6). The findings reveal that the societal neglect of plants weakens ecological literacy, limiting the effectiveness of sustainability policies and conservation strategies. The lack of educational and policy interventions exacerbates this issue, leading to inadequate plant-focused conservation efforts. Addressing plant blindness requires interdisciplinary solutions, including place-based education, sustainability learning ecologies, and policy reforms that highlight flora's essential contributions to global sustainability. This study presents actionable recommendations for policymakers, educators, and researchers, emphasizing the need to integrate plant awareness into sustainability frameworks. Increasing plant literacy is not merely an environmental concern but a fundamental prerequisite for long-term socio-economic sustainability. By bridging the gap between plant perception and sustainability policies, this research underscores the urgency of revising educational and policy approaches to mitigate plant blindness and reinforce sustainable development efforts.

Keywords: Plant blindness, sustainable development, Sustainable Development Goals (SDGs), ecological awareness, biodiversity conservation, environmental education, sustainability learning, plant literacy.

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Ethics Committee Approval: This study does not require ethical approval as it does not involve human participants, personal data, or experimental procedures.

Plagiarism/Ethics: This article has been reviewed by at least two referees and has been confirmed to comply with research and publication ethics, containing no plagiarism.

INTRODUCTION

In recent decades, sustainability has emerged as a global priority, with international organizations, policymakers, and researchers working toward the implementation of the United Nations Sustainable Development Goals (SDGs). While biodiversity conservation, climate resilience, and sustainable resource management remain central to these efforts, one fundamental aspect of sustainability often remains overlooked: the role of flora in ecological stability and human well-being. The phenomenon of plant blindness, defined as a cognitive bias that leads individuals to undervalue plants compared to animals, represents a critical challenge in achieving sustainability. This concept extends beyond a mere perceptual limitation and manifests as a structural issue embedded in education, policymaking, and environmental governance. Despite the growing awareness of sustainability, plant blindness continues to impede conservation efforts, weaken ecological literacy, and limit the effectiveness of sustainability policies.

Existing research has explored the effects of plant blindness in educational contexts, particularly in relation to students' limited recognition of plant diversity and function. Studies indicate that the educational system disproportionately emphasizes zoological knowledge while underrepresenting botanical literacy, contributing to a widespread disinterest in flora. However, the implications of plant blindness extend far beyond the classroom. The absence of plants from mainstream sustainability discourse restricts conservation initiatives, reduces public engagement with plant-related environmental policies, and ultimately weakens efforts to achieve key SDGs. Addressing plant blindness requires a paradigm shift that not only enhances botanical education but also integrates plant awareness into broader sustainability frameworks.

Despite the increasing focus on biodiversity conservation, research on plant blindness remains fragmented and predominantly confined to educational studies. While numerous studies have examined the importance of fauna conservation in sustainability strategies, far fewer have investigated the direct impact of plant blindness on SDG implementation. Furthermore, existing literature largely lacks interdisciplinary perspectives that bridge botanical science, environmental policy, and sustainability education. Without a comprehensive understanding of plant blindness in these contexts, sustainability efforts may remain incomplete, misdirected, or insufficient to address ecological challenges effectively.

This study seeks to fill this research gap by critically examining the relationship between plant blindness and sustainable development goals, assessing whether societal neglect of flora constitutes a hidden obstacle to global sustainability. Specifically, the study investigates the extent to which plant blindness impacts:

- Food security (SDG 2) through the underappreciation of plant-based food systems and agricultural sustainability.
- Climate action (SDG 13) by limiting public awareness of plants' role in carbon sequestration and ecosystem resilience.
- Terrestrial ecosystem conservation (SDG 15) due to inadequate plant-focused conservation policies.

- Water sustainability (SDG 6) by ignoring the role of plant ecosystems in maintaining water cycles and reducing soil erosion.

The primary objective of this study is to analyze plant blindness as a multidimensional issue affecting ecological awareness, policy implementation, and sustainability education. By synthesizing existing literature and identifying gaps, the study aims to:

- Examine the socio-environmental impact of plant blindness on sustainability initiatives.
- Evaluate the role of plant awareness in achieving key SDGs.
- Propose interdisciplinary solutions to integrate botanical literacy into sustainability policies and educational frameworks.

By addressing these objectives, this research contributes to the broader discourse on biodiversity conservation and sustainable development, offering policy recommendations for overcoming plant blindness and ensuring that flora receives adequate recognition in global sustainability strategies.

METHOD

Research Design

This study employs a qualitative, systematic literature review to analyze the relationship between plant blindness and sustainable development goals (SDGs). A narrative synthesis approach was chosen to integrate findings from multiple disciplines, including botanical sciences, environmental education, sustainability policy, and ecological conservation. The study does not aim to provide a purely statistical meta-analysis but rather to synthesize existing research, identify key themes, and highlight knowledge gaps (Petticrew & Roberts, 2006). Given that plant blindness is a multidimensional phenomenon spanning cognitive psychology, education, and environmental science, a qualitative review methodology allows for a broader exploration of how this issue affects SDG implementation (Snyder, 2019).

