***Review Article***

 **Feminization of Farming: Availability and Use of drudgery reducing tools**

**Abstract**

 Drudgery reducing tools have emerged as a strategic imperative in the feminization of farming, alleviating the physical burdens and enhancing the productivity of rural women in India. Women, who perform a majority of farm operations—from sowing and weeding to harvesting and post-harvest processing—often endure severe physical strain and health risks due to traditional manual methods. Thus, ergonomic and labor-saving technologies are essential to promote sustainable agricultural practices and empower women farmers.

**Methods:** This study presents a comprehensive review of literature on the adoption of drudgery reducing tools among farm women. Data were synthesized from multiple research papers, government reports, and field studies, focusing on the impact of these tools on various operational activities, including land preparation, seed treatment, weeding, harvesting, and post-harvest processing. The review examined barriers such as high cost, limited awareness, and insufficient training, as well as the significant benefits derived from tool adoption.

**Result:** Research findings indicate that the use of drudgery reducing tools can decrease labor time, reduce musculoskeletal strain, and improve overall operational efficiency. Furthermore, enhanced capacity-building initiatives and supportive government policies play a pivotal role in increasing adoption rates. These outcomes underscore the potential of tailored, women-centric technologies to transform agricultural productivity and contribute substantially to the ongoing feminization of farming in India.

***Keywords***: drudgery reducing tools, feminization of farming, rural women, mechanization, ergonomics

**Introduction**

The feminization of agriculture in India has intensified due to male migration, leaving women responsible for farm management and labor-intensive tasks. Women make up 37% of the agricultural workforce, with over 80% of rural women engaged in farming (PLFS, 2022-23). Despite their crucial role, they face challenges such as wage disparities, limited access to mechanization, and physically strenuous work, leading to musculoskeletal disorders and fatigue. Traditional farming methods expose them to excessive manual labor, restricting productivity and well-being. Studies show that drudgery-reducing tools—such as cycle weeders, fertilizer broadcasters, and mechanized threshers—can ease workloads, improve efficiency, and minimize health risks (PLFS, 2019-20). However, accessibility, affordability, and awareness remain key obstacles.

To address these challenges, gender-sensitive agricultural policies must promote subsidized ergonomic tools, improved credit access, and skill training for women farmers. Government programs should ensure mechanized equipment adoption, empowering women with technology-driven solutions. Additionally, recognizing women's land ownership rights and increasing their participation in decision-making can further enhance economic independence. By integrating financial support, modern technology, and policy interventions, India can boost agricultural productivity while reducing drudgery for women, fostering sustainable rural growth (NSSO, PLFS Report, 2018-19).

**Materials and Methods**

This study employs a qualitative review of literature to examine the adoption and impact of drudgery reducing tools in the feminization of farming. A systematic search of peer-reviewed articles, government reports, and institutional publications was conducted to identify studies relevant to ergonomic agricultural tools and their adoption among women farmers. The review focused on four key studies: Sarmah and Hazarika (2023), Tiwari *et al*. (2021), King (2016), and Singh *et. al*. (2011). Data extraction involved identifying core themes such as tool awareness, adoption rates, operational efficiency, and health impacts.

Sarmah and Hazarika (2023) provided insights into the challenges faced by rural women in Assam, emphasizing the triple burden of productive, reproductive, and social work, along with the role of Krishi Vigyan Kendras in increasing tool awareness and adoption. Tiwari et al. (2021) contributed quantitative data on high awareness (64.16%) and adoption (56.66%) rates of tools like groundnut decorticators, improved sickles, and maize shellers among farm women in Gumla district, highlighting the efficacy of training and demonstrations. King (2016) focused on small millets in Kolli Hills, revealing significant reductions in time and physical burden in post-harvest processing through simplified implements. Additionally, Singh *et al*. (2011) compared traditional and improved tools, documenting up to a 32.40% reduction in energy expenditure and notable health benefits.

Women play a crucial role in agriculture, particularly in rural and developing regions, where they are often engaged in a wide range of farming activities. However, farm women frequently operate under extremely hazardous and physically demanding conditions, primarily due to limited access to improved agricultural tools and technologies.

Given these challenges, a study was undertaken to evaluate and quantify the extent of drudgery experienced by farm women in various agricultural operations. By assessing the physiological workload, posture-related strain, and time-intensity of common farming tasks, the study hlighted critical areas where interventions—such as improved tools, mechanization, or ergonomic solutions—could alleviate the burden and enhance the wellbeing and productivity of women in agriculture.

