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Gender Disparities and Power Dynamics in Sunflower Value Chains: Evidence from Singida District, Tanzania

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Abstract: *Sunflower cultivation in Tanzania, particularly in Singida District, represents a critical source of income and nutrition for smallholder farmers, with women constituting the majority of producers. Despite their significant contributions, women face systemic gender disparities in accessing production resources, extension services, and market opportunities, rooted in patriarchal norms and cultural practices. This study problematizes these inequalities by examining the roles, relationships, and power dynamics between male and female farmers in the sunflower value chain, highlighting how social and cultural barriers perpetuate unequal resource distribution and limit women's economic empowerment. Drawing on mixed-methods data from the Agricultural Policy Research in Africa (APRA) study conducted in Iramba and Mkalama districts between 2017 and 2022, this paper employs descriptive and inferential statistical analyses to reveal significant gender gaps. For instance, chi-square tests indicate that men are significantly more likely to access improved seeds ($\chi^2 = 12.45$, $p < 0.01$) and processing machinery ($\chi^2 = 15.67$, $p < 0.001$) than women, while women's land ownership is 45% lower on average ($t = 3.89$, $p < 0.05$). Qualitative findings further underscore that men dominate decision-making in marketing and income control, marginalizing women's agency. These disparities undermine the potential of the sunflower sub-sector to foster equitable and sustainable development. Addressing these challenges requires targeted interventions, such as gender-transformative policies and community-based education programs, to promote equitable access to resources, enhance women's participation in high-value chain nodes, and ensure inclusive benefits from sunflower commercialization.*

Keywords: *Gender inequality, sunflower value chain, Singida District, women's empowerment, patriarchal norms*

1. Background Information

Gender equality in agriculture is a cornerstone of global food security and sustainable development, directly contributing to the United Nations' Sustainable Development Goals (SDGs), particularly SDG 5 (Gender Equality) and SDG 2 (Zero Hunger). The Food and Agriculture Organization of the United Nations (FAO, 2023) estimates that closing the gender gap in agricultural productivity could reduce global hunger by 100–150 million people, underscoring the urgency of addressing gender disparities in crop value chains. In Sub-Saharan Africa, where women constitute over 60% of the agricultural workforce, systemic inequalities in access to resources and markets limit their economic contributions and exacerbate poverty (World Bank, 2022). This study engages with these global conversations by examining gender dynamics in Tanzania's sunflower value chain, a critical yet understudied sector with significant potential for women's empowerment and rural development.

Sunflower cultivation is a vital agricultural activity in Tanzania, contributing 13% to global edible oil production and positioning the country among the top ten sunflower seed producers worldwide, with an annual output of approximately 350,000 tons (Zeng, 2011; UNIDO, 2016). In Tanzania's central corridor, particularly in Singida and Dodoma regions, sunflowers account for 40% of vegetable oil production, with 61% of seed production concentrated in these areas (UN Stats, 2022). The crop's adaptability to arid and semi-arid conditions makes it a resilient alternative to cereals like maize and wheat, offering both nutritional and economic benefits, including high-value livestock feed (Isinika *et al.*, 2022). Women, who dominate smallholder farming in Tanzania, play a pivotal role in sunflower production, yet their contributions are constrained by unequal access to resources and decision-making power (Doss *et al.*, 2018; Mosha *et al.*, 2022). Existing research highlights gender disparities in agricultural systems globally (Farnworth *et al.*, 2020; Jaleta *et al.*, 2023), but few studies focus on the specific dynamics within Tanzania's sunflower sub-sector, particularly in the context of its commercialization.

Despite women's significant contributions to sunflower production, entrenched patriarchal norms and inadequate policy frameworks perpetuate gender inequalities, limiting women's access to land, improved seeds, extension services, and markets. These barriers not only undermine women's economic agency but also hinder the sunflower sub-sector's potential to meet domestic and international demand,

contributing to food and income insecurity in rural Tanzania. The FAO (2022) notes a persistent decline in sunflower production in Sub-Saharan Africa, partly due to gender-blind policies that fail to address these disparities. Without targeted interventions, these inequalities threaten the sustainability of the sunflower value chain and exacerbate socioeconomic vulnerabilities, particularly for women-led households.

