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Review

Engaging Indigenous Peoples and local communities in global policy development for the conservation and sustainable use of wild food plants

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Wild Food Plants (WFPs) are edible species that grow without cultivation in forests, grasslands, field margins, and other natural and semi-natural spaces. They play a central role in the traditional food systems of Indigenous Peoples and local communities (IP&LCs) and have significant nutritional and nutraceutical value. Despite the importance of Indigenous knowledge and local practices in the stewardship of WFPs, IP&LCs have largely been under-represented in institutional structures and policies pertaining to their governance. Dominant policy agreements, tools, and guidance (e.g. International Treaty on Plant Genetic Resources for Food and Agriculture) have historically valorized WFPs for their commercial potential as sources of plant genetic traits for crop improvement, and protection activities have focused primarily on the collection and *ex-situ* storage of plant germplasm in gene banks, often located far from Indigenous territory where these species originate. As commercial interest in WFPs continues to grow, IP&LC rights, knowledge, and governance risk are being marginalized. This paper reviews the role of IP&LCs in the conservation and management of WFPs and proposes a framework to integrate their knowledge, stewardship practices, and governance into decision-making processes.

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Introduction

Wild Food Plants (WFPs) form an essential part of the traditional food systems of Indigenous Peoples and local communities (IP&LCs), sustaining livelihoods, reinforcing cultural identity, and contributing to social as well as ecological resilience to climate change, food insecurity, and biodiversity loss [1–4]. Found in natural as well as semi-natural ecosystems, such as forests, grasslands, smallholder farms, field margins and other developed spaces, these species, ranging from berries and roots to leaves, seeds, tubers and other edible plant parts, have not only important nutritional and nutraceutical value, but are also embedded in place-based stewardship practices that foster connection to land, cultural continuity and identity, kindship networks, and other elements of human well-being [5–8]. The United Nations Food and Agriculture Organization (FAO) estimates that approximately one billion people incorporate WFPs into their diets [9]. While they are often relied upon when food from conventional sources is unavailable during crises, such as natural disasters, armed conflicts, and famine [10–12], many WFPs are consumed preferentially not out of necessity but by choice as they are regarded as delicacies [5,13]. WFPs also contribute to diet diversification, as they are often highly nutritious [2,14,15]. For example, wild berries in northern Canada are higher in fiber and health-promoting antioxidants than commercial varieties [2,15]. In Indigenous territories where soil and environmental conditions make it difficult to cultivate crops or maintain market or subsistence home gardens, the consumption of WFPs provide essential micronutrients, such as vitamin A and vitamin C that complement a predominantly meat-based diet [12,16,17]. In addition, accessing WFPs often requires physical activity associated with gathering and other stewardship practices, which have additional benefits for metabolic health [18].

Examples of WFP species that contribute to the food security and sovereignty of IP&LCs are presented in Table S1 in the Supplementary materials. An extensive list of plant families that include WFPs has been published by Borelli et al. [4]. It illuminates their broad taxonomic diversity and the extent to which they are relied upon by IP&LCs. The contribution of WFPs to global food security is further emphasized by national

Table 1

Multilevel policy instruments relevant to the governance of WFPs.

Policy agreements	Policy guidance	Policy tools
Convention on Biological Diversity (CBD; including Article 8(j) on Traditional Knowledge, Innovation and Practices of IP& LCs; 1992)	Strategic Plan for Biodiversity (2011–2020) and Aichi Targets	Funding mechanisms that provide financial, technical, and capacity-building support for biodiversity conservation, sustainable use, and fair-benefit sharing (e.g. Global Environment Facility, the Green Climate Fund, the Biodiversity Finance Initiative, etc.)
Nagoya Protocol on Access and Benefit-sharing (NPABS; 2010)	Nagoya Protocol Implementation Guidelines (CBD/COP Decision NP-1/4)	Access and Benefit-Sharing (ABS) mechanisms, such as the Access and Benefit-Sharing Clearing-House (ABSCH); National ABS Legislation (e.g. India's Biological Diversity Act 2022)
International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA; 2001)	Global Plan of Action for the Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture; The Global Strategy for Plant Conservation 2020–2030	Multilateral System (MLS) for Access and Benefit-Sharing; Standard Material Transfer Agreements (SMTA)
UN Declaration on the Rights of Indigenous Peoples (UNDRIP; 2007)	UN Permanent Forum on Indigenous Issues	Indigenous community protocols (e.g. biocultural protocols)
Kunming-Montreal Global Biodiversity Framework (KMGBF; 2022)	IPBES Assessment Report on the Sustainable Use of Wild Species (2022)	National Biodiversity Strategies and Action Plans (NBSAPs)

contributions to the recent Third Report on the State of the World's Plant Genetic Resources for Food and Agriculture published by the FAO [19].