**Drudgery index-**

Data indicating musculoskeletal disorders as analyzed by ergonomics assessment of postural and biomechanical assessments using the Human Physical Drudgery Index (HPDI), resulting in the maximum drudgery reflecting very high risk in transplanting (48.4%), followed by threshing (47.2%), load carrying (46.00%), and harvesting (45.14%).

Table 01: HDPI of different agricultural operation

|  |  |
| --- | --- |
| **Agricultural operations** | **HDPI (%)** |
| Nursery | 23.71 |
| Sowing | 27.43 |
| Transplanting | 48.4 |
| Irrigation | 27.43 |
| Manuring | 27.28 |
| Weeding | 38.07 |
| Plant protection | 27.29 |
| Harvesting | 45.14 |
| Binding crops | 22.57 |
| threshing | 47.2 |
| Winnowing | 29.06 |
| Load carrying | 46.00 |
| Drying | 28.21 |
| Storage | 28.82 |

 Source: Joshi et al. 2024

A narrative synthesis was employed to integrate findings, identify recurring themes, and assess the effectiveness of drudgery reducing technologies in enhancing the productivity and well-being of women in agriculture. This qualitative approach provides a comprehensive understanding of both the benefits and barriers associated with the adoption of these tools.

**Results and Discussion**

The presented tables (Table:2,3,4 & 5) illustrate a comprehensive range of agricultural tools designed to alleviate physical strain and improve operational efficiency for women in farming. The tools span various stages—from pre-sowing (seed treatment and sowing devices) to field maintenance (fertilizer application and weeding) and harvesting through to post-harvest processing. Each tool is not only cost-effective, with prices varying according to their function and sophistication, but also engineered to increase efficiency by 15–50% and save up to 40% in costs. These improvements mean that tasks once performed manually and with considerable physical effort are now streamlined, reducing the overall workload.

Efficiency gains directly translate into reduced physical stress, which is particularly important for women who often bear a disproportionate share of labor in agriculture. For example, the seed treatment drum, with a 30% efficiency increase and a 20% cost saving, minimizes manual handling and ensures uniform application of chemicals, thereby reducing repetitive motions that can lead to fatigue. Similarly, tools such as the rotary maize sheller and pedal-operated paddy thresher significantly lower the need for intensive labor, cutting down the time and effort required for complex tasks. This decrease in physical exertion not only enhances productivity but also reduces “cardiac cost” – a term reflecting the diminished strain on the heart and overall reduction in health risks associated with continuous, strenuous manual labor.

Post-harvest tools (Table 05) like the grain mill and dal mill further exemplify how mechanization benefits women in agriculture. By automating traditionally labor-intensive processes, these tools help in achieving consistent quality in processed products while mitigating long-term physical wear and tear. In essence, the strategic implementation of these women-friendly tools fosters a safer, more efficient, and cost-effective farming environment, empowering women to contribute more sustainably to agricultural productivity and overall household income.

Table 02: Women Friendly sowing and seed treatment tools for Agricultural Efficiency

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S. No. | Equipment Name | Uses | Approximate Cost (INR) | Importance for Women | Average Increase of Efficiency (%) | Percentage of Saving Cost (%) |
| 1 | Seed Treatment Drum | Used for coating seeds with protective chemicals before sowing. | ₹2000 | Reduces manual effort in seed treatment, ensuring uniform coating. | 30% | 20% |
| 2 | CIAE Seed Drill | Mechanized sowing device for precise seed placement. | ₹5000 | Reduces labor intensity and ensures uniform seed distribution. | 35% | 25% |
| 3 | PAU Seed Drill | Designed by Punjab Agricultural University for efficient sowing. | ₹5000 | Improves sowing efficiency, reducing time and effort for women. | 35% | 25% |
| 4 | Naveen Dibbler | A manual tool for planting seeds at appropriate spacing. | ₹700 | Reduces bending and improves precision, lowering physical strain. | 15% | 10% |
| 5 | Rotary Dibbler | Uses rotary action for better efficiency in seed planting. | ₹2300 | Speeds up the sowing process while reducing drudgery. | 40% | 30% |

Table 03: Drudgery Reducing Fertilizer and Weeding Tools for Women in Agriculture