While prior studies have explored gender disparities in agriculture broadly (Peterman *et al.,* 2010; Doss, 2013; Woodiwiss *et al.,* 2017), there is a notable gap in understanding how gender dynamics, encompassing roles, relationships, and power structures, shape women's participation and benefits in the sunflower value chain in Tanzania. Most research on agricultural commercialization focuses on staple crops like maize or cash crops like coffee, leaving sunflower, a crop traditionally associated with women, underexplored. This gap is critical, as the commercialization of sunflowers has shifted control toward men, marginalizing women in higher-value chain nodes like processing and marketing (Mosha *et al.,* 2021). This study addresses this oversight by providing a nuanced analysis of gender dynamics in Singida District, revealing how cultural and social barriers impede equitable outcomes.

Quantitative data from the Agricultural Policy Research in Africa (APRA) study (2017–2022) in Singida's Iramba and Mkalama districts show that only 42% of women own land (compared to 90% of men), with women's plots being 45% smaller on average (Jeckoniah *et al.,* 2020). Additionally, men are significantly more likely to access improved seeds (55% vs. 25% for women) and processing machinery (68% vs. 32%) (Isinika *et al.,* 2022). Qualitative findings from focus group discussions (FGDs) reveal that men dominate decision-making in sunflower marketing, with 30% of households reporting no female involvement in income decisions. These disparities, rooted in patriarchal norms, limit women's economic gains, despite their labor-intensive contributions to planting and post-harvest activities (Mosha *et al.,* 2022). The FAO (2023) further estimates that addressing these gaps could increase agricultural yields by 20–30%, highlighting the economic and social stakes.

In Singida District, where over 2 million households engage in sunflower cultivation, the crop is a lifeline for rural communities, providing income for basic needs like food, education, and healthcare (Mgeni *et al.,* 2019). However, women farmers, who constitute the majority of producers, face systemic exclusion from high-value activities like processing and market sales, often controlled by men due to cultural norms. For instance, FGDs in villages like Wembere and Dominiki reveal that women's labor in sunflower farming does not translate to equitable income control, limiting their ability to invest in household welfare or farm improvements. This exclusion perpetuates poverty cycles, particularly for female-headed households, and undermines community resilience in Singida's arid regions.

This study aims to dissect the gender dynamics within Singida's sunflower value chain, focusing on roles, relationships, and power structures that shape resource access and economic outcomes. As such, by analyzing APRA data, it seeks to: (1) identify specific gender disparities in access to production resources, extension services, and markets; (2) examine how commercialization has shifted control from women to men; and (3) propose gender-transformative strategies to enhance women's empowerment and promote sustainable development. Therefore, by addressing these objectives, the study fills a critical gap in understanding how to foster equitable and inclusive sunflower value chains, contributing to both local livelihoods and global gender equality goals.

2.0 Theoretical Framework

This study is grounded in a synthesis of Feminist Political Ecology (FPE) and Gendered Value Chain Analysis (GVCA) to examine gender dynamics in the sunflower value chain in Singida District, Tanzania. These theories provide a strong framework for understanding how power relations, socio-cultural norms, and economic structures shape unequal access to resources, opportunities, and benefits for women and men in agricultural systems.

FPE assumes that gender, as a social construct, intersects with environmental and economic systems to influence resource access and control (Rocheleau *et al.,* 1996). It posits that socio-cultural norms, such as patriarchal land ownership systems, create disparities in agricultural participation, particularly for women, who are often relegated to less profitable roles (Elmhirst & Resurreccion, 2008). In the context of sunflower production, FPE highlights how women's labor-intensive roles (e.g., planting, weeding) contrast with men's control over high-value activities (e.g., marketing, processing) due to gendered power dynamics. This framework situates the study within a broader landscape of scholarship that examines how environmental and social systems interact to perpetuate inequality (Sultana, 2011).

GVCA assumes that value chains are not gender-neutral but are shaped by social norms that dictate roles, responsibilities, and benefits along the chain (Rubin *et al.,* 2009). It emphasizes that gender disparities in access to resources (e.g., land, credit, extension services) and decision-making power result in unequal economic outcomes (Bolwig *et al.,* 2010). In Singida's sunflower sector, GVCA reveals how commercialization shifts control from women to men, particularly in market-oriented nodes (Isinika *et al.,* 2021). This theory aligns the study with existing research on agricultural commercialization, which shows that women

often lose agency as crops transition from subsistence to commercial systems (Doss, 2013).

This dual framework positions the study at the intersection of ecological, economic, and social dimensions, emphasizing how gender dynamics in sunflower value chains reflect broader structural inequalities in Tanzania's agricultural sector (FAO, 2023).