Despite their importance, dominant policy agreements, tools, and guidance (e.g. International Treaty on Plant Genetic Resources for Food and Agriculture; Table 1) have historically valorized WFPs primarily for their commercial potential as sources of plant genetic traits for crop improvement (e.g. crop resistance to pests or drought) [20,21]. As a result, conservation efforts have often focused on the collection and *ex-situ* storage of plant germplasm in large, centralized, and expensive gene banks often located far from Indigenous territory where these species originate and are sometimes disconnected from customary stewardship systems that maintained them over generations [4,22]. In doing so, policy settings have often overlooked the holistic and territorially grounded systems of governance maintained by Indigenous Peoples and other place-based knowledge holders relevant to the conservation of wild plant genetic resources (i.e. small-holder farmers, pastoralists, foragers) [5,13,23]. These systems are embedded in customary institutions (e.g. the Agdal system, an agro-sylvo-pastoral governance system of collectively managed lands that are seasonally closed and opened according to customary rules practiced by Amazigh communities in the High Atlas Mountains of Morocco; 24) and include gendered roles, and collective responsibilities that support both biodiversity conservation and food security through traditional plant knowledge and place-based stewardship practices, such as burning, fertilizing, pruning, seed-saving and other participatory actions [25–27].

While the subsistence uses and contributions of Indigenous Peoples and local communities to WFP stewardship remain understudied and underrepresented in policy development, a growing body of literature documents the diverse ways in which IP&LCs actively protect, restore, and enhance WFPs. At the same time, these studies acknowledge that many stewardship practices remain undocumented or insufficiently represented in the academic literature. Existing studies demonstrate that stewardship of WFPs encompasses biophysical interventions across multiple ecological scales targeted at the genetic, species (population and meta-population), community, and ecosystem levels, as well as broader socioecological relationships between people and nature, including cultural, spiritual, and political dimensions [6–8].

In their review of biophysical stewardship practices associated with nature's contributions to people, Mattalia et al. [28] distinguished between those interventions intended to enhance specific elements of a target species (e.g. abundance and quality) and those related to the maintenance and/or restoration of the habitats in which preferred species live. These distinctions are not discrete, and Mattalia et al. al [28] note that biophysical stewardship practices targeted at a single culturally valuable species can have broader ecosystem-wide impacts as well as social-ecological consequences. For example, Indigenous Peoples of the boreal forest biome, including the Gitksan and Wet'suwet'en, have historically employed fire as a management tool to sustain and enhance the productivity of wild food resources, such as berry-producing shrubs, and other co-occurring plants and animals [29,30]. Periodic burning removes senescent and dead vegetation and stimulates sprouting and berry

production in fruit-producing plants, such as *Vaccinium* spp. (blueberries and huckleberries) [29]. The traditional management of berry patches involved intricate political and social systems that guided authority over burning, prescribed the timing of burns, and governed access to these shared resources [29,31]. Such traditional governance systems and stewardship practices were systematically suppressed and, in some instances, criminalized following European settlement and the establishment of colonial land use regimes (e.g. commercial forestry) across Indigenous territories [29]. As a result, many traditionally managed berry patches have disappeared or are no longer as productive as they once were [27].

The stewardship of WFPs goes well beyond the management of abiotic and biotic processes, such as nutrient cycling, competition, or herbivory, but is deeply rooted in local cosmologies, kinship networks, and intergenerational transmission of knowledge [6,27,28]. These cultural frameworks define not only how preferred plants are identified, harvested, and shared, but also how stewardship responsibilities are assigned within communities, often guided by protocols tied to ceremony, language, and other spiritual, social, and psychological dimensions [27,30,31]. For example, Indigenous and local communities in sub-Saharan and West Africa, such as the Mandinka, Serer, and Dogon peoples, revere Baobab as a sacred tree linked to ancestors and the spirit world. During harvest, they sing, dance, and offer prayers or animal sacrifice, especially at the start of the rainy season [32]. These cultural practices are a form of WFP stewardship, centered on respect, reverence, and upholding reciprocal relations with nonhuman species [30].

