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Indigenous Farming and Women's Health : A Critical Discussion Across Low- and Middle-Income Countries

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Abstract: Women-led indigenous farming and ethnobotanical systems across Asia, Africa, and South America are vital yet often overlooked foundations for reproductive health, food security, and ecological resilience. This paper draws on diverse case studies—including jamu in Indonesia, ayurveda in India and helawedakama in Sri Lanka, milpa systems in Mexico, Andean potato terraces, and sub-Saharan African agroforestry—to illustrate how women cultivate biodiversity-rich agricultural and medicinal traditions that support menstruation, fertility, childbirth, and postpartum care. As farmers, healers, seed custodians, and knowledge holders, women advance nutritional, therapeutic, and psychosocial outcomes while preserving intergenerational resilience. Yet these systems face mounting threats from land dispossession, extractive industries, commercial seed regimes, and exclusionary policies. Regional examples—from Kenya's seed banks and Brazil's feminist agroecology to Venezuela's survival-based herbal practices—demonstrate both the strength of these traditions and the gendered barriers to their sustainability. Climate change further underscores the urgency of safeguarding these low-input, locally adapted practices. As women increasingly navigate civil society and state frameworks, their knowledge must be formally recognized and resourced. We argue that inclusive health, agricultural, and environmental policies that centre gender equity, biocultural heritage, and climate resilience in low- and middle-income countries. International collaboration is essential to protecting and scaling women-led indigenous systems as pathways toward transformative global health and sustainability.

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1. Background

Indigenous farming refers to traditional agricultural practices developed by local communities over generations, closely tied to their cultural, spiritual, and ecological knowledge (Guo et al., 2021). The traditional agricultural practices often rely on biodiversity, natural input, and local seed varieties, emphasising sustainability and harmony with the environment. Unlike industrial agriculture, indigenous farming typically involves intercropping, crop rotation, agroforestry, and organic compost or manure (Adefila et al., 2024). It is often adapted to local climates and landscapes, making it more resilient to environmental changes (Huynh et al., 2020).

Women are central in many indigenous farming systems, especially in seed selection, seed saving, food processing, pest control, soil management and medicinal plant cultivation. These practices not only support food sovereignty but also help preserve cultural heritage and ecological diversity. Indigenous farming systems in low- and middle-income countries (LMICs) are vital for ecological sustainability, cultural identity, and food sovereignty (Matsa and Mukoni, 2013) Women's active engagement and labour contributions are fundamental to the success of these. agroecological practices, developed and maintained over generations, are especially significant for women's health, given the gendered division of labour and care-giving roles in many communities.

Indigenous farming across Asia, Africa, and South America faces several interlinked challenges (Erni, 2015, Jat et al., 2016). Land insecurity and limited access to resources disproportionately affect women and marginalised communities, key custodians of traditional agricultural knowledge (Garutsa and Nekhwevha, 2016). Government policies and development programs often prioritise industrial or commercial farming, leading to the erosion of indigenous seed systems, biodiversity loss, and reduced support for agroecological methods. Climate change, deforestation, and extractive industries further threaten the viability of traditional farming by disrupting ecosystems and water sources. Additionally, the undervaluing of indigenous knowledge in formal research, education, and extension services limits the visibility and scalability of these practices. Together, these challenges undermine indigenous farming systems.

When viewed through the lens of the United Nations (UN)-aligned Sustainable Development Goals (SDGs), the marginalisation of indigenous farming in Asia, Africa, and South America poses significant barriers to achieving equitable health and development outcomes. **SDG 2 (Zero Hunger)** and **SDG 3 (Good Health and Well-being)** are directly threatened by the displacement of biodiverse, nutrient-rich indigenous crops in favour of monocultures promoted by commercial agriculture. The lack of land rights and institutional support for indigenous farmers, especially women—also hinders **SDG 5 (Gender Equality)** and **SDG 10 (Reduced Inequalities)**, as these groups are excluded from decision-making and access to resources. Furthermore, SDG 13 (Sustainable cities and communities) are closely linked to Indigenous farming and women's roles, as it emphasises inclusivity, resilience, and ecological balance, yet the invaluable contributions of Indigenous practices and women's leadership often remain under recognised and undervalued. The loss of agroecological practices and traditional medicinal knowledge undermines **SDG 13 (Climate Action)** and **SDG 15 (Life on Land)**, emphasising the need for locally driven environmental stewardship. A critical gap exists in recognising and integrating the indigenous systems within formal health and agricultural policies, reflecting broader failures to uphold **SDG 17 (Partnerships for the Goals) (United Nations, 2015)**. Without structural reforms that centre indigenous knowledge, promote gender equity, and safeguard ecological resilience, the health and sustainability benefits of indigenous farming will remain underutilised in global development efforts. are closely linked to Indigenous farming and women's roles, as they emphasise inclusivity, resilience, and ecological balance..

This commentary critically explores the transformative potential of indigenous farming practices in enhancing women's health outcomes LMICs in Asia, Africa, and South America, highlighting how these traditional, eco-cantered approaches can improve nutrition, autonomy, and

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community well-being, while also acknowledging the persistent structural barriers—such as gender inequality, land insecurity, and limited policy support—that hinder their widespread impact (Figure 1).

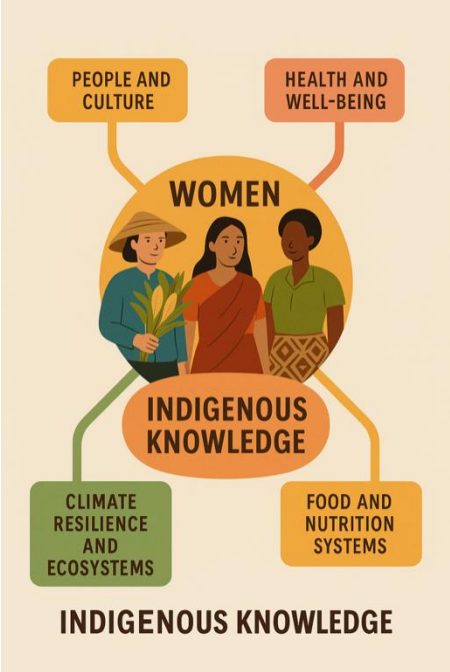

Figure 1. Interconnected Themes of Indigenous Knowledge and Well-being.