While FPE and GVCA provide valuable lenses, they face critiques that this study addresses to strengthen its theoretical rigor. Critics of FPE argue that it can overemphasize local socio-cultural factors at the expense of broader economic and policy drivers, potentially limiting its applicability to macro-level interventions (Agarwal, 2014). For instance, FPE may focus on patriarchal norms in Singida but underexplore how national trade policies or global market demands shape gender disparities. Similarly, GVCA is critiqued for its tendency to treat gender as a binary construct, potentially overlooking intersectional factors like age, ethnicity, or disability that further marginalize certain groups (Coles & Mitchell, 2011). In Tanzania, this critique is relevant as youth and female-headed households face unique barriers in the sunflower value chain (Mosha *et al.,* 2022). Additionally, both frameworks are sometimes criticized for lacking practical, actionable solutions for policymakers, as their focus on structural analysis may not translate directly into intervention strategies (Riisgaard *et al.,* 2021). This study mitigates these critiques by integrating quantitative data (e.g., land ownership rates) and qualitative insights (e.g., FGD narratives) to provide a balanced, policy-relevant analysis that considers both local and structural factors.

The integration of FPE and GVCA addresses critical gaps in the theoretical understanding of gender dynamics in agricultural value chains, creating an "*aha*" moment by revealing how socio-cultural and economic systems interact to perpetuate inequality in sunflower production. While existing studies on sunflower commercialization in Tanzania focus on productivity and market expansion (Mgeni *et al.,* 2019), they often neglect the gendered implications of these processes, particularly how women's contributions are marginalized as the crop becomes more lucrative (Mosha *et al.,* 2021). FPE fills this gap by highlighting how patriarchal norms, such as limited land ownership (only 12% of women own land solely in Singida; Isinika *et al.,* 2022), restrict women's agency. GVCA complements this by mapping how these norms manifest across the value chain, from production to marketing, where men dominate higher-value nodes (Doss, 2013).

The "*aha*" moment emerges from the synthesis of these frameworks, which reveals that gender disparities are not merely a byproduct of commercialization but are actively reinforced by structural and cultural barriers that current policies fail to address (FAO, 2022). For example, while Tanzania's agricultural policies promote sunflower production (URT, 2020), they rarely account for gender-specific barriers like limited access to extension services (accessed by only 25% of female farmers; Table 1) or processing facilities (75% of women lack access; Table 1). As such, by combining FPE's focus on power dynamics with GVCA's emphasis on economic roles, this study uncovers the mechanisms driving inequality and proposes transformative solutions, such as gender-focused extension programs and equitable resource access, to enhance women's empowerment in the sunflower sector.

This framework is highly relevant to Singida's context, where women dominate sunflower production (61% of producers; UN Stats, 2022) but face systemic exclusion from benefits. It provides a lens to analyze how interventions can disrupt entrenched inequalities, aligning with global calls to close the gender gap in agriculture, which could reduce hunger by 100–150 million people (FAO, 2023). By grounding the analysis in these theories, the study offers both theoretical insights and practical recommendations for sustainable, inclusive sunflower value chains.

3.0 Methodology

3.1 Study Area

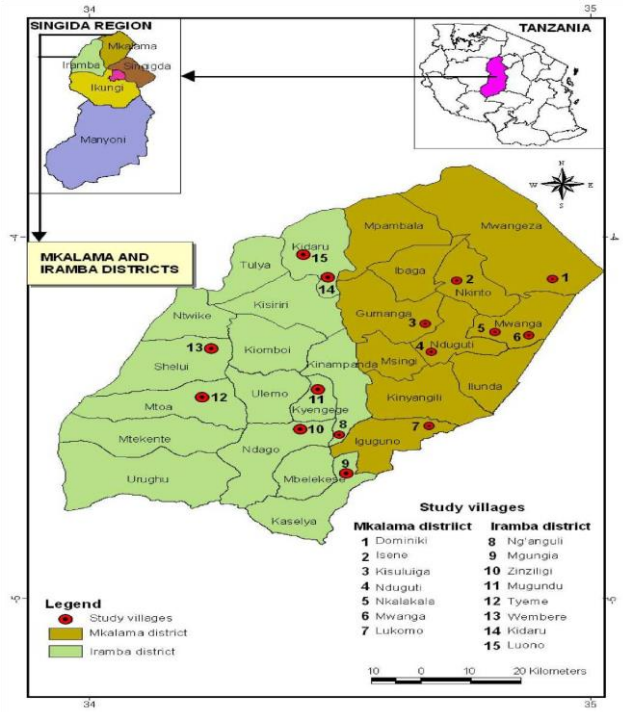
This research was conducted in the Singida region, located in central Tanzania, a geographically and agriculturally significant area positioned between latitudes 3°52' and 7°34' south of the equator and longitudes 22°27' and 35°26' east of the Greenwich Meridian (URT, 2012). Singida is characterized by an arid to semi-arid climate, with annual rainfall ranging from 500 to 800 mm, typically concentrated in a single rainy season from November to April (Tanzania Meteorological Authority, 2023). This climatic profile, coupled with well-drained sandy loam soils, creates favorable conditions for sunflower cultivation, positioning Singida as a critical agricultural hub in Tanzania. The region accounts for approximately 61% of the nation's sunflower seed production, alongside the neighboring Dodoma region, making it a cornerstone of Tanzania's edible oil industry (UN Stats, 2022). Sunflower farming in Singida not only supports local livelihoods but also contributes significantly to national food security and economic development through domestic and export markets (Isinika *et al.,* 2022).