Data Collection and Selection Criteria

To ensure comprehensive and unbiased coverage, peer-reviewed journal articles, policy documents, and relevant books published between 1986 and 2024 were included. The starting point of 1986 corresponds to James Wandersee's seminal work on plant blindness (Wandersee, 1986), which laid the foundation for contemporary research on the topic. Key inclusion and exclusion criteria were applied to refine the dataset:

Inclusion Criteria: Peer-reviewed studies discussing plant blindness, botanical literacy, or ecological awareness. Research linking plant conservation, environmental education, and SDG implementation. Policy documents and international reports (e.g., UNESCO, UN Environment Programme, and IUCN) discussing flora-related sustainability policies.

Exclusion Criteria: Articles without peer review or insufficient methodological rigor. Studies focusing exclusively on faunal conservation, unless they provided a comparative perspective on plant-related issues. Policy papers without explicit reference to plant-related sustainability challenges.

Search Strategy

A structured keyword-based search was conducted across major academic databases, including: Scopus, Web of Science (WoS), ScienceDirect, Google Scholar, ERIC (for educational research), UN and IUCN Reports (for policy-based analysis). The following search terms were used in various Boolean combinations to refine results: "plant blindness," "botanical literacy," "ecological awareness," "sustainable development goals," "biodiversity conservation," "environmental education," and "flora in sustainability policies."

The initial search yielded 1,243 papers, which were systematically filtered based on relevance, leading to a final selection of 124 peer-reviewed articles and policy documents.

Data Analysis and Thematic Categorization

A thematic content analysis was employed to classify the selected studies into three overarching research themes:

Plant Blindness in Education: The role of curricula and textbooks in shaping botanical literacy (Amprazis & Papadopoulou, 2018; Bebbington, 2005). Cognitive biases leading to plant underrepresentation in classrooms (Uno, 2009). Strategies for integrating plant-focused learning into education.

Plant Blindness and Policy Implementation: The exclusion of plants in global biodiversity conservation policies (Fischer et al., 2018). The role of urban planning and reforestation initiatives in addressing plant blindness (Poe et al., 2014). The impact of neglecting flora in sustainability frameworks (Leal Filho et al., 2019).

Plant Blindness as a Barrier to SDGs: The link between plant awareness and food security (SDG 2) (Díaz et al., 2019). Plants' role in carbon sequestration and climate adaptation (SDG 13) (Berry, Beerling & Franks, 2010). The importance of plant-based solutions for clean water and sustainable land use (SDG 6 & 15) (Calder, 2007; Piao et al., 2019).

Each selected study was coded and analyzed to identify key patterns, gaps, and research trends, ensuring a comprehensive synthesis of knowledge.

Reliability and Limitations

To ensure research validity and reliability, the following strategies were applied:

- *Triangulation:* Multiple data sources (scientific literature, policy reports, and educational studies) were used to cross-validate findings.

- *Independent Review:* Two researchers independently assessed the relevance and quality of selected papers to minimize bias.
- *Expert Consultation:* Environmental scientists, educators, and policy experts were consulted to refine the thematic framework.

However, certain limitations should be noted:

- *Lack of Primary Data Collection:* This study relies on secondary data rather than fieldwork, limiting real-time insights.
- *Geographical Bias In Literature:* Most available research focuses on Western educational and policy frameworks, necessitating further research in developing regions.
- *Potential Publication Bias*: Studies emphasizing plant conservation might be overrepresented due to selective reporting trends in academia.

Ethical Considerations

Since this study is based on a systematic literature review, no direct human participants were involved. However, all reviewed studies were assessed for ethical research practices, ensuring transparency and academic integrity.

This methodology provides a robust framework for examining plant blindness within the context of sustainable development. By systematically analyzing how botanical literacy and policy engagement influence SDG implementation, this research aims to bridge knowledge gaps and propose interdisciplinary solutions for overcoming plant blindness. The findings will contribute to ecological education, conservation strategies, and global sustainability policies, ensuring a more balanced approach to biodiversity conservation.

FINDINGS

This section presents the findings of the study, detailing how plant blindness affects the achievement of Sustainable Development Goals (SDGs). The analysis focuses on the fundamental role of plants in sustainable development, the ways in which plant blindness hinders the realization of SDGs, and the conceptual visualization of plant contributions to sustainability.

The Role of Plants In Achieving Sustainable Development Goals (SDGs)

Plants play a fundamental role in achieving the United Nations Sustainable Development Goals (SDGs) by contributing to multiple dimensions of sustainability, including climate regulation, food security, public health, biodiversity conservation, and sustainable urbanization. This section highlights the ways in which plants are essential to the realization of these goals, emphasizing their ecological, economic, and social significance.

