



## Women's Contribution to Indian Agriculture through Indigenous Knowledge Systems: Practices, and Impact on Sustainable Rural Development

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### Abstract

Women have been the epicentre of Indian agriculture, not only in food production but also in biodiversity and local ecosystem conservation. This paper explores the critical role women play in agriculture through indigenous knowledge systems-on their practice, challenge, and how they influence sustainable rural development. Women have traditionally been the backbone of agriculture, utilizing traditional knowledge to enhance productivity, preserve natural resources, and maintain ecological balance. Their contributions from seed preservation, organic farming, water management, and intergenerational wisdom, all of which are very significant to sustainability. Still, women have many problems, including access to resources, education, and decision-making, though they play a very significant role. In this paper, recognition and mainstreaming of women's indigenous knowledge towards sustainable agricultural development is highlighted. It also calls for policy interventions that will empower women, provide them with better access to resources, and strengthen their participation in agricultural decision making. Through the utilization of skills and practices of women, India can develop more resilient, eco-friendly, and sustainable agricultural systems. The paper concludes by recommending that the policymakers support the contributions of women in the sense that their knowledge and practices will be preserved and used for the benefit of the rural communities and the environment.

**Keywords:** *women, Indian agriculture, indigenous knowledge, rural development, sustainability.*

### Introduction:

Women form an important section for India's agricultural economy. Contributions by women make a big chunk in this entire agrarian scenario. It commences with seeding to harvesting followed by post harvesting. Women still do not get appreciated. Generational transfer of indigenous knowledge systems between women are more significant in preserving agriculture sustainably. This concerns seed preservation,



management of soil fertility, water and all the conventional practices. Based on these issues, the author examines women contributions, indigenous knowledge systems, their impact on rural developments.

## Objectives

1. To critically assess the multi-dimensional contribution of women to Indian agriculture and their various roles in the value chain of agricultural production—from cultivating crops, maintaining livestock to post-harvest processing, as well as preserving seeds—and establishing their economic as well as environmental importance.
2. To examine the contribution of indigenous knowledge systems (IKS) held and passed on by women, including how indigenous practices like organic farming, natural pest control, water conservation, and crop diversification help achieve sustainable agricultural productivity and rural ecosystem resilience.
3. To evaluate the contribution of women's farming practices and traditional knowledge towards sustainable rural development, including their effects on food security, environmental protection, community empowerment, and attainment of Sustainable Development Goals (SDGs).
4. To determine the issues and constraints for women in agriculture, including their limited access to land, credit, technology, and decision-making, and assess the impact of institutional interventions and policy actions designed to empower women farmers.
5. To develop practical recommendations on mainstreaming women's indigenous knowledge and increasing their involvement in agricultural decision-making in order to achieve more resilient, inclusive, and sustainable rural communities.
6. To examine loopholes in women in agriculture policies and provide recommendations that should be implemented.

## Methodology

### 1. Literature Review Approach

The research employs an integrated literature review approach, systematically gathering and analysing prior research, reports, and case studies on women's contributions in Indian agriculture and indigenous knowledge systems.

### 2. Thematic Analysis

Syntheses of key themes are drawn from the literature, including:

- Women's contributions in agricultural production and post-harvesting work
- Indigenous knowledge practices for soil, water, and pest management
- Socio-economic and environmental effects of women's farm work



- Policy and institutional arrangements favouring women in agriculture

### 3. Case Study Analysis

The analysis includes case studies across different parts of India, for example, organic farming by women in Andhra Pradesh, to demonstrate the applied use and effects of indigenous knowledge and women's leadership in agriculture.

### 4. Comparative Analysis

The report compares indigenous and contemporary farming methods, assessing the efficacy and sustainability of traditional techniques in comparison with modern methods, focusing on climate resilience and rural incomes.

### 5. Policy and Program Evaluation

The review determines the effectiveness of government and non-government programs (such as Mahila Kisan Sashaktikaran Pariyojana) in empowering women, facilitating access to resources, and enhancing capacity development in agriculture.