1.1. Nutritional Security and Dietary Diversification in LMICs

Indigenous farming systems promote biodiversity, seasonal planting, and sustainable land use. Women farmers often cultivate and manage nutrient-rich crops such as millets, leafy greens, legumes, and medicinal plants. These directly alleviate malnutrition and micronutrient deficiencies prevalent in LMICs, particularly iron, vitamin A, and folate nutrients essential to maternal and reproductive health (Boliko, 2019).

In Iran, women are integral to Iran's agricultural sector, engaging in activities such as planting, weeding, pest control, harvesting, and marketing. Their involvement is essential for household and community food security (FAO, 1994) Women in northern Iran's rice fields contribute over 70% of the manual labour during the transplanting and harvesting phases (Chizari et al., 1997). Rice is a central staple in many Iranian households, particularly in urban areas, and is often consumed daily as the main carbohydrate source. However, there are many challenges facing women in Iran in this area, including limited land ownership and inheritance rights, exclusion from agricultural extension and education programs, and lack of access to agricultural inputs and resources (Fact Sheet: Iran - Women, Agriculture and Rural Development, n.d.; Rural Women's Role in Sustainable Development, 2023) (Table 1)

1.2. Asia

In India and Nepal, the revival of indigenous millet and pulse cultivation through women-led farming collectives has shown promise in improving dietary diversity and reducing anaemia among women of reproductive age (Kinyoki et al., 2021, Keya, 2023). These crops are naturally rich in iron, calcium, and folate and are well-suited to the dryland and hilly agroecological zones where conventional high-input crops often fail. However, despite these documented nutritional benefits, such interventions remain localised and poorly integrated into national food and health policies. Moreover, the challenges of land tenure insecurity and limited access to markets continue to constrain the scalability of these women-led initiatives. In Pakistan, the prevalence of anaemia among women of reproductive age is alarmingly high. A study analysing data from the Pakistan Demographic and Health Survey reported that 51.0% of women of reproductive age were anaemic. Factors such as

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higher parity and lower body mass index (BMI) were significantly associated with increased anaemia prevalence among these women. In Bangladesh, anaemia remains a significant public health concern (Harding et al., 2018). Also, a comparative study in West Bengal (India) and Bangladesh highlighted that women from poorer households, those with higher parity, and those practising open defecation were more likely to be anaemic (Jana et al., 2022). In Sri Lanka, data from 2019 indicated that the southern part of the country had 36.9 % (Galle) and the northern part of the country had 42.5% (Jaffna) of anaemic pregnant women (Amarasinghe et al., 2022). . In Vietnam, even though the effort of government to reduce the anaemia among women of reproductive age however still 20.6% of them were affected (Global Nutrition Report | Country Nutrition Profiles - Global Nutrition Report, n.d). This suggests a considerable burden of anaemia among women, though specific data on women of reproductive age is limited. In the Philippines, the situation appears comparatively better. A study reported that the prevalence of anaemia among women of reproductive age was 13.3%, the lowest among the South and Southeast Asian countries analysed (Sunuwar et al., 2020). Addressing anaemia in these countries requires multifaceted approaches, including improving dietary diversity, enhancing access to healthcare, and implementing targeted nutritional interventions. Empowering women through education and supporting their roles in agriculture can also contribute to better nutritional outcomes. For instance, the Food and Agriculture Organisation (FAO) emphasises the importance of gender-responsive policies and programs to combat food insecurity and malnutrition. Integrating indigenous farming practices, particularly those led by women, can be crucial in enhancing dietary diversity and reducing anaemia prevalence among women of reproductive age in these regions.

1.3. Africa

In sub-Saharan Africa, indigenous vegetables such as amaranth, spider plants, and cowpea leaves are major sources of micronutrients but are often underutilised due to the dominance of imported or hybrid seeds (Karmakar and Roy, 2024). Indigenous vegetables such as amaranth, spider plant, and cowpea leaves are nutritionally dense crops rich in essential micronutrients like iron, calcium, and vitamin A. These vegetables have been central to traditional diets across sub-Saharan Africa, especially in rural and peri-urban communities. They are also climate-resilient, requiring fewer external inputs and adapting well to local growing conditions. Despite these advantages, their cultivation and consumption have declined over recent decades due to the dominance of imported or hybrid seed varieties, changes in dietary preferences, and limited commercialisation efforts (Bosman et al., 2012).

In Rwanda, 52% of the population is women and they constitute about two-thirds of the labour in household farms (National Institute of Statistics of Rwanda, 2022). They cultivate stable crops like beans, maize, potatoes, cassava and also indigenous vegetables such as Amaranth species (*dodo, imbwija and inyabutongo*), African nightshade (*black* nightshade, *intagarasoryo*), and spider plant (*isogi*) amongst other grains and cash crops remain important in rural food systems and are widely consumed, particularly in subsistence farming households (CASA, 2023). In Nigeria, while amaranth and cowpea leaves remain widely consumed in rural areas, urban diets increasingly favour exotic vegetables such as cabbage and lettuce. This dietary shift has been accompanied by reduced support for indigenous vegetable production in agricultural extension services (Adeloye, 2021). Similarly, in the Democratic Republic of Congo (DRC), while amaranth and spider plant hold cultural significance, their cultivation is hindered by weak seed systems and competition from imported produce plants. In Ghana, there is growing recognition of the role of African Indigenous Vegetables (AIVs) in food security, with some initiatives underway to document and revive traditional farming knowledge. However, these remain fragmented and underfunded. In Ethiopia, many indigenous vegetables are grown and consumed locally, yet awareness of their nutritional benefits is low, especially in urban centres (Belew, 2015). This is compounded by the absence of supportive markets and infrastructure, which makes it difficult for smallholder farmers, particularly women, to commercialize these crops. In Mozambique, indigenous vegetables are valued in rural diets but are displaced by more marketable crops as urbanization advances and agricultural priorities shift toward export-oriented production (Chagomoka et al., 2013). Reviving local vegetable production here will require

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coordinated policy support and investment in urban food systems. Kenya presents a more positive example where AIVs such as African nightshade, cowpea leaves, and amaranth have been successfully integrated into formal markets. Women-led cooperatives have played a central role in this transformation, enhancing household nutrition and income security (Kuo et al., 2022). However, challenges remain in scaling up these efforts beyond pilot projects and ensuring they are embedded in national agricultural strategies.