Plants As A Foundation For Climate Action (SDG 13) And Environmental Sustainability

One of the most critical roles of plants in sustainability is their contribution to climate regulation and carbon sequestration. Through photosynthesis, plants absorb atmospheric carbon dioxide (CO_2), mitigating the effects of climate change (Bonan, 2015). The ability of forests and grasslands to store carbon is crucial in efforts to reduce greenhouse gas emissions and regulate global temperatures (Berry, Beerling, & Franks, 2010; Espeland & Kettenring, 2018). Changes in plant phenology, such as shifts in blooming and leaf-out periods, are widely recognized as indicators of climate change (Parmesan & Hanley, 2015). Furthermore, deforestation and habitat destruction contribute to climate instability by releasing stored carbon into the atmosphere (Piao et al., 2019). Sustainable forest management practices, urban greening, and reforestation programs are essential to addressing climate-related challenges and ensuring long-term environmental stability.

The Role Of Plants In Food Security And Economic Stability (SDG 1, SDG 2, SDG 8)

Plants are the foundation of global food systems, making them central to SDG 1 (No Poverty), SDG 2 (Zero Hunger), and SDG 8 (Decent Work and Economic Growth). Agricultural production depends on plant-based resources, including grains, fruits, vegetables, and oil crops, which provide nutrition and economic sustenance for millions worldwide (Dantsis et al., 2010). Sustainable agricultural practices, such as organic farming, permaculture, and agroforestry, ensure long-term food security while preventing soil degradation and biodiversity loss (Abhilash et al., 2016). However, plant blindness affects agricultural education and policy-making, as decision-makers may prioritize livestock or industrial development over crop diversity and soil conservation. Encouraging sustainable farming practices, promoting plant science education, and integrating plant-based solutions into agricultural policies are necessary steps toward eradicating poverty and hunger.

Plants and Public Health: Their Contribution To Medicine and Mental Well-Being (SDG 3)

The connection between plants and human health is well-documented, supporting SDG 3 (Good Health and Well-Being). Plants serve as primary sources of medicinal compounds, forming the basis of traditional and modern pharmaceuticals (Lewis & Elvin-Lewis, 2003; Raskin et al., 2002). Many critical medications, such as aspirin (from willow bark) and quinine (from cinchona bark), are derived from plant species (Sen & Samanta, 2014). Additionally, plant-rich environments have been shown to improve mental health by reducing stress, anxiety, and depression (Karjalainen, Sarjala, & Raitio, 2010; Maller, 2009). Green spaces, botanical gardens, and urban forests contribute to psychological well-being, enhancing community health through nature exposure therapy. However, the undervaluation of plant-based medicine due to plant blindness limits its integration into public health strategies. Raising awareness about the medicinal properties of plants and expanding botanical research is essential for advancing global health initiatives.

Sustainable Urbanization: The Role of Plants In Green Cities (SDG 11)

Plants play a significant role in urban environments, directly contributing to SDG 11 (Sustainable Cities and Communities). The integration of plants into urban planning improves air quality, regulates temperatures, and enhances aesthetic appeal (Manning, 2008). Urban greening projects, including green roofs, vertical gardens, and urban forests, help mitigate heat island effects and promote sustainable city living (Korjenic, Zach, & Hroudová, 2016). Moreover, residential yards with edible and medicinal plants encourage urban sustainability (Vila-Ruiz et al., 2014). However, plant blindness leads to the underutilization of urban green spaces, resulting in poor environmental planning and limited public investment in urban forestry. Incorporating plant-based solutions into urban policies can enhance resilience to climate change and air pollution, ensuring a higher quality of life for urban populations.

Plants As A Renewable Resource For Industry and Energy (SDG 7, SDG 9, SDG 12)

Plants serve as a renewable resource for construction, industrial materials, and energy production, supporting SDG 7 (Affordable and Clean Energy), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 12 (Responsible Consumption and Production). Biomass energy, derived from crop residues, wood pellets, and algae biofuels, represents a sustainable alternative to fossil fuels (Byrt, Grof, & Furbank, 2011; Jablonowski et al., 2017). Furthermore, plant-derived construction materials, such as bamboo, hempcrete, and wood composites, offer low-energy, sustainable building solutions (Amziane & Sonebi, 2016). However, unsustainable biomass harvesting and deforestation can lead to biodiversity loss and carbon emissions (Rodríguez-Monroy, Mármol-Acitores, & Nilsson-Cifuentes, 2018). Balancing sustainable plant utilization with conservation efforts is crucial for reducing environmental degradation and promoting circular economies.

Biodiversity Conservation and Ecosystem Stability (SDG 14, SDG 15)

Plants are essential for biodiversity conservation, forming the backbone of terrestrial and aquatic ecosystems. Their role in maintaining ecological balance and supporting wildlife habitats is critical for SDG 14 (Life Below Water) and SDG 15 (Life on Land) (Bonan, 2015). Algae and phytoplankton contribute to marine food chains, while forests, grasslands, and wetlands sustain diverse terrestrial species (Pereira & Neto, 2014). Deforestation, habitat destruction, and invasive species threaten global biodiversity, necessitating urgent conservation efforts (Gillison, 2019). However, plant blindness contributes to conservation biases, where charismatic animal species receive more protection than equally endangered plant species (Young, 2000). Policy frameworks must integrate plant conservation as a priority, ensuring the long-term sustainability of ecosystems.