### 6. Synthesis and Recommendations

Literature and case study findings are synthesized to make conclusions and recommend policy, practice, and research, highlighting the importance of recognizing, conserving, and upscaling women's indigenous knowledge for sustainable rural development.

This systematic approach guarantees a comprehensive understanding of the topic, offering evidence-based information and practical recommendations for agriculture and rural development stakeholders.

## Women's Contribution to Indian Agriculture

Women in India play a pivotal role in nearly all stages of agricultural production, contributing significantly to the country's agrarian economy. Their involvement begins with crop cultivation, where they participate in activities such as planting, weeding, and harvesting (Vikaspedia, n.d.). These tasks demand considerable physical effort and skill, highlighting their essential contribution to food production. In addition to cultivating crops, women are deeply engaged in livestock management. They rear animals, manage fodder supplies, and oversee milk production, ensuring the smooth functioning of rural households and local economies dependent on dairy farming (Food and Agriculture Organization [FAO], 2011; National Sample Survey Office [NSSO], 2019; Agarwal, 1994).

Post-harvest processing is another critical area where women's efforts are invaluable. They are responsible for grain drying, milling, and storage, which are essential for maintaining the quality and longevity of agricultural produce. Furthermore, women play a key role in seed preservation, using traditional techniques to safeguard seeds for future planting. This practice not only supports the sustainability of crop cycles but also contributes to biodiversity and food security (World Bank, 2020).



Despite their significant contributions, women in agriculture face numerous challenges. Limited land ownership restricts their decision-making power and financial independence. Wage disparities and unequal access to resources further exacerbate their struggles. However, women's use of indigenous methods, such as applying cow dung as organic manure or using turmeric as a natural pesticide, reflects their knowledge of sustainable farming. Moreover, their ability to adapt these techniques in response to changing climatic conditions demonstrates their resilience and innovation in the face of adversity.

Women's contributions to agriculture, though often underrecognized, are foundational to the sector's productivity and sustainability (Kumar & Singh, 2020). Addressing the barriers, they face and empowering them with equitable access to resources and opportunities will strengthen rural livelihoods and foster more inclusive agricultural growth.

### Indigenous Knowledge Systems (IKS)

Indigenous Knowledge Systems, or IKS, refers to the local and traditional knowledge which has been cultivated and refined for generations of human beings. In agriculture, the custodians of IKS are predominantly women, whose preservation and implementation of sustainable agriculture leads to significant positive impacts on farm productivity and rural ecosystem resilience (Sharma, Verma & Gupta, 2021). Their activities encompass the entire gamut of work done in improving agricultural productivity as well as the sustenance of ecological balance in a rural economy.

One significant area where women apply IKS is in soil and water conservation. Techniques such as contour farming and bund-making are commonly practiced preventing soil erosion and enhance land productivity. Additionally, traditional irrigation systems, designed to optimize the use of available water resources, reflect a deep understanding of local hydrological patterns. Women's expertise in managing these systems ensures efficient water use, which is particularly crucial in regions facing water scarcity and erratic rainfall (Altieri, 2004; Deccan Development Society [DDS], 2018).

Pest management is another domain where women's indigenous knowledge shines. They prepare and apply natural pesticides using bioresources like neem leaves, turmeric, and cow urine. These organic solutions are not only environment friendly but also reduce dependence on chemical inputs, promoting healthier soil and crops. By relying on locally available materials, women farmers contribute to sustainable pest control practices that align with the principles of agroecology.

Crop diversification is a vital strategy that women implement to mitigate risks and improve yields. Practices like intercropping and mixed cropping enable farmers to grow multiple crops on the same piece of land, enhancing soil fertility, optimizing resource use, and reducing the vulnerability of crops to pests and diseases. This diversity also contributes to dietary variety and nutritional security within rural households, underscoring the holistic benefits of traditional farming systems.