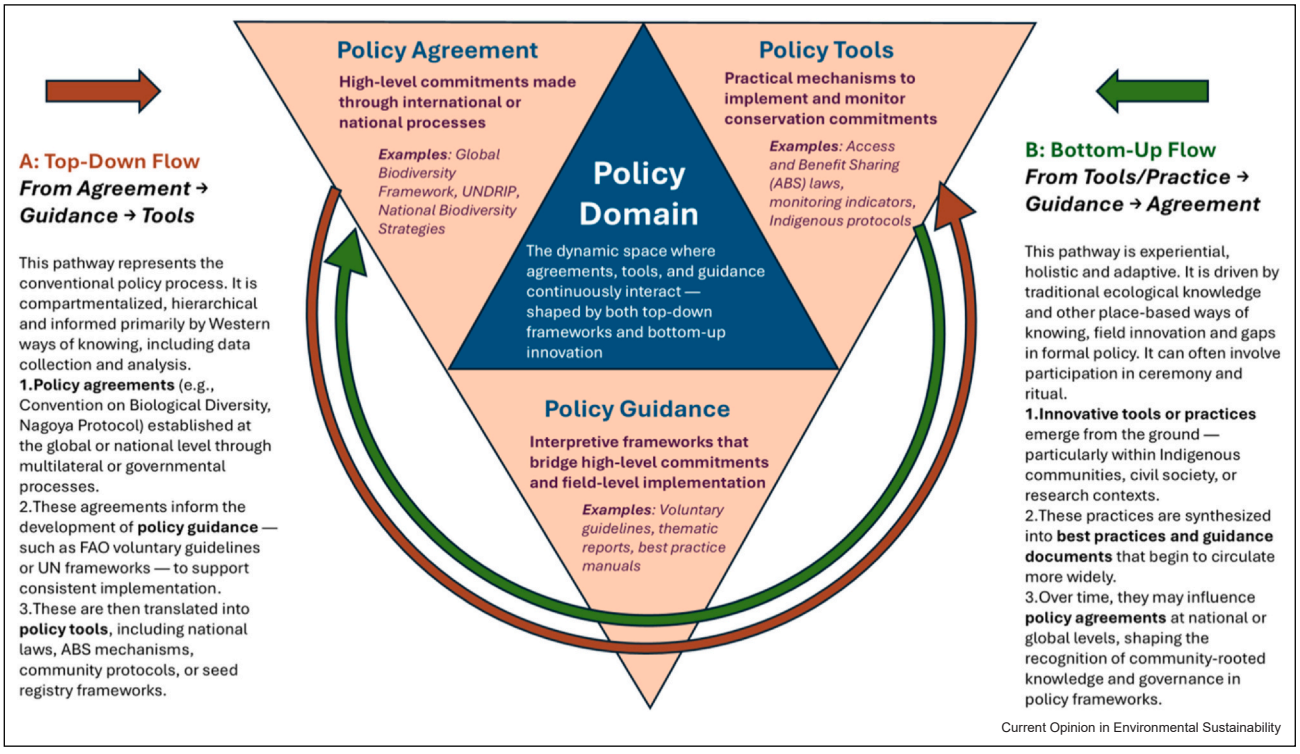
Developing policy that is responsive and reflective of traditional wild food plant stewardship

As interest in WFPs, especially their commercial application in crop improvement, gains traction, there is a significant risk that the knowledge, rights, and governance of IP&LCs could be sidelined without their meaningful inclusion in emerging policy domains [22]. Conventional policy forums that are shaped by global agreements like the International Treaty on Plant Genetic Resources for Food and Agriculture and implemented through policy instruments such as the Nagoya Protocol follow a top-down trajectory shaped by formal institutions, siloed disciplines, and normative frameworks that can marginalize Indigenous and other place-based knowledge systems that are shaped by ritual, reciprocity, and lived experience. This technocratic lens, while offering mechanisms like Access and Benefit Sharing (ABS), risks reinforcing extractive relationships when Indigenous customary tenure is unrecognized in domestic legal systems [33,34]. For example, ABS frameworks may require IP&LCs to enter into formal agreements with state or corporate actors for access to WFPs, despite communities having stewarded these plants under customary governance for generations [34]. This disconnect not only limits IP&LC agency but also undermines the relational values that guide sustainable use, including reciprocity, obligation to place, and collective rights. In contrast, Indigenous frameworks understand WFPs as kin or relatives within broader ecosystems of care, governed not through contracts, but through protocols guided by ceremony, traditional ecological knowledge (TEK), and intergenerational responsibility [8]. Bridging these worldviews is essential for meaningful inclusion of IP&LCs in policy development for the conservation and sustainable use of WFPs and to avoid the further marginalization of often vulnerable peoples through well-intentioned, but poorly adapted instruments.