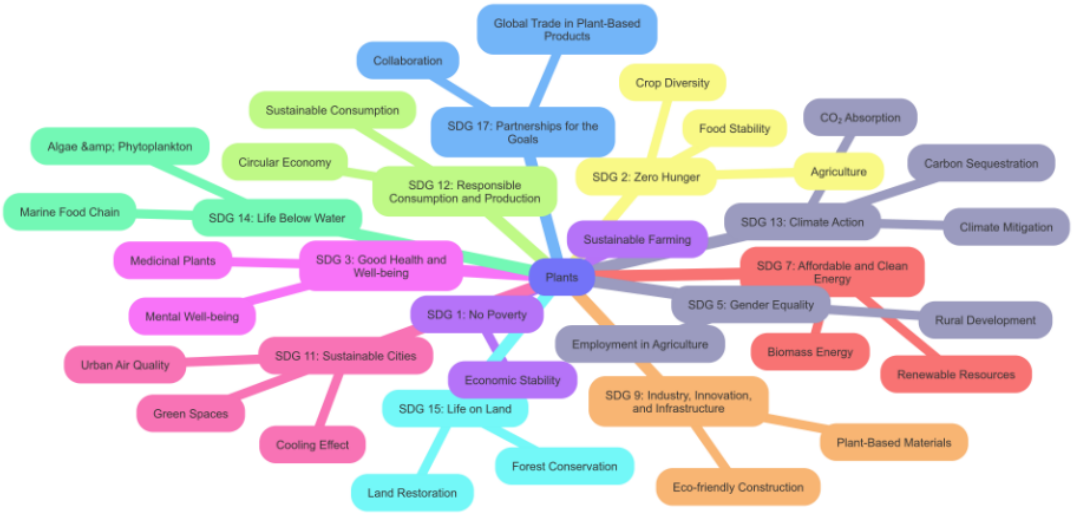

Figure 1. Conceptual Framework of Plant Contributions to SDGs

To illustrate the integral role of plants in sustainable development, Figure 1 presents a conceptual framework linking plant-related benefits to SDGs. This model highlights direct and indirect relationships between plant functions and sustainability efforts, emphasizing the importance of plant conservation, education, and policy-making.

The Impact of Plant Blindness On The Achievement of SDGs

Plant blindness, defined as the inability to recognize or appreciate the significance of plants in ecosystems and human life (Wandersee & Schussler, 1999), has far-reaching consequences that extend beyond education and scientific literacy. It poses a substantial barrier to achieving the United Nations Sustainable Development Goals (SDGs) by limiting the integration of plant-based solutions into sustainability strategies. This section explores the diverse ways in which plant blindness affects global sustainability efforts.

Plant Blindness and The Undermining of Biodiversity Conservation *(SDGs 14 & 15)*

Biodiversity loss is one of the most urgent environmental challenges of the 21st century, and plant blindness contributes to the neglect of plant species conservation. Although global conservation efforts primarily focus on protecting charismatic megafauna (e.g., tigers, elephants, pandas), flora receives significantly less attention (Balding & Williams, 2016). This bias in conservation priorities has direct implications for SDG 14 (Life Below Water) and SDG 15 (Life on Land).

- *Terrestrial ecosystems (SDG 15):* Forests, wetlands, and grasslands play a crucial role in carbon sequestration, water regulation, and habitat preservation. However, due to plant blindness,

deforestation and habitat destruction often receive less public resistance than threats to animal species (Lindemann-Matthies, 2005).

- *Marine biodiversity (SDG 14):* The ecological importance of underwater flora, such as phytoplankton and algae, remains underappreciated. These plant organisms are responsible for nearly 50% of global oxygen production and form the base of marine food webs (Falkowski, Barber, & Smetacek, 1998). Neglecting their protection weakens efforts to combat marine ecosystem degradation.

Figure 1 illustrates the interconnected relationships between plants and SDGs, emphasizing how the conservation of flora is fundamental to achieving biodiversity-related sustainability goals.

The Role Of Plants In Climate Change Mitigation And Adaptation (SDG 13)

Climate change remains one of the most pressing global challenges, and plant-based solutions are central to mitigation and adaptation strategies. However, plant blindness limits the widespread adoption of nature-based solutions (NbS) in addressing climate change (Cheng et al., 2020).

- *Carbon sequestration:* Forests and grasslands act as major carbon sinks, absorbing approximately 2.6 gigatons of CO_2 annually (Pan et al., 2011). Despite this, public policy often prioritizes technological solutions over reforestation or afforestation programs.
- *Urban climate resilience:* Green roofs, urban forests, and tree canopies mitigate heat island effects, reduce flood risks, and improve air quality in cities (Nowak et al., 2014). Yet, the underrepresentation of plants in urban planning due to plant blindness slows the integration of these climate adaptation strategies.

A broader recognition of plants' role in climate action is essential for accelerating the achievement of SDG 13 (Climate Action).