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S. No. | Equipment Name | Uses | Approximate Cost (INR) | Importance for Women | Average Increase of Efficiency (%) | Percentage of Saving Cost (%) |
| 1 | Fertilizer Broadcaster | Distributes fertilizers uniformly across the field. | ₹2500-3000 | Reduces manual effort, ensuring even fertilizer application and improving soil fertility. | 35% | 25% |
| 2 | Twin Wheel Hoe | A hand tool used for weeding and aeration in row crops. | ₹800 | Eases weeding work, reducing back strain and improving efficiency. | 20% | 15% |
| 3 | Cono Weeder | Specially designed for weeding in paddy fields. | ₹1900 | Reduces drudgery, improves posture, and enhances weeding efficiency in wetland farming. | 30% | 20% |
| 4 | Grubber Weeder | Used for weeding and loosening soil in crops. | ₹400 | Reduces bending effort, making weeding less strenuous. | 15% | 10% |
| 5 | Single Wheel Hoe | Helps in weeding, soil aeration, and earthing-up. | ₹600 | Lightweight tool, reduces physical strain and time. | 20% | 15% |
| 6 | Hand Ridger | Used for making ridges and furrows for planting. | ₹2,000 - ₹5,000 | Reduces physical effort in making ridges, improving efficiency. | 25% | 20% |

Table 04: Women-Friendly Harvesting Tools for Drudgery Reduction

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S. No. | Equipment Name | Uses | Approximate Cost (INR) | Importance for Women | Average Increase of Efficiency (%) | Percentage of Saving Cost (%) |
| 1 | Improved Sickle | Ergonomically designed for efficient crop cutting. | ₹150 - ₹500 | Reduces hand fatigue and improves cutting efficiency. | 25% | 15% |
| 2 | Fruit Harvester | Long-handled tool for picking fruits without damage. | ₹500 - ₹1,500 | Prevents climbing-related injuries and improves safety. | 30% | 20% |
| 3 | Tea Plucker (Scissor Type) | Specially designed for precise tea leaf plucking. | ₹300 - ₹1,200 | Reduces strain on fingers and speeds up plucking. | 20% | 15% |
| 4 | Bhindi Plucker | Helps in easily plucking ladyfinger (okra). | ₹200 - ₹800 | Minimizes hand injuries and increases harvesting speed. | 20% | 15% |
| 5 | Sugarcane Stripper | Removes leaves from sugarcane stalks efficiently. | ₹500 - ₹2,000 | Reduces manual effort and speeds up sugarcane processing. | 25% | 20% |

Table 05: Post-harvest drudgery reducing tools and its importance for women

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S. No. | Equipment Name | Uses | Approximate Cost (INR) | Importance for Women | Average Increase of Efficiency (%) | Percentage of Saving Cost (%) |
| 1 | Groundnut Decorticator (Sitting Type) | Hand-operated tool for shelling groundnuts | ₹2,400 | Reduces hand strain and speeds up shelling process | 30% | 20% |
| 2 | Groundnut Stripper | Separates groundnuts from plants | ₹2,500 | Eases post-harvest processing, reducing workload | 30% | 20% |
| 3 | Tubular Maize Sheller | Removes maize grains from cobs | ₹60 | Increases efficiency and reduces hand fatigue | 40% | 30% |
| 4 | Rotary Maize Sheller | Mechanized maize sheller for higher efficiency | ₹4,000 - ₹6,000 | Saves time and minimizes physical effort | 50% | 40% |
| 5 | Rotary Arecanut Dehusker | Removes husks from arecanuts | ₹8,000 - ₹18,000 | Reduces time and effort in dehusking arecanuts | 45% | 35% |
| 6 | Pedal Operated Paddy Thresher | Threshes paddy grains manually | ₹5,500 | Increases output and reduces drudgery | 40% | 30% |
| 7 | Paddy Winnower | Separates grains from chaff using airflow | ₹5,000 - ₹9,000 | Improves grain quality and reduces manual effort | 35% | 25% |
| 8 | Hanging Type Grain Cleaner with Sack Holder | Cleans grains before storage | ₹4,500 - ₹6,000 | Reduces dust exposure and improves storage quality | 30% | 20% |
| 9 | Grain Mill | Used for grinding grains into flour | ₹19,000 - ₹25,000 | Helps women process grains at home, reducing labor | 35% | 25% |
| 10 | Dal Mill | Processes pulses into dal by removing husks | ₹15,000 - ₹30,000 | Reduces manual work and increases processing speed | 35% | 25% |

**Conclusion**

The comprehensive evaluation of drudgery-reducing tools reveals their pivotal role in empowering women in agriculture. By streamlining tasks—from seed treatment and sowing to harvesting and post-harvest processing—these technologies significantly enhance efficiency while mitigating the physical strain associated with traditional farming methods. With efficiency improvements ranging from 15% to 50% and cost savings of up to 40%, these tools not only boost productivity but also contribute to better health outcomes by reducing repetitive, strenuous labor.