Across the region, the underutilisation of indigenous vegetable stems is driven by a combination of sociocultural biases (often considered "poor people's food"), inadequate or lack of policy support, and weak value chains. To overcome these barriers, a multi-pronged approach is needed—one that includes investment in research and development, better access to markets, and public awareness campaigns that highlight the health and environmental benefits of AIVS. Policy integration and gender-responsive agricultural programming are also essential to ensure that women, often the primary cultivators and custodians of these crops, are adequately supported. Harnessing the full potential of Indigenous vegetables could contribute significantly to reducing micronutrient deficiencies, promoting dietary diversity, and strengthening food sovereignty across sub-Saharan Africa

1.4. South-America

In the Andean highlands of South America, women play a central role in cultivating and conserving native crops such as quinoa, amaranth, and diverse potato varieties, which are vital for food sovereignty and climate resilience. These crops are adapted to challenging high-altitude environments as they are nutrient-dense, rich in protein, iron, and complex carbohydrates. Women in rural communities often act as custodians of these seeds, selecting, exchanging, and planting varieties according to local ecological conditions and traditional knowledge systems. This preservation of agrobiodiversity is essential in areas where environmental stress, such as drought and soil degradation, increasingly threatens food security (Zimmerer and De Haan, 2017).

However, the commercialisation of native crops especially quinoa has brought both opportunities and challenges. In Bolivia and Peru, for example, global demand for quinoa has led to increased income for some producers, but also to monocropping, land pressure, and rising local prices that threaten household-level food access (Andrango et al., 2020). While integral to traditional agricultural systems, women are often excluded from decision-making and control over profits in larger commercial operations. Furthermore, intellectual property rights and benefit-sharing remain unresolved, as indigenous communities rarely receive recognition or compensation for their genetic resources and farming knowledge.

In Brazil, especially in the Amazon and Cerrado regions, indigenous women contribute to agricultural diversity by cultivating cassava, beans, maize, and medicinal plants (Bomfim et al., 2024). While Brazil has progressive constitutional recognition of indigenous rights, including land and traditional knowledge, deforestation and agribusiness expansion—particularly soybean farming—have led to the displacement of communities and the erosion of indigenous food systems. Nonetheless, feminist agroecology movements, such as the Movimento das Mulheres Camponesas (Women Peasants Movement), have worked to reclaim land and promote food sovereignty through native seed networks and solidarity markets (Motta and Teixeira, 2022).

Chile presents a contrasting picture. In Mapuche territories of southern Chile, women continue to grow traditional crops like wheat, quinoa, and beans, often in home gardens or small plots (Van Der Grinten). However, neoliberal land reforms and monoculture forestry (especially pine and eucalyptus plantations) have greatly reduced access to arable land. Indigenous farming persists more as a form of cultural resistance than a supported livelihood, with little integration into national food or health programs.

In Mexico, indigenous communities, particularly in Oaxaca, and Chiapas maintain *milpa* systems, a form of intercropping involving maize, beans, squash, and amaranth (Vazeux-Blumental et al., 2024). These systems provide dietary diversity and ecological balance, and women play a key role in seed selection and food preparation. However, NAFTA-era trade liberalization and the influx of subsidised U.S. corn have weakened traditional markets and displaced smallholder farmers,

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including many women (Nisivaco, 2017). The rise of diabetes and obesity in indigenous populations has also been linked to the nutritional decline caused by reduced consumption of native foods (Milburn, 2004).

Argentina and Venezuela have seen growing challenges in sustaining indigenous farming practices (Parraguez-Vergara et al., 2018). In Argentina, land concentration and the expansion of genetically modified soybean farming have marginalised indigenous communities, such as the Qom and Wichí, pushing them to the peripheries of economic life. Efforts to reclaim native crops like maize and sweet potatoes are ongoing but receive little institutional support. Economic collapse and political instability in Venezuela have disrupted agricultural production across the country (Bull and Rosales, 2020). However, in some indigenous regions such as the Sierra de Perijá, women have preserved the traditional cultivation of plantains, cassava, and beans as a survival strategy in the face of food scarcity and government food rationing failures (Pearsall, 2008).

Across these countries, women's traditional farming practices remain crucial to sustaining nutritional resilience, cultural identity, and climate-adapted food systems. However, shared challenges continue to undermine these contributions: limited access to land and credit, erosion of seed sovereignty, weak protection of intellectual property rights for indigenous knowledge, and the persistent absence of women's voices in agricultural governance. These barriers, compounded by gender inequality in agricultural support systems, restrict women's ability to scale sustainable practices (Meinzen-Dick et al., 2019). To fully harness the benefits of indigenous farming for public health and sustainability, Latin American governments must prioritise inclusive policies that secure land rights, fund agroecological training for women, and formally recognise the role of indigenous crops in national nutrition strategies.