In recent years, knowledge frameworks that attempt to integrate Western science (WS) and Indigenous ways of knowing have emerged to inform conservation, resource management, and other areas of public policy [35–37]. One such framework that has been adopted across numerous science and policy settings is Etuaptmumk (Mi'kmaq for 'Two-Eyed Seeing'), developed by Mi'kmaq Elders, Albert and Murdena Marshall, for unifying knowledge systems [38–40]. Elder Albert Marshall describes Two-Eyed Seeing as: "learning to see from one eye with the strengths of Indigenous knowledges and ways of knowing, and from the other eye with the strengths of Western knowledges and ways of knowing, and to use both these eyes together, for the benefit of all" [41]. Building on this approach, we propose a model of dual policy flows to synthesize and guide the integration of IP&LCs and their stewardship practices into policy development for WFPs using a Two-Eyed Seeing approach (Figure 1). The model draws on key insights from the literature, including the persistence of tensions between WS and Indigenous and local knowledge and a recognition that their reconciliation is principally a political issue rather than an ontological matter [37,42]. For example, embedded power imbalances between Indigenous Peoples and the state often privilege Western science over traditional knowledge to the detriment of local communities [43]. While Two-Eyed Seeing does not eliminate the potential for disagreement, it provides a process by which different forms of knowledge and evidence can be brought into dialogue to create the conditions necessary for shared learning, adaptive management, and the co-development of solutions for biodiversity conservation while respecting Indigenous rights and responsibilities [40,41].

In this model, the policy domain is a dynamic space of negotiation, influence, and interaction between Western science-policy settings and Indigenous and other place-based governance and stewardship practices. It encompasses conventional agreements, guidance, and tools as well as traditional knowledge, customary practices, and field

Figure 1



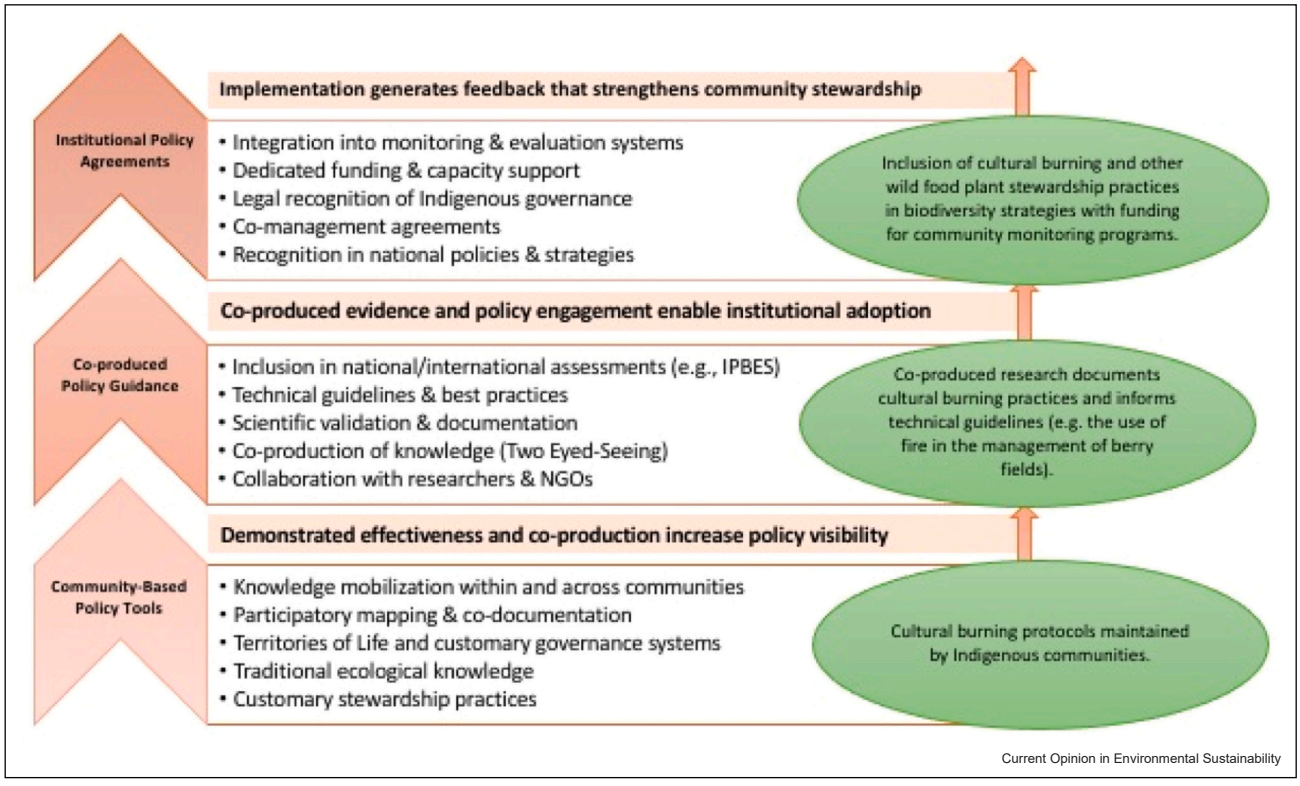
Dual flows for incorporating IP&LC stewardship into policy development for WFPs. The policy domain is a dynamic space of negotiation, influence, and interaction. It encompasses conventional policy agreements, guidance, and tools, as well as traditional knowledge, customary practices, and field innovations that shape how policies are formed, interpreted, and implemented. **(a)** Conventional policy development is characterized by Top-Down Flows that are driven by high-level multilateral agreements (e.g. International Treaty on Plant Genetic Resources for Food and Agriculture), which are interpreted through technical guidelines and operationalized into national strategies, legislative frameworks, and other implementation tools. This pathway is normative, technocratic, and largely informed by Western ways of knowing only. **(b)** Bottom-Up Flows, in contrast, emerge from the lived experiences, customary laws, and place-based knowledge systems of Indigenous Peoples and local communities. These approaches center the conservation and sustainable use of WFPs through relational practices such as seasonal harvesting, controlled burns, and language transmission, embedded within specific landscapes and cultural contexts. This pathway is experiential, holistic, interconnected, and adaptive, and can involve ritual and other elements of ceremony that emphasize the reciprocal contributions between people and nature.

