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## **Strategies for implementing gender-transformative sustainable agricultural mechanisation within smallholder agriculture production**

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### **Abstract**

Agriculture is a vital industry that provides livelihoods to millions of people worldwide. The farming community relies on natural and man-made resources, such as land and farm machinery, to produce the food that sustains us. However, social and cultural norms surrounding agricultural production can result in an uneven distribution of essential resources necessary for sustainable agricultural mechanisation. Sustainable agricultural mechanisation (SAM) is a farming practice that uses appropriate machinery to remove drudgery, enhance agricultural production efficiency, and be economically and environmentally friendly. Promoting equality among farmers and advocating for SAM is crucial to ensuring fair and sustainable farming practices. Therefore, it is necessary to adopt gender-transformative approaches to promote inclusive and sustainable agricultural mechanisation. This will help remove gender barriers and support women, who play a crucial role in agriculture, in accessing and adopting mechanisation practices. Quantitative and qualitative data were used to understand gender dynamics in machinery acquisition, access, and utilisation by smallholder farmers in Asutsuare, Ghana. The study utilises quantitative data from 320 farmers and qualitative data from six key informant interviews and three focus group discussions to emphasise the need for a gender-transformative approach to sustainable agricultural mechanisation. The data analysis revealed differences in machinery access, intention to use machinery, and projected benefits among gender and age groups. The presentation introduces a framework and strategies for promoting gender-transformative sustainable agricultural mechanisation and highlights their practical implications. These strategies foster gender equality, sustainable agriculture, and socio-economic and eco-friendly practices through mechanisation. The strategy and framework proposed, when implemented, will make significant strides towards a more equitable and sustainable agricultural sector.

**Keywords:** Agricultural production, gender-transformative agriculture, smallholder farmers, sustainable agricultural mechanisation

### **Introduction**

Agriculture has significantly transformed from traditional practices to more advanced methods to boost productivity and profitability. This evolution is deeply rooted in historical milestones, particularly the agricultural and green revolutions. Modern farming systems have supplanted conventional approaches, positioning agriculture as a cornerstone of many economies and a critical factor in achieving global food security. Without robust agricultural practices, the world would confront grave challenges such as hunger and malnutrition (FAO, 2022). Moreover, this sector

employs a substantial portion of the workforce and is essential in promoting environmental sustainability and maintaining biodiversity.

The Sustainable Agricultural Mechanization (SAM) concept has emerged to address needs related to sustainable production, emphasizing the importance of balancing environmental, socio-cultural, and economic sustainability when introducing technologies designed to reduce labor intensity and enhance efficiency. While food production increasingly relies on advanced technological resources, it utilizes vital natural and human resources. Productivity can be significantly enhanced by improving smallholder farming through adopting appropriate power sources and techniques. Initiatives that advocate for SAM, establish hiring services, and offer affordable machinery that can contribute to increased output (Huossou et al., 2013). To support these efforts, it is crucial to encourage private sector involvement and implement government subsidies to enhance productivity, bolster food security, and facilitate job creation. These interventions are vital in supporting the countless smallholder farmers who play a pivotal role in global agricultural production.

However, recent studies highlight a troubling gender imbalance in African agriculture. Notably, over 50% of farm laborers are women, which can soar to 60% in certain countries (FAO, 2023). Research indicates significant disparities that limit resource access for female farmers, thus impeding their full participation in and benefit from agricultural initiatives (Njuki et al., 2023). For instance, in Ghana's Karaga District, the limited adoption of mechanization is closely tied to gender biases in land ownership—a trend also observed in Benin (Eissler et al., 2020). Consequently, developing inclusive strategies for smallholder mechanization becomes imperative.

While current agricultural resource allocation programs aim to foster gender equity, they often fail to address the underlying causes of inequality, leading to initiatives that may be superficial and short-lived. Therefore, it is essential to actively engage communities and adopt gender-transformative strategies that promote equitable access to mechanization and resources by addressing systemic gender inequalities that compromise women's access to resources and decision-making. This approach is vital for achieving lasting equity in the agricultural sector.

This article explores innovative approaches to ensuring equitable access to agricultural resources, emphasizing Sustainable Agricultural Management (SAM). By implementing these strategies, we aim to demonstrate how promoting fair access can enhance sustainable and inclusive farming practices, benefiting all smallholder farmers in sub-Saharan Africa where these strategies can be applied.

### **Evidence on smallholder mechanisation and gender dynamics**

The article explores the gender dynamics of smallholder rice farmers in Ghana, focusing on access to machinery and agricultural resources. It incorporates quantitative and qualitative data gathered from 320 farmers through questionnaires, three focus groups, and six interviews to provide a comprehensive understanding of the challenges women face compared to men in accessing resources like land, credit, and training. The initial study findings indicate that while both genders have comparable machinery usage trends, there are significant differences in access, intentions, and perceived benefits based on gender and age (Dorvlo et al., 2024). The study emphasizes the need for equitable resource distribution and decision-making to enhance sustainability in mechanization efforts. It advocates for gender-transformative approaches to address inequalities and improve outcomes in agricultural programs.