1.5. Empowerment and Psychosocial Well-Being Among Women in LMICs

Indigenous farming is often practised through community-based, women-led cooperatives and networks. These settings can foster psychosocial well-being by reinforcing social cohesion, identity, and autonomy factors closely linked to improved mental health outcomes for women (Liang, 2022). Participation in agricultural decision-making and income-generating activities can reduce women's vulnerability to poverty, gender-based violence, and intergenerational cycles of poor health. Entrenched gender norms and systemic undervaluing of indigenous knowledge shape the potential for empowerment of indigenous farming. Recognition and protection of women's contributions in these systems remain limited in policy and academic discourse (Table 1)

1.6. Africa

In Kenya and Tanzania, women's collectives have actively engaged in indigenous seed banking and agroecology, not only to conserve biodiversity but also as a means of economic empowerment and mental well-being. According to Mendum and colleagues (2018), these initiatives have helped women build a sense of autonomy, improve self-esteem, and reduce stress through shared learning and collective action (Mendum and Njenga, 2018). Seed banks allow women to reclaim control over food production cycles and reduce reliance on commercial hybrid seeds that are often costly and ill-suited to local conditions. Moreover, agroecological practices such as intercropping, composting, and water conservation align with traditional knowledge systems that women have historically preserved and transmitted. These practices also strengthen community resilience to climate shocks, disproportionately impacting women.

In Nigeria, women's participation in traditional farming has long been central to rural livelihoods, yet their access to land and agricultural inputs remains severely constrained (Effiong, 2013). While indigenous vegetables like amaranth and fluted pumpkin are cultivated by women for consumption and sale, formal seed systems often exclude these crops. Seed-saving is practised informally, but the lack of institutional support means that such efforts remain vulnerable to climate and economic disruptions. Introducing structured seed banking and agroecological training could amplify women's roles in ensuring household nutrition and ecosystem restoration.

In the Democratic Republic of Congo (DRC), women in rural communities play a key role in cultivating traditional crops and managing biodiversity. However, conflict, displacement, and lack

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of access to agricultural extension services (Inogwabini, 2014) have undermined their capacity to maintain local seed systems. There is potential for indigenous seed banking to not only improve food sovereignty but also offer psychosocial healing in post-conflict contexts. Women-led agroecological initiatives could address widespread food insecurity while restoring degraded land in regions affected by extractive industries.

Ghana has made strides in recognising the nutritional value of indigenous vegetables like cocoyam leaves, garden eggs, and roselle (Ayim et al., 2024). Women often lead their cultivation and marketing yet face marginalization in decision-making forums and agricultural research. If supported through policy and infrastructure, community seed banks could enhance women's agency and enable greater local control over crop diversity, especially in regions vulnerable to erratic rainfall and soil erosion.

In Rwanda, women play important role as both cultivators and custodians of these crops. There is this practice of cultivating kitchen gardens that are filled with various fruits and vegetables known as *"Akarima k'Igikoni,"* which have become an important tool for women in the Southern Province who often rely on them to ensure household food security and to treat minor ailments using traditional knowledge (Forefront Magazine 2023).

In Ethiopia, where indigenous farming practices remain widespread, women are deeply involved in preserving landraces of barley, teff, and sorghum (Asfaw, 2000). Yet, their knowledge is rarely documented or protected through formal channels. Agroecology has gained traction in some highland areas through participatory seed exchange networks and farmer field schools, but gender equity in leadership and benefit-sharing remains limited. Elevating women's leadership in agroecological cooperatives could enhance both nutrition and adaptive capacity to climate change.

Mozambique presents a dual narrative: while women remain key to food production in rural areas, their practices are threatened by land-grabbing, monoculture expansion, and displacement due to natural disasters. Community seed systems are underdeveloped, and reliance on external food aid has weakened local food sovereignty. Supporting women-led seed banks and indigenous crop revival initiatives could counteract these trends and restore locally adapted food systems (Ervilha, 2022, Bruna, 2019).

Across sub-Saharan Africa, the intersection of women's empowerment, indigenous knowledge, and agroecological resilience is increasingly recognised as a critical lever for health and development. However, structural inequalities—from land rights and financing to the devaluation of traditional knowledge—continue hindering progress. Evidence from Kenya and Tanzania demonstrates that when women are given the tools to lead agroecological transformation, the benefits extend beyond food security to mental well-being, environmental sustainability, and intergenerational knowledge transfer. Scaling these models across other African countries requires supportive policy frameworks, secure land tenure for women, investment in grassroots organising, and integration of seed sovereignty into national food and climate strategies (Sibanda, 2025).

1.7. South-America

In Brazil, the Movimento das Mulheres Camponesas (MMC) has emerged as a powerful feminist movement using agroecological farming as both a political and practical strategy to reclaim autonomy, health rights, and cultural knowledge (Do Amaral Valèrio, 2019). Women within MMC advocate for food sovereignty through the revival of native seeds, organic farming, and the intergenerational transfer of traditional medicinal knowledge especially crucial in rural communities with limited access to formal healthcare. Agroecology is reframed not merely as an agricultural method, but as a form of resistance against capitalist agribusiness and patriarchal structures that marginalise rural women. This intersectional approach enables women to reassert control over their bodies, land, and labour, positioning health and food justice as core feminist concerns. However, these grassroots gains are continually challenged by national policy shifts favouring industrial agriculture, deforestation, and extractive economic models.

In Chile, particularly in Mapuche communities, women have sustained agroecological practices such as seed-saving and cultivating traditional crops like quinoa, beans, and native wheat (Van Der Grinten). Yet, their struggle is deeply shaped by the legacy of land dispossession and monoculture

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forestry (pine and eucalyptus plantations) encouraged by neoliberal policies. While feminist environmental justice movements have gained momentum, there is less state-level recognition or support for women's agroecological leadership compared to Brazil. The persistence of the Mapuche women's farming systems is thus a form of cultural and political resistance but often remains informal and unsupported within national development frameworks.

Mexico offers a rich context for agroecology through indigenous systems like the milpa, an intercropping method involving maize, beans, squash, and amaranth (Vazeux-Blumental et al., 2024). Women are central to these systems, responsible for planting and seed selection and preserving culinary and medicinal traditions. However, neoliberal trade policies, especially under NAFTA, have undercut smallholder farming by flooding markets with subsidised industrial corn, leading to the erosion of local food systems. Despite this, a growing agroecological and feminist movement, often linked to food sovereignty campaigns, is working to revitalize traditional agriculture, resist genetically modified seeds, and challenge gender inequalities in rural extension services. Nevertheless, women farmers still face barriers to land ownership, credit, and participation in cooperative governance structures.