innovations that shape how policies are formed, interpreted, and implemented. Recognizing the policy domain as an interactive space allows us to challenge the assumption that policy change occurs only in a linear top-down direction. Bottom-up processes, led by Indigenous Peoples and local communities, can play an important role in shaping, informing, and even transforming dominant policy settings. Such dual flows incentivize inclusive policy-making that respects the agency of Indigenous Peoples and local communities to make decisions, take actions, and influence the conservation and management of WFPs under their own governance and stewardship practices.

Bottom-up policy pathways for integrating Indigenous Peoples and local communities stewardship into wild food plant governance

Bottom-up governance of WFPs is not a new phenomenon; it has long been embedded in Indigenous stewardship systems that shape land management practices and sustain biodiversity and food systems [44]. IP&LCs have protected WFPs through customary governance, traditional ecological knowledge, and community protocols that regulate harvesting, seasonal use, and habitat stewardship, often within collectively governed landscapes recognized as Territories of Life [45,46]. What is relatively recent is the formal recognition of these contributions within policy arenas. Increasingly, global and national institutions are creating spaces where Indigenous knowledge and governance inform policy development, including the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES; [47,48]), UNESCO's recognition of biocultural heritage and sacred sites [49], and Article 8(j) of the Convention on Biological Diversity, which affirms the role of traditional knowledge in biodiversity conservation [50]. These initiatives begin to address long-standing institutional barriers such as epistemic bias, the colonial legacies of fortress conservation, and the

Figure 2



This figure describes how bottom-up approaches can influence institutional management of WFPs by foregrounding IP&LC knowledge, stewardship practices and agency in policy development. The opportunity for integrating Indigenous environmental governance in policy development is illustrated using the example of cultural burning by Indigenous Peoples in Canada and Australia.

marginalization of IP&LCs and their rights to territories and resources in multilateral environmental governance [37,51].