Women are also the stewards of seed selection and storage, employing indigenous methods to ensure seed quality and longevity. Techniques such as storing seeds in ash, neem leaves, or earthen pots protect them from pests and fungal infections, safeguarding the next planting cycle. In states like Andhra Pradesh, where organic farming initiatives have gained momentum, women-led movements have demonstrated the transformative potential of grassroots agricultural innovations. These efforts have enhanced rural livelihoods and created models of sustainable farming that inspire broader agricultural reforms.



These traditional practices have relevance beyond local economies, as they are directly linked to global Sustainable Development Goals (SDGs). The continued use and promotion of IKS support goals related to zero hunger, sustainable agriculture, responsible consumption, and climate action. It is important to recognize the role of women in preserving and advancing indigenous agricultural knowledge to frame inclusive, sustainable agricultural policies that respect cultural heritage while addressing modern environmental challenges (United Nations Development Programme [UNDP], 2019).

### Sustainable Rural Development

Contributions of women, which are deeply intertwined with IKS, are integral in fostering sustainability in rural areas. Their roles in agricultural production, resource management, and sustainable practices drive significant positive impacts in the economic, environmental, and social spheres (Patel & Joshi, 2021). Recognizing and supporting their efforts is crucial for holistic rural development and sustainable growth (National Gender Resource Centre in Agriculture [NGRCA], 2020).

This means one of the significant contributions that women make to rural economic growth is through IKS. The role of women's labour in agriculture – from planting and harvesting, livestock management, to post-harvest processing, remains at the centre of the food systems. It provides for household and community food security while adding to productivity and decreasing costs through their traditional practices. For instance, experience in seed banking and pest management reduces dependence upon costly commercial inputs, thereby contributing to higher net returns. In local economies, with women-led initiatives in organic farming, such as in Andhra Pradesh, that focus on long-term sustainable methods reinvigorate such economies. Indeed, women, through stable organically produced supplies and market diversity that increases rural earnings and employment potential, strengthen such rural economies.

In addition to economic benefits, women's adoption and preservation of eco-friendly agricultural practices contribute significantly to environmental conservation (Rani & Verma, 2022). Techniques like natural pest management, organic composting, and water conservation help maintain soil health, reduce pollution, and protect biodiversity. By mitigating the adverse effects of chemical fertilizers and pesticides, these methods promote long-term agricultural sustainability. Adaptive strategies that help reduce climate vulnerability include women's innovative responses to climate challenges such as adjusting crop cycles or enhancing drought resilience through mixed cropping. By such efforts, women are at the forefront of efforts to combat the environmental threats facing rural areas and contribute to more general climate action goals (NITI Aayog, 2022).

Social empowerment is another impact that women's involvement in IKS-driven agricultural practices has on their lives (Desai & Gupta, 2022). Their leadership in farming initiatives fosters stronger community ties and cultivates knowledge-sharing networks among women. Participation in self-help groups, cooperative societies, and local governance bodies amplifies their voices in decision-making processes (Press Information Bureau, 2023). By acting as custodians of traditional knowledge and sustainable farming, women inspire younger generations and other women in the community, creating a ripple effect of empowerment. This



active engagement strengthens gender equity in the rural areas, community cohesion, and resilience in social and economic challenges.

### Gender Equality for Sustainable Development

Institutions, such as government bodies, NGOs, and local organizations, play an important role in promoting fairness between men and women in agriculture. Women make significant contributions to farming in India, especially through traditional practices passed down for generations (United Nations India, 2023). However, their work often goes unrecognized. Ensuring that women have equal access to resources and opportunities is crucial for sustainable development in rural areas (UN Women, 2013).

Women in rural India are involved in several key agricultural activities, including selecting seeds, managing pests naturally, maintaining soil fertility, and storing food after harvest. Despite their efforts, they face barriers such as limited access to land, credit, and farming tools. Institutions must work to acknowledge their contributions and ensure they have equal opportunities to participate in farming activities (SMS Foundation, 2023). Government programs like the Mahila Kisan Sashaktikaran Pariyojana (MKSP) aim to empower women farmers by providing training and resources, but more focused efforts are needed to implement such programs effectively, especially in remote areas (Sharma & Bansal, 2021).