In Argentina, the landscape is dominated by large-scale industrial agriculture, particularly genetically modified soy production for export (Leguizamón, 2014). This model has displaced smallholders, degraded soil, and increased pesticide use, with disproportionate health and economic effects on rural women. Feminist agroecological groups have begun to emerge in response, advocating for land redistribution, seed sovereignty, and ecologically sound farming. However, these remain small in scale and often unsupported by public institutions. The lack of an enabling policy environment, alongside entrenched land concentration, limits the visibility and influence of women's agroecological work.

Venezuela presents a different scenario, where economic collapse and food insecurity have pushed communities to revive local food production, often out of necessity rather than ideology (Tsakok, 2021). In rural and indigenous regions such as the Sierra de Perijá, women have continued cultivating traditional crops like cassava, plantains, and beans. Although not always organised under explicit feminist frameworks, these practices function as critical survival strategies, helping families navigate the collapse of food supply chains and state rationing systems. However, the absence of reliable agricultural inputs, political instability, and limited mobility greatly constrain the scale and consistency of these efforts (Anderson, 2022).

Across these five countries, agroecology as a feminist strategy varies in visibility, institutional support, and grassroots strength. In Brazil, the MMC demonstrates how women's organizing can successfully link agroecological practice with political demands for health, bodily autonomy, and recognition of traditional knowledge. Similar efforts exist elsewhere, such as in Argentina or Venezuela but are hindered by structural, economic, and political barriers. What unites these movements is a shared emphasis on reclaiming land, seeds, and health from systems of exploitation, and centring women, especially those from indigenous and peasant backgrounds, as agents of ecological and social transformation. To scale and sustain these approaches, governments must shift away from extractive agricultural models and create space for inclusive, feminist food and health systems grounded in agroecological principles. In addition, Afro-descendant, Indigenous, and peasant women in Brazil and Venezuela experience land loss through distinct struggles: peasant women use agroecology to reclaim autonomy, Indigenous women resist dispossession with traditional practices, and rural women in Venezuela engage in subsistence farming out of necessity, all facing systemic marginalization and loss of land.

1.8. Asia

In India, the Deccan Development Society (DDS) is a widely recognised example of how indigenous farming practices, particularly millet cultivation, can be leveraged to promote food sovereignty, women's empowerment, and psychosocial well-being (Diversi, Saxena, 2020). The DDS primarily works with Dalit women in the semi-arid regions of Telangana, supporting them in reclaiming degraded land, preserving indigenous seeds, and practising agroecological farming. This initiative does more than increase food access—it restores women's agency over land and nutrition,

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reduces dependence on commercial food systems, and revitalises cultural and ecological knowledge. Critically, participants report increased self-confidence, reduced anxiety linked to food insecurity, and stronger community solidarity. However, despite its success, such models are often isolated, and state agricultural policies continue to favour high-input, commercially viable crops like wheat and rice under schemes like the Public Distribution System (PDS), marginalising traditional cereals and smallholder women farmers.

Pakistan has limited institutional support for women's agroecological initiatives or the revival of indigenous crops (Fatima, 2024). Although women, particularly in Sindh and Baluchistan, engage in home gardening and small-scale farming of lentils, millet, and sorghum, their roles are often undervalued and undocumented. Cultural restrictions and low female land ownership further limit women's participation in decision-making around agriculture. While some NGOs have initiated kitchen gardens and nutrition programs, these are rarely framed as rights-based or empowerment-focused strategies. As a result, the potential for indigenous agriculture to support women's mental well-being and autonomy remains largely untapped.

In Bangladesh, women play a significant role in homestead food production systems, especially in coastal and flood-prone areas where traditional crops like local rice varieties, leafy greens, and pulses are cultivated. However, the dominant agricultural narrative is one of high-yield varieties and hybrid seeds, often promoted without considering local dietary diversity or women's knowledge. Climate-smart agriculture programs have recently begun to integrate women's roles more intentionally, but the emphasis remains on productivity rather than empowerment or well-being. Without robust support for seed sovereignty and indigenous food systems, these initiatives risk reinforcing existing inequalities and erasing valuable traditional knowledge (Ria, 2025, Hoque, 2023).

Sri Lanka has a rich history of indigenous agriculture, including chena cultivation (shifting agriculture) and community-based seed systems. Women have traditionally been the knowledge bearers in food preparation, herbal medicine, and seed selection. Yet post-conflict land redistribution, agricultural modernisation, and urbanisation have eroded these practices. There is emerging interest in sustainable farming and ayurvedic food systems, but few national-scale programs explicitly centre women or link indigenous farming to mental health or food sovereignty. Additionally, patriarchal norms in rural governance structures often limit women's visibility and leadership in agricultural planning (De Silva, 2024). However, Indigenous women in Sri Lanka actively participate in farming activities, contributing significantly to sustainable agriculture and rural livelihoods. Their roles encompass a wide range of tasks, including planting, weeding, harvesting, and processing crops.

In the Philippines, especially in upland and indigenous communities, women engage in diversified farming systems involving root crops, bananas, legumes, and medicinal plants. The indigenous *kaingin* system (a type of shifting cultivation) remains a vital part of food production in areas like the Cordilleras. Some NGOs, such as MASIPAG and Grow Her Program, and academic institutions have supported participatory seed conservation and agroecology, with women as key actors. However, extractive industries, mining, and militarisation in indigenous areas pose severe threats to land access and women's security. Despite women's strong presence in grassroots movements and cooperatives, government agricultural programs remain skewed towards export-oriented crops like bananas and pineapples, with limited integration of traditional systems (Parreño-De Guzman et al., 2015).