The Economic and Agricultural Implications of Plant Blindness (SDGs 1, 2, and 8)

Agriculture is a primary driver of economic stability and food security worldwide, directly influencing SDG 1 (No Poverty), SDG 2 (Zero Hunger), and SDG 8 (Decent Work and Economic Growth). However, plant blindness results in a lack of appreciation for the importance of crop diversity, soil health, and sustainable farming methods.

- *Declining crop diversity:* The over-reliance on a few staple crops (wheat, rice, corn) has led to a 75% reduction in agricultural biodiversity over the past century (FAO, 2019). Many traditional and underutilized plant species with high nutritional and ecological value remain ignored.
- *Loss of traditional knowledge:* Indigenous agricultural knowledge, which emphasizes the cultivation of diverse plant species, is being eroded. This loss exacerbates food insecurity, particularly in developing nations (Altieri & Toledo, 2011).

- *Employment opportunities in sustainable agriculture:* The economic potential of plant-based industries (e.g., medicinal plants, bio-based products) is often underestimated due to plant blindness, limiting job creation in sustainable and green economies (Zhang et al., 2017).

To counteract these challenges, educational and policy initiatives must highlight the economic value of plant biodiversity and agroecological practices.

The Neglect of Plants In Public Health and Well-Being (SDG 3)

Plants play a critical role in human health and disease prevention, yet their contributions are frequently overlooked due to plant blindness. This has significant implications for SDG 3 (Good Health and Well-being).

- *Medicinal plant research gaps:* Although over 80% of the global population relies on plant-derived medicines (WHO, 2020), research funding is disproportionately allocated to synthetic pharmaceuticals (Rates, 2001).
- *Mental health benefits:* Exposure to green spaces and interaction with plants significantly reduce stress, anxiety, and depression (Bratman, Hamilton, & Daily, 2012). However, plant blindness contributes to the undervaluation of biophilic design in healthcare environments.
- *Nutritional security:* The decline of traditional plant-based diets in favor of processed foods has been linked to rising obesity, diabetes, and cardiovascular diseases (Johnston, Fanzo, & Cogill, 2014). Raising awareness about plant-based nutrition is crucial for public health promotion.

By integrating plant science into medical education, public health campaigns, and urban planning, policymakers can harness flora's potential to improve global health outcomes.

The Disconnect Between Plants and Sustainable Industrialization (SDGs 9, 11, and 12)

Modern industrialization and infrastructure development have often ignored the potential of plant-based materials and bioeconomy solutions, affecting SDG 9 (Industry, Innovation, and Infrastructure), SDG 11 (Sustainable Cities and Communities), and SDG 12 (Responsible Consumption and Production).

- *Green construction materials:* Bamboo, hempcrete, and other plant-derived building materials offer low-carbon alternatives to cement and steel, yet they remain underutilized in global infrastructure projects (Raftery et al., 2017).
- *Sustainable urban planning:* Cities that incorporate green corridors, vertical gardens, and urban forests benefit from enhanced air quality, reduced energy consumption, and improved public well-being (Beatley, 2016). However, plant blindness limits their integration into urban development plans.

- *Biodegradable consumer products:* The bioplastic industry, which relies on plant-derived polymers, could significantly reduce plastic pollution. Despite this, traditional petroleum-based plastics dominate due to lack of awareness and investment (Wang et al., 2018).

Overcoming plant blindness in industrial sectors could accelerate the transition toward a circular economy, enhancing sustainability in urbanization and manufacturing. To further illustrate the impact of plant blindness on sustainability, Table 1 categorizes key symptoms of the phenomenon and their corresponding implications for SDG achievement.

Table 1. Symptoms of Plant Blindness and Their Impact on SDGs.

Symptoms of Plant Blindness	Affected SDGs	Implications
Viewing plants as background elements rather than essential life forms	SDG 15, SDG 14	Leads to conservation biases that favor animals over plants
Underestimating the economic value of plant-based industries	SDG 1, SDG 8, SDG 9	Limits job creation and economic diversification
Lack of awareness of plants' role in climate regulation	SDG 13, SDG 6	Reduces adoption of nature-based climate solutions
Ignoring the health benefits of plant-based environments	SDG 3	Neglects therapeutic and nutritional advantages of plants
Limited integration of plant-based materials in industrial innovation	SDG 9, SDG 12	Slows down sustainable infrastructure development

Table 1 presents a structured overview of how different aspects of plant blindness hinder the successful implementation of various Sustainable Development Goals (SDGs). By systematically analyzing the consequences of ignoring, underestimating, or misinterpreting the role of plants in ecosystems, economies, and human well-being, this table provides a comprehensive framework for understanding the broader implications of plant blindness.