One of the ways institutions can help is by organizing training programs to build women's skills in sustainable agriculture. These sessions can teach them about organic farming, composting, water-saving techniques, and crop diversification. Along with this, institutions must ensure that women have fair access to land, loans, and farming inputs. Joint land ownership between men and women, as well as loans designed specifically for women farmers, can go a long way in addressing these challenges (UN Women, 2013).

Another important role of institutions is to preserve and promote the traditional knowledge women possess. This knowledge, which includes natural pest control and crop rotation methods, has been proven to benefit the environment and boost sustainability. Collaborations with universities and research organizations can integrate this knowledge into modern agricultural practices (Ugboma, 2014). Institutions can also create platforms for women to share their ideas, influence policies, and connect with other farmers. Women-led cooperatives and self-help groups are examples of how women can thrive when given the right support (SMS Foundation, 2023).

It is also important for institutions to monitor and evaluate the impact of women's contributions to sustainable rural development. By measuring outcomes like improved food production, environmental benefits, and income stability, institutions can better understand how women's roles in agriculture strengthen rural communities.

### Women's Contribution to Indian Agriculture Using Traditional Knowledge

Women's traditional knowledge in agriculture is a cornerstone of rural development. For instance, women often select seeds based on their understanding of soil conditions and climate, ensuring better crop growth (Jayasheela, 2015). They use natural methods to improve soil health, such as compost and animal manure, and employ safe techniques like neem leaves and ash for pest control. Women are also skilled in conserving



water through practices like mulching and traditional irrigation methods. Additionally, they grow a variety of crops together, which helps maintain soil health and reduces risks.

These practices have a significant impact on rural development. Organic farming and crop diversity help protect the environment by reducing pollution and conserving biodiversity. Women also contribute to income generation by engaging in farming, processing crops, and selling their produce. Their work strengthens community resilience by improving food security and preparing for natural disasters. Furthermore, when women are empowered to lead farming initiatives or join groups, it boosts their confidence and encourages social growth (UN Women, 2013).

However, women face several challenges in agriculture. Many do not have access to land or decision-making power, which limits their ability to grow. They also struggle to obtain loans, modern farming equipment, and training. Social norms often restrict their involvement in leadership roles, and their voices are underrepresented in policymaking (SMS Foundation, 2023).

Institutions can address these issues by ensuring women have equal rights to land and resources. Tailored training programs and gender-sensitive credit schemes can help bridge the gaps. Supporting women-led groups and protecting traditional knowledge will also contribute to their empowerment. Raising awareness about the importance of gender equality in agriculture is vital to creating long-lasting change (Ugboma, 2014).

### Issues Facing Women in Agriculture

Despite their strong contributions to agriculture and rural development, women have many challenges limiting their potential and impact (Mehta, 2020). They are deeply entrenched in social norms, systemic inequalities, and gaps in policy frameworks, which do not adequately address specific gender needs. It is crucial to identify and break these barriers for the full realization of the benefits that women's work in agriculture and IKS holds.

Perhaps one of the most constant challenges is women's lack of recognition for labour and expertise in agriculture. Indeed, traditional gender roles and social norms in many rural societies override contributions from women in such areas to be relegated in the informal sectors of the economy and unaccounted for. Although women do most of the labour-intensive work, including planting, weeding, harvesting, and post-harvest processing, their work is often considered an extension of household chores rather than a formal economic activity. This lack of recognition excludes women from decision-making at the household, community, and policy-making levels, which undermines their authority and ability to advocate for their needs and rights.