Across these South and Southeast Asian contexts, the potential of **indigenous agriculture as a vehicle for women's empowerment and mental well-being** is clear but unevenly supported. India's DDS exemplifies how centring marginalised women in agroecological practices can foster autonomy, nutritional resilience, and psychosocial health. In contrast, **Pakistan, Bangladesh, Sri Lanka**, and the **Philippines** show varying levels of engagement, ranging from informal, under-recognised roles to formal but male-dominated development programs. The missing links often lie in **land rights, policy recognition, and culturally embedded support systems**. To replicate the success of models like DDS, governments and development actors must shift from productivity-focused paradigms to rights-based (these center on ensuring that policies and programs recognize and protect the rights of marginalized communities, especially women), community-led (driven by the priorities and knowledge of the communities) approaches that affirm women's knowledge, leadership, and well-

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being in food systems. However, women's unpaid labour in agriculture remains largely unacknowledged in national health and development statistics, weakening the argument for structural investments in these systems.

Table 1. A summary table of indigenous crops and practices as well as challenges and women's roles across the Asian, African, and South American context.

Country	Indigenous Crops/Practices	Women's Role	Key Challenges
Iran	Rice, wheat and barley, pulses, saffron, and date palms	Planting, weeding, pest control, harvesting, and marketing	Lack of access to resources, limited land ownership, and exclusion from ag extension and education
India	Millet, pulses; women-led farming collectives / Millet cultivation, seed saving (Deccan Development Society)	Primary cultivators and decision-makers / Leaders in land reclamation, agroecology, seed saving	Land access, poor integration in national policy / Neglect of traditional grains in public policy
Nepal	Millet, legumes, community seed saving	Seed saving, knowledge transmission	Policy neglect, lack of extension services
Pakistan	Home gardening, underused indigenous crops / Traditional lentils, millet, sorghum	Informal food providers, limited support / Food producers, limited land rights, informal roles	Exclusion from formal ag programs / Limited access to land, ag extension, and credit
Bangladesh	Home gardens, pulses, local leafy greens / Homestead food production, local rice	Primary in-home gardening, food prep / Homestead cultivators, low policy engagement	High anaemia, weak local food systems / Hybrid seed dominance, weak support for women
Sri Lanka	Chena cultivation, traditional vegetables, crop rotation / Chena cultivation, ayurvedic systems, herbal medicine	Knowledge holders, labour contribution, food saving and preparation / Healers, food processors	Land use change, undervalued knowledge, urbanization, erosion of traditional systems
Philippines	Upland farming, tubers, banana varieties / Kaingin system, root crops, legumes, medicinal plants	Crop managers, food processors / Seed custodians, informal leaders	Deforestation, limited market access / Mining, militarization, policy neglect of indigenous areas
Nigeria	Amaranth, cowpea leaves, indigenous vegetables / Fluted pumpkin	Producers, marketers / Key cultivators	Stigma, poor market infrastructure / Low institutional support, limited land ownership
DR Congo	Spider plant, amaranth; traditional diets / Cassava, traditional leafy greens	Custodians of seeds, dietary managers / Caretakers of traditional diets and crops	Seed availability, import competition / Conflict, displacement, weak extension services

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Ghana	Leafy greens, legumes, traditional home gardens / Cocoyam leaves, local leafy greens	Farmers, transmitters of indigenous knowledge / Market participants, custodians of nutrition	Fragmented policy support, funding gaps / Fragmented support, low visibility in policy
Ethiopia	Indigenous vegetables, low urban awareness / Teff, barley, sorghum landraces	Undervalued, low visibility in urban settings / Landrace preservationists, informal knowledge	Awareness, market development issues / Documentation gaps, limited female leadership
Mozambique	Root crops, traditional vegetables in rural areas / Informal seed systems	Central to rural food production / Central to household food systems, under-resourced	Urbanization, cash crop pressure / Urban migration, poor rural infrastructure
Kenya	Nightshade, amaranth; commercialised AIVs / Amaranth, cowpea leaves, AIVs	Leaders in cooperatives and markets / Leaders in cooperatives, agroecology, food markets	Scaling efforts, policy integration / Scaling agroecology, unequal gender participation
Rwanda	Pulses, root crops, and indigenous vegetables like Amaranth, African nightshade	Main cultivators	Limited access to quality seeds, land fragmentation, and declining indigenous knowledge transfer
Bolivia/Peru	Quinoa, potatoes, amaranth; seed preservation / High-altitude farming	Seed custodians, nutritional gatekeepers / Agrobiodiversity stewards, seed knowledge holders	Commercialisation pressure, gender exclusion / Commercial pressures on biodiversity
Brazil	Cassava, maize, beans; women-led agroecology / Medicinal plants (MMC agroecology)	Agroecology activists, land defenders / Feminist movement leaders, food and health activists	Deforestation, agribusiness threats / Agribusiness threats, deforestation, land violence
Chile	Quinoa, beans; home gardens, Mapuche traditions / Mapuche traditional farming	Cultural preservation through farming / Cultural preservationists	Monoculture forestry, land loss / Land dispossession
Mexico	Milpa system (maize, beans, squash, amaranth)	Seed selectors, food preparers / Milpa stewards, nutrition caregivers	Trade liberalisation, nutritional decline / Health-nutrition transitions
Argentina	Maize, sweet potatoes; land pressure / Community-based seed recovery	Marginalised in agri systems / Displaced food providers, landless farming efforts	GM crops, land concentration / Land inequality, GM crop dominance
Venezuela	Plantains, cassava; traditional survival farming / Informal indigenous farming	Keepers of traditional food systems / Survival farming leaders, caretakers of traditional food	Economic collapse, food scarcity / Input scarcity, insecurity

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Tanzania	Indigenous vegetables, local grains, seed banking	Women's groups improve mental health, seed resilience	Climate impacts, funding gaps for seed systems

1.9. Mitigating Environmental and Climate-Related Health Risks in LMICs

Many LMICs face escalating climate change impacts that disproportionately affect women, particularly those responsible for securing food, water, and fuel. Indigenous farming practices, which often emphasise soil conservation, water harvesting, and agroforestry, can help buffer against environmental shocks. By promoting ecological resilience, these systems contribute indirectly to health resilience, preventing displacement, malnutrition, and waterborne diseases. Indigenous farming techniques such as agroforestry, terracing, intercropping, and organic fertilisation enhance soil health and biodiversity, helping communities adapt to climate stressors such as droughts and floods, factors that disproportionately impact women (Change, 2001). An extensive discussion has been described in Supplementary file 1.