- *Viewing plants as background elements rather than essential life forms (SDG 15 & SDG 14):* One of the primary symptoms of plant blindness is the perception of plants as mere scenery rather than active, essential life forms. This misunderstanding has far-reaching implications, particularly for biodiversity conservation (SDG 15 - Life on Land) and marine ecosystems (SDG 14 - Life Below Water).
- *Terrestrial biodiversity loss:* Conservation initiatives predominantly focus on charismatic animal species, such as tigers, pandas, and elephants, while neglecting plants that form the structural and functional foundation of ecosystems (Balding & Williams, 2016). This oversight weakens global conservation strategies.
- *Marine ecosystems and algae:* Phytoplankton and algae contribute to carbon sequestration and oxygen production, yet their protection is often overlooked. Without proper awareness, marine biodiversity conservation efforts fail to incorporate plant-based solutions (Falkowski et al., 1998).

Thus, failing to recognize plants as primary components of biodiversity undermines conservation effectiveness and weakens efforts to mitigate climate change and habitat degradation.

Underestimating the economic value of plant-based industries (SDG 1, SDG 8, SDG 9): Another significant consequence of plant blindness is the underappreciation of plants' economic potential. This symptom negatively affects multiple SDGs, particularly poverty reduction (SDG 1), economic growth (SDG 8), and industrial innovation (SDG 9).

- *Agricultural biodiversity & food security:* Many traditional drought-resistant or highly nutritious plant species remain underutilized because they are not recognized as economically valuable (FAO, 2019). This limits efforts to combat hunger and poverty in developing nations.
- *Sustainable employment:* The bioeconomy—which includes industries such as medicinal plants, bioplastics, and eco-friendly construction materials—has the potential to create millions of sustainable jobs. However, due to plant blindness, policymakers and investors often fail to prioritize funding for these sectors (Zhang et al., 2017).
- *Industrial and infrastructural applications:* The use of plant-derived materials in construction, textiles, and energy production remains underdeveloped. Despite the potential of bioplastics, bamboo, and plant-based insulation materials, conventional materials dominate due to lack of awareness and policy incentives (Raftery et al., 2017).

By raising awareness of plants' economic importance, governments and businesses can enhance job creation, promote industrial innovation, and ensure sustainable economic growth.

Lack of awareness of plants' role in climate regulation (SDG 13, SDG 6): Plants are central to climate regulation—they absorb carbon dioxide, moderate temperatures, and regulate the water cycle. However, plant blindness leads to an underappreciation of these ecological services, negatively impacting SDG 13 (Climate Action) and SDG 6 (Clean Water and Sanitation).

- *Carbon sequestration & climate change:* Forests, wetlands, and grasslands store more than 50% of terrestrial carbon (Pan et al., 2011), but deforestation and land-use changes continue at alarming rates due to lack of recognition of plants' climate functions.
- *Water cycle & watershed management:* Forested areas enhance groundwater recharge, prevent soil erosion, and regulate precipitation patterns. However, policies often fail to integrate forest management into water security strategies (Calder, 2007).
- *Urban heat mitigation:* Green spaces and urban forests reduce heat island effects, improve air quality, and enhance urban resilience. Yet, plant blindness prevents cities from integrating nature-based solutions into climate adaptation strategies (Nowak et al., 2014).

Thus, addressing plant blindness in climate policies and urban planning can accelerate carbon neutrality goals and improve global climate resilience.

Ignoring the health benefits of plant-based environments (SDG 3): The connection between plants and human health is well-documented, yet largely overlooked in public health strategies. This negatively impacts SDG 3 (Good Health and Well-being).

- *Medicinal plant research & healthcare innovation:* Despite the fact that over 80% of global medicines originate from plant compounds (WHO, 2020), funding for synthetic pharmaceuticals vastly outweighs botanical research investment (Rates, 2001).
- *Mental health and urban greenery:* Studies show that green spaces reduce stress, anxiety, and depression (Bratman et al., 2012), yet biophilic design is not a common feature in modern urban planning.
- *Plant-based nutrition & non-communicable diseases:* The global rise in obesity, diabetes, and cardiovascular diseases correlates with declining plant-based diets. Plant blindness contributes to the lack of awareness about the nutritional benefits of traditional and indigenous crops (Johnston et al., 2014).

By incorporating plant science into medical research, public health policies, and nutrition education, plant blindness can be counteracted to enhance global well-being.

Limited integration of plant-based materials in industrial innovation (SDG 9, SDG 12): Sustainable industrialization and infrastructure development require eco-friendly materials. However, plant blindness hinders innovation in plant-based construction, packaging, and consumer products, affecting SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production).

- *Green construction materials:* Bamboo, hempcrete, and plant-based insulation materials reduce carbon footprints but remain underutilized due to conventional building material dominance (Kibert, 2016).
- *Biodegradable alternatives to plastics:* Plant-derived bioplastics offer sustainable packaging solutions, yet only account for 1% of global plastic production due to market resistance and policy gaps (Wang et al., 2018).
- *Circular economy potential:* The biomass industry—which utilizes plant-based waste materials—can significantly reduce landfill waste. However, due to plant blindness, many industries fail to capitalize on plant-derived materials as viable alternatives (Rodríguez-Monroy et al., 2018).

Thus, promoting plant-based industrial innovation can drive sustainability in manufacturing and consumer habits.