Access to resources is another important challenge that discriminates against women in agriculture. Most women are deprived of access to modern agricultural technology, which can significantly increase productivity and reduce the labour burden. Moreover, there are considerable hindrances to the access of credit and financing by women due to the absence of land ownership, which most often is needed as collateral. The lack of enough capital makes women unable to spend on better seeds, tools, or irrigation systems. Similarly, training facilities and farm extension services remain inaccessible to women, missing technical imperatives meant for farm practices improvement or the adoption of innovative improvements. These inequalities are affecting resource provision access in perpetuating cycles of poverty in rural settings.



Policy gaps continue to worsen the plight of women in agriculture production. Most policies drawn to guide agricultural sectors are gender-discriminative in nature. This implies that they overlook all unique challenges women face during these periods. Policies for instance on land reforms and subsidy distribution fail to apply thought to consider the structural barrier that prevents women from owning some portions of land or accessing governments in distributive benefits (Down To Earth, 2023). There are insufficient investments in programs specially tailored for the promotion of women farmers, for instance targeted training, gender-responsive credit schemes, and women-led cooperatives, for the most part. This denies inclusiveness in the policy design and implementation aspects of the development efforts, which can go on to demote gender in rural economies.

Addressing these challenges requires a multifaceted approach that includes recognizing women's contributions to agriculture, improving their access to resources, and implementing gender-sensitive policies (Nair & Rao, 2023). Ensuring that women have equitable rights to land, credit, technology, and education will enhance their productivity and economic independence. Moreover, integrating gender perspectives into agricultural policy frameworks will create a more inclusive, resilient, and sustainable agricultural sector. Empowering women is not only a matter of social justice but also a crucial step toward achieving broader developmental goals and food security (Ministry of Women and Child Development [MWCD], 2016).

## Loopholes in Policies Concerning Women in Agriculture and Proposed Improvements

### 1. Mahila Kisan Sashaktikaran Pariyojana (MKSP)

Goal: Strengthen women farmers by enhancing their access to inputs, skills, and sustainable farming practices.

Alignment: Aligns directly with women-led activities in organic farming and indigenous methods, although gaps in implementation occur in far-flung regions.

Loopholes:

- Limited coverage in tribal and far-off areas.
- Training modules tend to be generic, failing to include local or indigenous knowledge.

Evidence:

Shroffs Foundation Trust's assessment report indicates the necessity for locally adapted social innovation strategies (Banerjee, Kumar, Shakil, Dukpa, Rai, & Mrinal, 2017)

Improvement Suggestions:

- Create localized mobile outreach units with area-specific training in IKS.
- Develop region-specific modules dealing with local climate problems and indigenous practices.

### 2. National Policy for Farmers (2007)



Purpose: Enhance the economic feasibility of farming using gender-inclusive methods.

Alignment: Identifies women's contributions to agriculture and recommends support measures, although not fully implemented on the ground.

Loopholes:

- Weak enforcement mechanisms in an outdated framework.
- Wide provisions without specific measures for women's empowerment.

Evidence:

Policy focuses on gender mainstreaming but is not supported by action programs. (Department of Agriculture & Cooperation, 2007)

Improvement Suggestions:

- Insert mandatory gender-responsive budgeting into the policy.
- Form a Women Farmers' Task Force to provide constant input and integration of traditional practices.

### 3. Integrated Watershed Management Programme (IWMP)

Objective: Encourage soil and water conservation with community involvement.

Alignment: Provides scope for integrating women's traditional water management methods into national planning.

Loopholes:

- The participation of women is usually confined to nominal posts.
- Engineering-based approach with lesser focus on traditional practices.

Evidence:

Top-down approach has resulted in under-employment of traditional knowledge and very little empowerment of women. (Sreedevi, Wani, & Nageswara Rao, 2007).

Suggestions for Improvement:

- Engage women in the community water planning boards.
- Address traditional water harvesting practices in norms of planning.

### 4. Rashtriya Krishi Vikas Yojana (RKVY)

Goal: Ensure complete development of agriculture and allied industries.

Alignment: Can be used to promote women's organic and sustainable farming practices.



Loopholes:

- Does not have a gender-sensitive fund allocation framework.
- Project proposals tend to circumvent women's needs or involvement.