1.10. Preserving Medicinal Knowledge and Women's Reproductive Health in LMICs

Indigenous farming is also a repository for traditional medicine, preserving access to medicinal plants and herbal treatments. Women often use and transmit knowledge of medicinal plants for treating common reproductive health conditions, such as menstrual cramps, infertility, and postpartum infections. In areas with limited access to formal healthcare, these resources offer a critical supplement to biomedical care. However, the commodification of traditional medicine without equitable benefit-sharing or intellectual property protection risks undermining the health sovereignty of women in indigenous communities, as described in Supplementary file 1 and Table 2.

Table 2. The Siddha Medicine approach.

Approach	Country of Origin	Time period	Brief description	References
Siddha Gynecology (Magalir Maruthuvam)	India (Tamil Nadu)	Ancient (2000+ years ago)	A Siddha branch focused on women's reproductive health including menstruation, fertility, pregnancy, and menopause. Emphasizes natural remedies, dietary regimens, and lifestyle management based on humoral theory (vali, azhal, iyam).	(M, 2021.)
Home-based Herbal Remedies by Women	India (South India)	Ongoing/Traditional	Women in rural areas traditionally prepare herbal decoctions and oils for issues like PCOS, leucorrhoea, infertility, and postpartum recovery, using knowledge passed down generations.	(Balamurugan, 2017)
Medicinal Plant Cultivation by Women	India (Tamil Nadu, Kerala, NE states)	Traditional to Present	Women cultivate, preserve, and harvest medicinal plants in home gardens and temple	(Kumar, 2019)

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			groves. Their knowledge is vital for sustainable use of Siddha herbs and biodiversity conservation.	
Community Health through Women Healers	India (Tribal regions, Tamil Nadu)	Historical & Contemporary	Elderly women and midwives serve as primary care providers in rural Siddha communities, offering gynecological treatments and childbirth support with herbal knowledge in absence of modern facilities.	(Benefitting from a Tribal Community's Symbiotic Relationship with Nature: The Healing System Practiced by Irula Women – Tamil Nadu – Tribal Cultural Heritage in India, n.d.)

Despite their resilience, both systems face challenges. In India, the commercialisation of *ayurvedic* products has led to concerns about overharvesting, monoculture plantations, and corporate control of traditional formulations—often without benefit-sharing or recognition of women's contributions (Sahai, 2000, Sahai, 2004). In Indonesia, *jamu* has undergone commodification and urban market repackaging, frequently leaving behind the rural women who maintain the foundational knowledge and plant sources (Krier, 2011). In both countries, the knowledge of women as healers and growers is often informal and unprotected, making it vulnerable to exploitation or erasure.

However, the rising commodification of traditional medicine, often without benefit-sharing or recognition of women's contributions, threatens biodiversity and local health sovereignty. Figure 2 showed the global farming methods briefly.

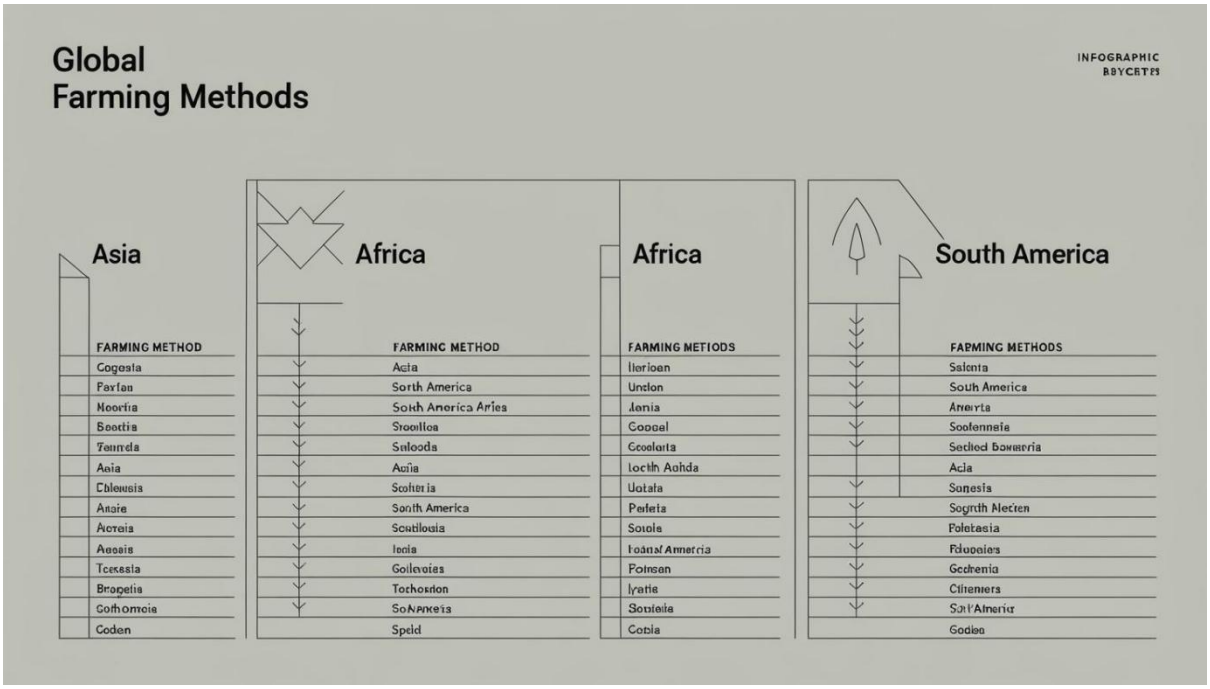

Figure 2. The Global Indigenous Farming Methods among different regions.

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2. Strengths and Limitations

A key strength is that this critical summary offers comparisons of indigenous farming practices and its' impact on women's health across Asia, Africa, and South America (Figure 2).