The findings presented in this section clearly demonstrate how plant blindness obstructs the successful achievement of nearly all SDGs. This phenomenon is not merely an educational gap but a systemic issue that affects conservation, climate policies, economic development, public health, and industrial innovation. To

mitigate plant blindness and enhance plant-centered sustainability strategies, several key actions must be taken:

- *Educational reform:* Schools and universities must integrate botany, plant ecology, and sustainable agriculture into curricula.
- *Policy initiatives:* Governments should prioritize plant-based climate solutions, conservation policies, and urban green space integration.
- *Economic incentives:* Investment in bioplastics, plant-derived pharmaceuticals, and sustainable agriculture must be expanded.
- *Public awareness campaigns:* The significance of plants in daily life, health, and sustainability should be actively promoted through media and outreach programs.

By recognizing and addressing plant blindness, global sustainability efforts can be significantly enhanced, ensuring that plants are given their rightful place in achieving a more sustainable and resilient future.

CONCLUSION and DISCUSSION

This study reveals a critical yet overlooked barrier to sustainable development: plant blindness. Despite the undeniable role of plants in shaping ecosystems, sustaining economies, and ensuring human well-being, they remain marginalized in conservation policies, public awareness, and educational curricula. This systemic oversight has significant consequences, undermining global efforts to achieve the Sustainable Development Goals (SDGs) and highlighting an urgent need for a shift in perspective. One of the most concerning findings is the disproportionate focus on animals over plants in conservation and environmental discourse. While biodiversity conservation remains a global priority, the majority of funding and policy initiatives favor charismatic fauna, leaving thousands of plant species unprotected and on the brink of extinction (Uno, 2018; Hoekstra, 2000). This bias poses a direct challenge to SDG 15 (Life on Land), which aims to halt biodiversity loss, and SDG 14 (Life Below Water), where aquatic plants play a crucial role in marine ecosystems (Pereira & Neto, 2014). Without addressing this imbalance, global conservation efforts will remain incomplete and ineffective.

Beyond conservation, economic and industrial systems suffer from a failure to recognize the potential of plant-based innovations. While sustainable agriculture, bio-based materials, and plant-derived pharmaceuticals present promising solutions to pressing global challenges, they remain underfunded and underutilized (Byrt, Grof, & Furbank, 2011; Rodriguez-Monroy et al., 2018). This oversight slows progress toward SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production), both of which require the integration of renewable, plant-based alternatives to fossil fuels, synthetic materials, and unsustainable industrial practices.

Similarly, the role of plants in public health is largely ignored, despite substantial evidence supporting their contributions to preventive medicine, pharmaceutical advancements, and mental well-being (Lewis & Elvin-

Lewis, 2003; Von der Pahlen & Grinspoon, 2002). The exclusion of plants from global healthcare strategies limits the effectiveness of SDG 3 (Good Health and Well-being), particularly in developing regions where traditional plant-based remedies provide affordable and accessible treatment options.

Perhaps most alarming is the systematic neglect of plants in educational curricula, which perpetuates plant blindness across generations (Hershey, 1996; Link-Perez et al., 2010). Textbooks, classroom lessons, and science outreach programs continue to prioritize animal studies over plant sciences, fostering a cognitive bias that reinforces the undervaluation of plants (Amprazis & Papadopoulou, 2018). This deficit in botanical education undermines efforts to achieve SDG 4 (Quality Education), as students grow up with limited understanding of the ecological and economic significance of plant life.

The intersections of plant blindness with urban planning, social justice, and climate action further demonstrate its pervasive consequences. The failure to integrate plants into urban infrastructure leads to less sustainable, more polluted, and increasingly inhospitable cities (Manning, 2008). This misstep directly affects SDG 11 (Sustainable Cities and Communities), as green spaces, urban forests, and climate-responsive plant-based solutions remain secondary considerations in city planning.

A holistic, interdisciplinary strategy is needed to combat plant blindness and fully integrate plants into sustainability frameworks. This requires not only policy reforms but also a cultural and educational shift that repositions plants as central to environmental resilience, economic prosperity, and human survival.

In an era of escalating environmental crises, neglecting plants is no longer an option. This study underscores the urgent need to confront plant blindness as a critical barrier to achieving sustainability. Plants are not merely a backdrop to animal life—they are the foundation of ecological balance, economic stability, and human health. Yet, due to cognitive biases, systemic educational gaps, and economic oversight, they remain undervalued and overlooked.

The consequences of plant blindness extend beyond scientific curiosity; they directly impact global sustainability efforts. The failure to integrate plant conservation into environmental policies has left thousands of species vulnerable, undermining SDG 14 (Life Below Water) and SDG 15 (Life on Land). In economic and industrial sectors, the neglect of plant-based innovations limits the potential for sustainable development, slowing progress toward SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production). The exclusion of plants from global healthcare strategies weakens SDG 3 (Good Health and Well-being), while their absence from urban planning and education restricts the realization of SDG 4 (Quality Education) and SDG 11 (Sustainable Cities and Communities).