Evidence:

Scheme encourages states but does not have special provisions for women. (Department of Agriculture & Farmers Welfare, n.d.)

Suggestions for Improvement:

- Allocate a minimum quota of funds for women-led projects.
- Mandate gender impact assessment prior to state-level project approval.

## 5. Digital India & PMGDISHA

Objective: Foster digital literacy in rural India.

Alignment: Contributes to goals of training women in agri-tech tools for e-marketing and information access.

Loopholes:

- Low coverage of rural women owing to mobility, awareness, and digital divide.
- Absence of agriculture-related content and e-services.

Evidence:

Digital tools fail to be effectively customized for women farmers. (Press Information Bureau, 2021)

Improvement Suggestions:

- Create women-centric digital agriculture courses with regional language content.
- Train local women as digital mentees for SHGs and farming groups.

## 6. Deendayal Antyodaya Yojana - NRLM

Target: Poverty reduction through skill development and livelihood promotion.

Alignment: Women-led SHGs are of priority for co-op building and disseminating IKS.

Loopholes:

- Greater concentration on earning generation activities and lesser on agriculture that is sustainable.
- In indigenous knowledge, the core agenda has no incorporation.



Evidence:

Great mobilization of rural homes but greater agro focus should be included. (Ministry of Rural Development, 2025)

Improvement Suggestions:

- Map out IKS training modules with livelihood groups among rural women.
- Arrangement of partnering academic institutions towards ecological farming inputs.

## Conclusion

Women's indigenous knowledge and traditional practices are vital for advancing sustainable agriculture and rural development. Their expertise in soil conservation, water management, seed preservation, and organic farming methods not only enhances agricultural productivity but also promotes environmental stewardship. However, the potential of women in agriculture remains underutilized due to systemic barriers and policy gaps. Addressing these issues requires comprehensive, gender-sensitive policy measures that prioritize equity, resource access, and the integration of indigenous knowledge into contemporary agricultural strategies.

A critical policy priority is the promotion of gender equity in land ownership and wages. Land is a fundamental asset in agriculture, yet women often face discriminatory inheritance laws and cultural norms that limit their ability to own or control land. Policies that ensure women's legal rights to land, along with enforcement mechanisms to uphold these rights, are essential for empowering women economically and enhancing their decision-making power. In addition, wage disparities in agricultural labour must be addressed through regulations that guarantee equal pay for equal work, recognizing women's contributions as economically valuable rather than supplementary to male labour.

Providing women with equitable access to resources such as modern agricultural technology, financial services, and specialized training is another crucial policy objective. Many women farmers lack the tools, credit, and knowledge necessary to adopt advanced farming techniques that could boost productivity and reduce labour intensity. Gender-responsive agricultural extension programs can bridge this gap by tailoring training sessions to women's schedules, literacy levels, and specific needs. Access to affordable credit and microfinance schemes without stringent collateral requirements, combined with initiatives to improve women's digital and technological literacy, would further enhance their capacity to innovate and thrive in agriculture.

Equally important is the documentation and integration of indigenous knowledge into modern agricultural practices. Women's traditional methods of natural pest management, seed preservation, and climate adaptation have been refined over generations and provide sustainable, eco-friendly alternatives to industrial farming techniques. Policymakers must invest in research and knowledge-sharing platforms to capture these practices, ensuring that they are preserved, validated, and disseminated widely. Collaborative approaches that blend indigenous wisdom with scientific advancements can create resilient agricultural systems that are both productive and sustainable. Recognizing women as knowledge holders and involving



them in research, policy design, and implementation will further strengthen agricultural innovation and rural development.

In conclusion, empowering women through policies that promote land and wage equity, resource access, and the integration of indigenous knowledge is key to building sustainable and inclusive agricultural systems. Gender-sensitive reforms not only benefit women but also enhance food security, environmental health, and economic resilience. Policymakers must prioritize these measures to harness the full potential of women as leaders and innovators in agriculture.

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