A practical pathway for translating bottom-up stewardship into formal policy can be understood as a progression from community-based policy tools to co-produced policy guidance and ultimately institutional policy agreements, guided by a Two-Eyed Seeing approach that brings Indigenous and Western knowledge systems into equitable dialogue (Figure 2). At the tool level, customary stewardship practices, participatory mapping, and community protocols make local governance systems visible through knowledge mobilization and co-documentation. Demonstrated effectiveness and co-production with researchers and NGOs increase policy visibility, enabling guidance through scientific validation, technical recommendations, and inclusion in national or international assessments [35,37]. Co-produced evidence and policy engagement can then lead to institutional adoption, including recognition in biodiversity strategies and mechanisms such as Free, Prior and Informed Consent (FPIC), community protocols, and co-management agreements, alongside legal recognition of Indigenous governance and dedicated funding for community monitoring [51]. The adoption of Indigenous cultural burning in Australia and the expansion of Indigenous Protected and Conserved Areas (IPCAs) in Canada illustrate how longstanding community practices can move from local stewardship to formal policy adoption, supported by public funding and co-governance arrangements [52,53]. In Australia, this progression has occurred through a staged process in which Aboriginal fire knowledge was documented through ranger programs, participatory mapping, and community monitoring, increasing its visibility to researchers and government agencies [54]. Co-produced research demonstrating ecological benefits, then informed national fire management guidelines that recognized cultural burning as an effective tool for fuel reduction and biodiversity conservation. These developments enabled formal policy adoption, including dedicated funding for Indigenous ranger programs, incorporation of cultural burning into fire management strategies, and co-management arrangements that support Indigenous leadership [53,55]. This staged process provides a replicable mechanism for embedding IP&LC stewardship of WFPs into policy design, implementation, and

evaluation. The relationship between increased IP&LC agency in policy development and outcomes is not necessarily linear nor guaranteed (Figure 2). Progress may stall or even reverse when political will is inconsistent, or shifts in state actors affect funding and other forms of support for IP&LC stewardship. A central challenge for integrating Indigenous environmental governance in policy development is the tension between state sovereignty over biological resources and Indigenous rights to self-determination [50,51]. The Nagoya Protocol attempts to navigate this challenge through three complementary mechanisms: FPIC, Mutually Agreed Terms (MAT), and a framework for Access and Benefit-Sharing (ABS) to ensure the fair and equitable sharing of benefits arising from the utilization of genetic resources [58]. While these mechanisms do not fully resolve tensions between state sovereignty and Indigenous self-determination, they provide practical pathways for shared authority, co-governance, and equitable stewardship of WFPs and other biodiversity in Indigenous territories [50,51].

Conclusion

As the global demand for food continues to rise, Indigenous territories are facing growing pressures from the expansion of commercial agriculture and other land use changes that threaten populations of WFPs as well as the reciprocal relationships that IP&LC sustain with them [56,57]. The FAO has recently begun to include information on WFPs in its global assessments of plant genetic resources for food and agriculture. FAO's latest assessment found that nearly 40% of surveyed WFPs are threatened at the species or variety level, based on data contributed by 80 countries covering 6200 taxa of crop wild relatives, WFPs, and farmers' varieties/landraces surveyed between 2012 and 2019 [19]. The drivers of decline include overexploitation, climate change, and the effects of land use, particularly commercial agriculture, with high inputs of synthetic fertilizers and pesticides, along with social-environmental changes associated with the abandonment of traditional agropastoral practices [19]. In this context, future policy development must place IP &LC knowledge, rights, and agency at its center [51]. This requires recognizing Indigenous and local plant knowledge, supporting customary stewardship systems, and enabling sustainable practices of care that have safeguarded WFPs for generations [4,28].

Finally, it is important to stress that the distinction between *ex situ* and *in situ* conservation of WFPs is often blurred in local contexts, as IPLC stewardship spans a continuum from wild populations subject to varying degrees of human management to the collection and storage of germplasm in seed banks and related facilities [19]. While centralized gene banks have sometimes marginalized Indigenous governance and customary stewardship by extracting plant genetic resources without equitable benefit sharing, *ex situ* approaches are not inherently problematic and can complement *in situ* conservation when implemented through FPIC, ABS, and community-led partnerships [4]. Many Indigenous Peoples and local communities envision *ex situ* conservation as supportive rather than extractive, particularly when seed banks, nurseries, or living collections are co-managed, strengthen local capacity, and return benefits to the territories and knowledge systems that sustain WFPs [2]. Similarly, Indigenous Protected and Conserved Areas (IPCAs), Territories of Life, sacred sites, and other decolonial *in situ* conservation approaches provide effective and equitable mechanisms for biodiversity protection by foregrounding IP&LC knowledge, rights, and agency into area-based conservation initiatives [45]. Collectively, these approaches are critical for conserving WFPs and sustaining the social-ecological relationships and governance systems through which communities steward them.

Data Availability

No data were used for the research described in the article.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Faisal Moola reports financial support was provided by Government of Canada Social Sciences and Humanities Research Council. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.cosust.2026.101693.

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