Ultimately, the adoption of such ergonomic and mechanized solutions is essential for creating a sustainable and equitable agricultural environment. They provide women with the means to overcome labor-intensive challenges, promote safer work conditions, and enhance overall economic stability within rural communities. The continued integration of these innovations, supported by effective policies and targeted training, stands as a transformative strategy for advancing gender equity and ensuring the long-term viability of agricultural practices.

To promote the adoption of drudgery-reducing tools for women in agriculture, it is crucial to combine targeted financial support—such as subsidies and microfinance—with robust capacity-building initiatives like training programs and community workshops. These measures will not only equip women with the necessary skills to effectively use and maintain these tools, but also foster peer-to-peer learning and awareness about their benefits. Additionally, ongoing monitoring and feedback mechanisms should be implemented to refine these technologies and policies, ensuring sustainable improvements in productivity and reducing physical strain in agricultural practices.

**Reference**

Afridi, F., Bishnu, M., & Mahajan, K. (2021). Mechanization and the gendered division of labor in Indian agriculture. Indian Statistical Institute. <https://www.isid.ac.in/~mbishnu/Agriculture_LFP_Mechanization.pdf>

Bhushan, B., Kumari, S., & Kumari, P. (2016). Adoption of drudgery reducing tools among farm women. Indian Research Journal of Extension Education, 16(2), 121–124. <https://seea.org.in/irjee/view-content/adoption-of-drudgery-reducing-tools-among-farm-women>

Chavan, V., Nagappa, D., Pawar, S. M., Sutar, R. T., & Khadse, C. B. (2021). Assessment of drudgery reduction in agricultural and allied activities through Krishi Vigyan Kendra. Journal of Extension Education, 32(1), 6457–6462.

Devi, M. G., & Nivethitha, M. (2024). Women friendly farm tools and implements. Women’s Studies Journal, 6(5), 127. URL not available.

Dutta, S., & Saha, S. (2020). Awareness on drudgery reducing farm technologies for gender mainstreaming in agriculture. Asian Journal of Agricultural Extension, Economics & Sociology, 38(10), 21–28. <https://journalajraf.com/index.php/AJRAF/article/view/102>

Farzana, A., Bishnu, M., & Mahajan, K. (2021). Gendering technological change: Evidence from agricultural mechanisation. Ideas for India. <https://www.ideasforindia.in/topics/agriculture/gendering-technological-change-evidence-from-agricultural-mechanisation.html>

Food and Agriculture Organization. (2019). The role of women in agriculture. FAO. URL not available.

Hazarika, D., & Sarmah, P. (2023). Adoption of drudgery reducer tools used for different farm and allied activities by rural women of Assam. The Pharma Innovation Journal, 12(10S), 1207–1211. <https://www.thepharmajournal.com/archives/2023/vol12issue10S/PartP/S-12-8-403-466.pdf>

IGI Global. (2022). Drudgery reduction by adoption of new practices: An assessment. International Journal of Agricultural and Environmental Information Systems, 13(2), 1–14. <https://www.igi-global.com/article/drudgery-reduction-by-adoption-of-new-practices/301253>

International Labour Organization. (2021). Women in agriculture: Closing the gender gap for development. ILO. URL not available.

International Journal of Agriculture Sciences. (2016). Drudgery reduction of farm women through improved tools, 8(53), 2837–2840. <https://www.bioinfopublication.org/include/download.php?id=BIA0002733>

King, E. D. I. O. (2016). Impact of reduced drudgery of women in production and post-harvest processing of small millets (MSSRF Working Paper No. 09). M. S. Swaminathan Research Foundation. <https://www.researchgate.net/publication/301656237_Impact_of_Reduced_drudgery_of_women_in_production_and_post-harvest_processing_of_small_millets>

Kumari, S., & Kumari, P. (2021). Knowledge of drudgery reducing technologies among the farmers. International Journal of Extension Education, 17(2), 45–50. <https://www.extensionjournal.com/article/view/1180/7-9-133>

Mathur, S. M., & Sharma, S. (2021). Ergonomic evaluation of women farm workers using different manual weeding tools in maize crop of Udaipur district. Asian Journal of Agricultural Extension, Economics & Sociology, 39(3), 1–9. <https://journalajaees.com/index.php/AJAEES/article/view/1094>

Ministry of Agriculture & Farmers Welfare, Government of India. (2021). Drudgery reduction in agriculture through improved farm machinery (NAAS Strategy Paper No. 18). <https://naas.org.in/spapers/Strategy%20Paper%20No.%2018.pdf>