The availability and quality of data varied significantly across regions and countries. While some contexts offered robust epidemiological and ethnographic evidence, others relied heavily on qualitative or anecdotal sources due to limited documentation of indigenous practices and health outcomes. This disparity may affect the comparative balance and generalizability of findings.

The focus on women as custodians of traditional knowledge though central to the paper require further prospective research to understand the complex intra-community dynamics shaped by class, age, ethnicity, and land tenure. Future studies should disaggregate women's experiences to better reflect intersectional realities.

2.1. Policy Implications

Policy Brief: Protecting Women-Led Herbal Knowledge Systems in Asia, Africa, and South America

Across Asia, Africa, and South America, women play a critical but often overlooked role in sustaining traditional herbal knowledge systems for reproductive health. From the potato terraces of the Andes to the medicinal gardens of rural Africa and the jamu traditions of Southeast Asia, women cultivate, preserve, and pass down plant-based health practices vital for managing menstruation, fertility, childbirth, and postpartum care (Köhler et al., 2018, Nuraini et al., 2024). These systems are deeply tied to biodiversity, cultural identity, and community resilience but are increasingly threatened by land dispossession, environmental degradation, and policy neglect.

2.2. Policy Recommendations

1. **Legal Recognition:** Acknowledge women's roles as traditional health practitioners and protect their rights under national law.
2. **Community-Based Conservation:** Support women's herbal gardens and seed banks through agroecological funding.
3. **Intellectual Property Protections:** Enact fair benefit-sharing mechanisms for traditional remedies.
4. **Gender-Inclusive Health Systems:** Integrate traditional healing into formal health care with training and certification for women healers.
5. **Research & Documentation:** Fund participatory ethnobotanical research led by women to preserve and validate their knowledge.

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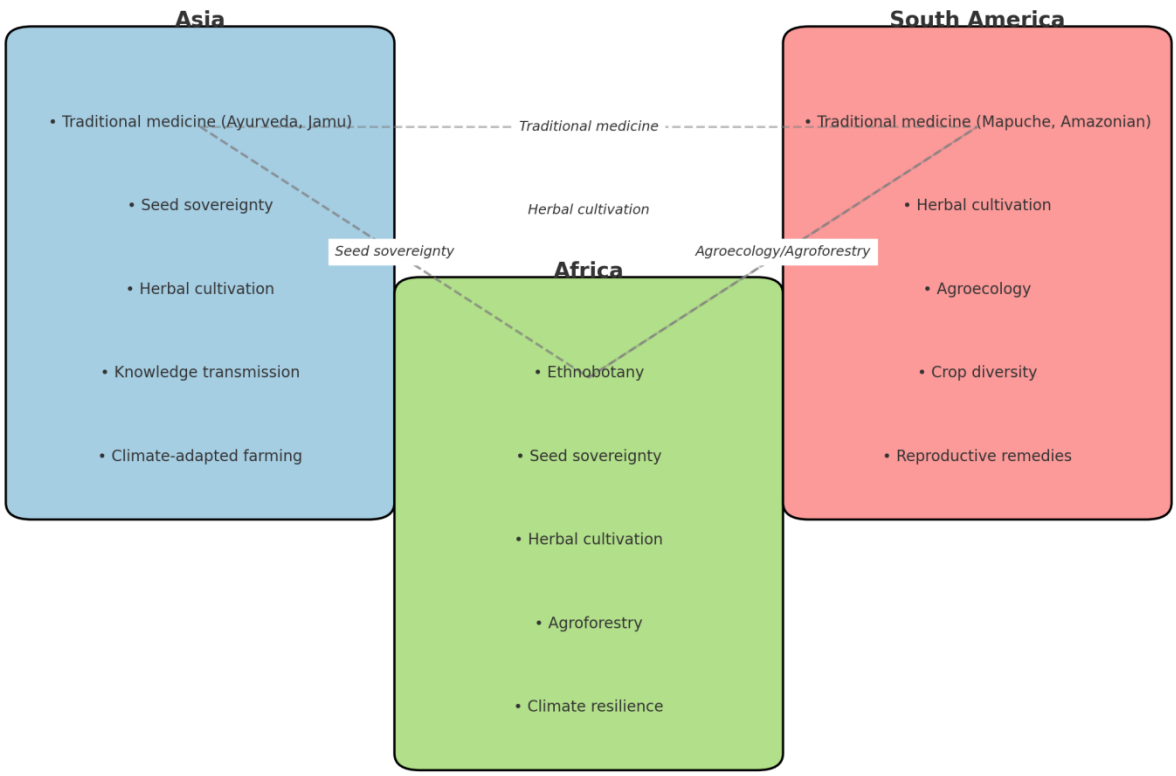

Figure 3. Regional themes and shared practices in women-led indigenous knowledge systems across Asia, Africa, and South America.

3. Conclusions

Indigenous farming holds substantial promise for improving women's health outcomes in LMICs by enhancing food and nutrition security, psychosocial well-being, climate resilience, and access to medicinal resources. However, for these benefits to be realised and scaled, structural barriers, including gender inequity, land insecurity, policy marginalisation, and epistemic injustice, must be confronted. Integrating indigenous farming into the broader health and development agenda demands a rights-based, gender-sensitive approach that elevates women as custodians of knowledge and agents of change. However, realising this potential requires dismantling systemic barriers: Efforts should focus on securing land rights and ensuring inclusive agricultural extension services for women, alongside integrating indigenous knowledge into public health and climate policies. Additionally, investing in women-led cooperatives and local agroecological markets, as well as protecting biodiversity and intellectual property to preserve medicinal knowledge, is essential for sustainable and equitable development. Adopting these strategies not only promotes greater health equity for women but also reinforces community resilience and long-term sustainability. Ensuring secure land rights and equitable access to agricultural extension services for women. Future research should explore longitudinal outcomes of women-led agroecological and medicinal systems, especially their roles in building climate and health resilience over time. Moreover, comparative policy analyses could identify best practices for integrating traditional knowledge into national health, food, and environmental strategies. A global mapping of women-led indigenous knowledge networks, combined with digital ethnobotanical archiving, would further support preservation, advocacy, and empowerment efforts.

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