### **Gender Transformative Sustainable Agricultural Mechanisation (GTSAM)**

Machinery and technical knowledge have made agricultural mechanisation essential for sustainable farming. Yet, integrating gender considerations into this field is challenging in many countries, especially for smallholder farmers who depend on effective resource use.

This article suggests a gender-transformative sustainable agricultural mechanisation (GTSAM) approach, addressing women's unique challenges in accessing farm machinery. This approach seeks to promote gender equity and navigate the cultural norms that perpetuate gender inequalities

in farming. Ensuring the sustainability of benefits from these interventions for female farmers in operating machinery is crucial for long-term success.

GTSAM provides smallholder farmers with appropriate machinery for their production scale while ensuring economically viable options that are both gender responsive and support gender equity. It aims to integrate sustained gender equity into the social norms of farming communities. This gradual change allows female farmers to gain recognition and acceptance. Research indicates that female farmers often engage in processing and sales activities of the food supply chain, possibly due to limited machinery access (gender paper). However, strategies promoting female machinery ownership can empower them as skilled operators, earning respect in their communities and offering women additional income-generating activities. Gender norms that assign stereotypical roles to men and women often deem it culturally inappropriate for women to operate machinery, limiting their entry and participation in these activities.

## **Strategies for Operationalising GTSAM**

### ***Research***

Effective research, innovative programs, and documentation are essential for GTSAM initiatives. Each community's unique cultural norms necessitate a tailored approach. GTSAM integrates resource access and ownership within the social context for sustainability. Understanding local customs is crucial for addressing farmers' needs, as Ullah et al. (2023) indicate that culture affects handheld tractor usage. Collaboration among farmers, researchers, and policymakers is vital for achieving GTSAM's goals of promoting transparency and enhancing machine access, ownership, and use. To ensure the effective integration of GTSAM strategies and address implementation issues, mechanization programs must be continuously refined and adapted through research to fit new technologies and climate challenges.

### ***Capacity strengthening***

Capacity strengthening is vital for GTSAM initiatives as successful implementation requires technical skills and socio-cultural awareness, especially among farmers and operators. Transforming deep-rooted gender norms in communities calls for informed strategies to improve gender equity in accessing suitable machinery. Overcoming personal gender biases that are inherent in the implementers of SAM will require capacity strengthening. GTSAM training will enhance sustainability and gender equality in agriculture. Therefore, ongoing capacity development is essential, engaging all stakeholders. Organizations should invest in continual training to keep staff updated on technology and best practices and the gender power dynamics that may emerge from promoting these technologies. Ongoing assessment of both intended and unintended gender outcomes should be integral to all SAM training interventions, with strategies to address any negative impacts. Additionally, training should strengthen relationships, promote collaboration, and establish shared responsibility for fair agricultural mechanization.

### ***Community engagement (community buy-in)***

Agricultural production significantly impacts smallholder farming communities, influencing their cultural practices such as planting and marketing. For example, rice cultivation varies globally: some communities transplant seedlings, while others broadcast seeds (Mohidem et al., 2022). Community and gender norms shape the acceptance of mechanization programs, making engagement essential for successful GTSAM initiatives. Collaborating with community leaders fosters ownership and acceptance of projects, ensuring fair participation. Such an approach should integrate sensitization on the benefits of gender equality for the household and community more broadly. Deliberate efforts to involve men in supporting gender equality can garner greater acceptance of GTSAM focused interventions. This engagement also promotes unity, which is crucial for development efforts. Tailoring the mechanization program to local resources and culture enhances sustainability and knowledge transfer. Ultimately, effective GTSAM implementation necessitates understanding social norms, involving community leaders, aligning programs with local needs, and fostering ownership and sustainability.

## **Financing**

Ensuring the financial viability of GTSAM programs is paramount. Sustainable financing is key to maintaining effectiveness, and proactive measures are necessary for continuity. Financing should address women's specific needs, such as limited access to collateral due to low property ownership. Integrating these gender dynamics into all financing measures ensures that financial products are accessible and equitable for women (Gachui, 2021). Therefore, diversifying funding sources beyond government aid is essential. Seeking private donations and corporate sponsorships lessens dependence on a single funding source. It's also crucial to educate farmers on economic sustainability. Implementing cost-saving strategies, such as optimizing processes and selecting suitable machinery, improves sustainability without sacrificing impact. Careful analysis of budgets for potential savings is vital for ongoing services. Finally, effectively communicating the importance of these programs to stakeholders through media campaigns, newsletters, and events will garner their financial support, ensuring a lasting positive effect on smallholder farmers.

## **Conclusions and Outlook**

In conclusion, the Gender Transformative Sustainable Agricultural Mechanisation (GTSAM) approach represents a vital framework for addressing the unique challenges faced by women in smallholder farming. By promoting gender equity, enhancing access to appropriate machinery, and fostering community engagement, GTSAM lays the groundwork for sustainable agricultural practices that benefit all farmers. Continued investment in research, capacity building, and diverse financing strategies will ensure that these initiatives are not only effective but also adaptable to the ever-evolving demands of agriculture and climate change. Ultimately, supporting female farmers through GTSAM can lead to enriched food systems, stronger community ties, and more equitable agriculture system.

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