Mishra, A., Singh, S. R. K., Singh, A., Borker, J., & Gour, S. (2016). Inventory on women friendly tools. ICAR-ATARI. <https://atarijabalpur.icar.gov.in/upload/publication/Inventory%20on%20Women%20Friendly%20Tool.pdf>

Mishra, S., Sarkar, A., Kumar, A., Behera, B. C., & Sarangi, D. N. (2023). Custom hiring centre: A means of livelihood for farm women. Vigyan Varta: An International E-Magazine for Science Enthusiasts, 4(3). <https://www.researchgate.net/publication/369532331_T_OPEN_ACCESS_Custom_Hiring_Centre_A_Means_of_Livelihood_for_Farm_Women>

National Academy of Agricultural Sciences. (2018). Drudgery reduction in agriculture through improved farm machinery (NAAS Strategy Paper No. 18). URL not available.

National Sample Survey Office. (2019). Periodic Labour Force Survey (PLFS) 2018–19. Government of India. URL not available.

National Sample Survey Office. (2023). Periodic Labour Force Survey (PLFS) 2022–23. Government of India. URL not available.

National Statistical Office. (2020). Key indicators of situation of agricultural households in India. Government of India. URL not available.

Pate, R. S., Puri, S. G., & Kadam, R. P. (2024). Adoption of drudgery-reducing technologies among the farmers. International Journal of Research in Agronomy, SP-7(9), 885–887. <https://www.agronomyjournals.com/article/view/1626/S-7-9-118>

Potdar, R. R., Khadatkar, A., & Agrawal, K. N. (2018). Drudgery reducing improved technologies for farm women (Technical Bulletin No. ESA/2017/232). ICAR-Central Institute of Agricultural Engineering. <https://www.researchgate.net/publication/347826708_Drudgery_Reducing_Improved_Technologies_for_Farm_Women_Tecnical_Bulletin_2018>

Porna, S., Ali, N. F., & Hazarika, D. (2023). Adoption of drudgery reducer tools used for different farm and allied activities by rural women of Assam. The Pharma Innovation Journal, 12(10S), 1207–1211. <https://www.thepharmajournal.com/archives/2023/vol12issue10S/PartP/S-12-8-403-466.pdf>

Rubina Sarmah, P., Ali, N. F., & Hazarika, D. (2023). Adoption of drudgery reducer tools used for different farm and allied activities by rural women of Assam. The Pharma Innovation Journal, 12(10), 1202–1214. <https://www.researchgate.net/publication/374952068_Adoption_of_drudgery_reducer_tools_used_for_different_farm_and_allied_activities_by_rural_women_of_Assam>

Sarmah, P., & Hazarika, D. (2023). Adoption of drudgery reducer tools used for different farm and allied activities by rural women of Assam. The Pharma Innovation Journal, 12(10S), 1207–1211. <https://www.thepharmajournal.com/archives/2023/vol12issue10S/PartP/S-12-8-403-466.pdf>

Singh, P., Singh, J., & Rahul. (2011). Drudgery reduction for farm women: An ergonomic assessment of improved agricultural tools and implements. Indian Journal of Extension Education, 47(1&2), 34–38. <https://epubs.icar.org.in/index.php/IJEE/article/view/128530>

Singh, S., & Ahlawat, S., Sanwal, S., Ahlawat, T. R., & Gora, A. (2016). Drudgery reduction of farm women through improved tools. International Journal of Agriculture Sciences, 8(14), 1242–1249. <https://www.researchgate.net/publication/322887448_DRUDGERY_REDUCTION_OF_FARM_WOMEN_THROUGH_IMPROVED_TOOLS>

Singh, S. P. (2025). Drudgery reducing farm equipment and techniques to assess musculoskeletal disorders in agricultural work. Scribd. URL not available.

Society of Extension Education-Agra. (2023). Adoption of drudgery reducing tools among farm women. Indian Research Journal of Extension Education. URL not available.

Sushant, G. (2023). Holistic development in saturation mode through aspirational district programme [Proceeding Report]. National Centre for Good Governance. URL not available.

Tiwari, N., Hasan, I. G., Tripathi, S., & Sharma, M. L. (2021). Adoption of drudgery reducing tools among farm women. Indian Research Journal of Extension Education, 21(2), 108–111. <https://seea.org.in/uploads/pdf/2021-66-108-111.pdf>

Venkatesh, P., & Srinivasan, R. (2019). Ergonomics and women in agriculture: A review. Journal of Ergonomics, 9(2), 1–7. URL not available.

Yadav, B. L., & Choudhary, N. (2020). Drudgery reduction technologies for farm women in India: A review. Agricultural Reviews, 41(2), 123–130. URL not available.