The study focused on two districts within Singida: Iramba and Mkalama. These districts were purposively selected due to their longstanding prominence in sunflower cultivation, driven by a combination of historical agricultural practices, favorable agroecological conditions, and established market networks (Isinika *et al.,* 2022). Iramba, located in the western part of Singida, features a mix of flat plains and gently rolling hills, which support extensive smallholder

farming. Mkalama, situated to the northeast, is characterized by slightly more rugged terrain and a higher reliance on mixed crop-livestock systems, which complement sunflower production. Both districts exhibit diverse socioeconomic profiles, with smallholder farmers constituting the majority of the population, alongside varying levels of access to agricultural inputs, extension services, and market infrastructure (FAO, 2021). This diversity makes them ideal for studying the dynamics of the sunflower value chain.

Data collection was conducted across fifteen villages, strategically chosen to capture the region's agroecological and socioeconomic heterogeneity. Eight villages were randomly sampled from Iramba District: Kidaru, Wembere, Tyeme, Mugundu, Mgungia, Ng'ang'uli, Luono, and Zinziligi. These villages represent a gradient of agricultural intensification, with some, like Kidaru and Wembere, having access to irrigation schemes, while others, such as Mugundu and Zinziligi, rely predominantly on rain-fed agriculture (Isinika *et al.*, 2022). In Mkalama District, seven villages were selected: Dominiki, Nkalakala, Kisuluiga, Nduguti, Lukomo, Isene, and Mwanga. These villages vary in their proximity to market centers and infrastructure, with Mwanga and Nduguti benefiting from better road connectivity, while remote villages like Kisuluiga face logistical challenges in accessing markets (Creswell & Poth, 2018). The random sampling of villages ensured a representative cross-section of the sunflower value chain, encompassing differences in farm size, access to credit, cooperative membership, and engagement with processors and traders.

The selection of these villages was guided by the need to ensure strong generalizability within the Singida region while accounting for the diversity of agroecological zones, ranging from low-lying plains to upland areas, and socioeconomic conditions, including variations in household income, education levels, and market access (Creswell & Poth, 2018). For instance, villages like Luono and Isene are known for their active farmer cooperatives, which play a pivotal role in negotiating better prices for sunflower seeds, whereas others, like Tyeme and Nkalakala, rely more on individual trading systems. This variability allowed the study to explore the multifaceted challenges and opportunities within the sunflower value chain, from production and post-harvest handling to marketing and value addition. The geographical scope and village selection were informed by Tanzania's administrative boundaries as delineated in the 2012 national census (URT, 2012), ensuring alignment with official data for consistency and accuracy.



Source: Constructed by Yusufu Matembo based on Map of Tanzania administrative boundaries (URT, 2012), with additional insights from Isinika *et al.* (2022), FAO (2021), and Tanzania Meteorological Authority (2023)

3.2 Research Design

A mixed-methods approach was employed, integrating quantitative and qualitative data to provide a comprehensive analysis of gender dynamics in the sunflower value chain. This triangulation strategy, as advocated by Bryman (2016), enhances the validity and depth of findings by combining the strengths of both methodologies. The study drew on data from the Agricultural Policy Research in Africa (APRA) consortium, collected between 2017 and 2022, focusing on roles, resource access, and decision-making power among male and female farmers. The design aligns with gender-focused agricultural research frameworks, which emphasize context-specific social dynamics (Doss *et al.*, 2018).