To reverse this trend, a fundamental shift in perception and policy is required. The integration of botanical education into school curricula, increased funding for plant conservation, and the promotion of plant-based

industries must become central priorities. Public awareness campaigns, government policies, and corporate sustainability initiatives should work in tandem to redefine the role of plants in human life.

Future research should explore the socio-cultural dimensions of plant blindness, investigating how historical, economic, and psychological factors contribute to this phenomenon. Additionally, a deeper examination of indigenous knowledge systems—which often place plants at the heart of environmental and cultural practices—can offer valuable insights into restoring a balanced relationship between humans and flora (Katz, 1989; Poe et al., 2014).

Sustainability cannot be achieved if plants continue to be ignored. The success of the SDGs depends on a paradigm shift—one that acknowledges the essential role of plants not just in conservation, but in every aspect of sustainable development. It is time to bring plants back into the center of environmental discourse, economic strategies, and educational frameworks. The path to sustainability begins with recognizing that plants are not just part of the planet's landscape—they are the very fabric of life itself.

SUGGESTIONS

The findings of this study highlight the urgent need to address plant blindness as a significant barrier to sustainability. To mitigate its effects and ensure plants are recognized as fundamental components of ecosystems, education, public awareness, policymaking, and scientific research must be strategically aligned. Addressing plant blindness is not only essential for biodiversity conservation but also for advancing the Sustainable Development Goals (SDGs).

A fundamental step in countering plant blindness is improving botanical education at all levels. The current biology curricula often prioritize animals over plants, leading to an educational gap that reinforces plant blindness. Schools should integrate more hands-on activities, such as school gardens, botanical excursions, and inquiry-based learning experiences, to enhance students' connection with flora. Higher education institutions should also place greater emphasis on plant sciences, incorporating interdisciplinary approaches that link botany with environmental science, agriculture, and climate studies. Furthermore, teacher training programs should be revised to equip educators with innovative teaching strategies that highlight the ecological and economic importance of plants.

Beyond formal education, public engagement plays a crucial role in overcoming plant blindness. Awareness campaigns should be designed to emphasize the significance of plants in daily life, ecosystem balance, and sustainability efforts. Green spaces, community gardens, and urban forestry projects should be expanded to increase public interaction with plants. Encouraging citizen science initiatives, such as plant monitoring programs, biodiversity mapping, and local conservation efforts, can foster a deeper appreciation for plant life. These initiatives can bridge the gap between scientific research and community action, ensuring that plant conservation becomes a shared societal responsibility.

Policymaking must also reflect the critical role of plants in environmental sustainability. Governments should prioritize plant conservation through legislation that supports afforestation, sustainable agriculture, and biodiversity preservation. Sustainable agricultural policies should be developed to promote plant-based fertilizers, crop diversity, and eco-friendly farming techniques. Additionally, economic incentives should be introduced to support industries that rely on plant-based solutions, such as biofuels, sustainable construction materials, and plant-derived pharmaceuticals. Recognizing plants as a valuable economic and ecological resource will strengthen sustainability efforts and ensure their protection.

Scientific research on plant blindness and plant conservation must also be expanded. Future studies should investigate the sociocultural dimensions of plant blindness, exploring how urbanization, digitalization, and lifestyle changes influence people's perception of plants. Research should also focus on indigenous knowledge systems, as traditional ecological practices often offer sustainable plant-based solutions that can be integrated into conservation strategies. Moreover, there is a need for economic assessments that quantify the financial benefits of plant conservation, sustainable forestry, and plant-based industries in global markets.

Finally, addressing plant blindness requires practical applications that integrate plants into sustainability initiatives. Urban planning should prioritize the creation of green infrastructure, such as vertical gardens, green roofs, and nature-based solutions for climate resilience. In agriculture, transitioning toward regenerative farming and agroecology will enhance soil health, biodiversity, and long-term food security. In public health, integrating plant-based medicine into healthcare systems can provide cost-effective solutions to various health challenges.

By implementing these measures, plant blindness can be reduced, allowing for a more balanced and sustainable approach to environmental conservation. Future studies should continue to explore innovative strategies for education, policymaking, and practical applications to ensure that plants are recognized as essential to human survival and planetary well-being. Addressing plant blindness is not just an academic concern but a necessary step toward a sustainable future where flora is valued for its ecological, economic, and cultural significance.

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Ethics Statement: This article complies with the journal's writing guidelines, publication principles, research and publication ethics, and ethical rules. The author(s) bear full responsibility for any potential violations related to the article. This study does not require ethical committee approval.

Declaration of Author(s)' Contribution Rate: The contribution rates of the authors are as follows: The first author contributed 50% and the second author 50%.

CONTRIBUTION RATE	CONTRIBUTORS
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Discussion and Commentary	Gamze Mercan, Zümrüt Varol Selçuk

Funding: No funding or support was received during the writing process of this study.

Informed Consent Statement: Informed consent was obtained from all participants involved in the study.

Data Availability Statement: All data related to the article are included within the manuscript.

Conflict of Interest: The authors declare that there is no conflict of interest with any individuals, institutions, or organizations related to this research, nor among the authors themselves.