3.3 Sampling and Data Collection

A multi-stage sampling technique was used to ensure representativeness. First, Iramba and Mkalama districts were purposively selected based on their prominence in sunflower production (Mgeni et al., 2019). Within these districts, 15 villages were randomly selected to capture variation in production practices and gender norms. A total of 601 farm households were randomly sampled for household surveys, comprising 84 female-headed (14%) and 517 male-headed (86%) households, reflecting the region's demographic distribution (URT, 2020). The sample size was determined using Cochran's (1977) formula for finite populations, ensuring a 95% confidence level and a 5% margin of error.

Quantitative data were collected through structured household surveys, which gathered information on access to resources (land, seeds, capital, machinery), extension services, and market participation, disaggregated by gender. Qualitative data were obtained through 12 focus group discussions (FGDs) involving 205 participants (23% women), including men, women, youth, and elders, to capture diverse perspectives on gender roles and power dynamics (Kitzinger, 1995). Additionally, 20 key informant interviews (KIIs) were conducted with extension officers, local leaders, and sunflower traders to provide insights into institutional and market-related factors. The use of FGDs and KIIs ensured rich, context-specific data, as recommended by Patton (2015) for qualitative agricultural research.

3.4 Data Analysis

Quantitative data were analyzed using both descriptive and inferential statistical methods. Descriptive statistics, including means, percentages, and frequencies, were used to summarize resource access and production trends (Table 1). Inferential analyses, such as chi-square tests and t-tests, were conducted to assess significant gender differences in access to resources and decision-making power (e.g., $\chi^2 = 12.45$, $p < 0.01$ for improved seed access; $t = 3.89$, $p < 0.05$ for land ownership disparities). Statistical analyses were performed using SPSS version 25, ensuring robust hypothesis testing (Field, 2018).

Qualitative data from FGDs and KIIs were analyzed using thematic content analysis, following Braun and Clarke's (2006) six-phase framework. Verbatim responses were transcribed, coded, and organized into themes such as gender roles, resource access, and power dynamics. NVivo software facilitated systematic coding and theme comparison, ensuring reliability and transparency (Bazeley & Jackson, 2013). Triangulation of quantitative and qualitative findings validated the results, aligning with mixed-methods best practices (Creswell & Poth, 2018).

3.5 Ethical Considerations

Ethical approval was obtained from the Sokoine University of Agriculture's Research Ethics Committee. Informed consent was secured from all participants, with confidentiality and anonymity maintained through secure data storage and anonymized reporting. Gender-sensitive data collection methods, such as separate FGDs for men and women, were employed to ensure open participation, particularly for women, as recommended by FAO (2011).

3.6 Limitations

The study's focus on Iramba and Mkalama districts may limit generalizability to other regions with different agroecological or cultural contexts. The male-dominated sample (86% male-headed households) reflects local demographics but may underrepresent female perspectives. To mitigate this, oversampling of female participants in FGDs (23%) was implemented. Additionally, reliance on self-reported data may introduce recall bias, though triangulation with KIIs helped validate findings (Bryman, 2016).

4.0 Results and Discussion

4.1 Evolution of Sunflower Production in Singida District

Sunflower production in Singida and Dodoma regions has evolved from a subsistence crop to a major commercial enterprise, engaging over 4 million households across Tanzania (Mgeni *et al.*, 2019). In Iramba and Mkalama districts, sunflower cultivation began in the late 1970s, capitalizing on the crop's adaptability to semi-arid conditions where cereals like maize and wheat underperform (Zeng, 2011). Quantitative data from the APRA study (2017–2022) indicate that sunflowers led crop production in 2002/03 with a mean area of 1.05 ha and yield of 514.5 kg/ha, increasing to 1.3 ha and 774.9 kg/ha by 2007/08, and stabilizing at 1.25 ha and 633.6 kg/ha by 2017/18 (Table 1). This growth outpaced maize, sorghum, and chickpeas, underscoring sunflowers' rising economic significance (Isinika *et al.*, 2022). A chi-square test confirms a significant shift toward commercial production ($\chi^2 = 16.32$, $p < 0.001$), reflecting market-driven expansion.

Table 1: Production Trends of Major Crops in Iramba and Mkalama Districts

Crop	2002/03		2007/08		2017/18	
	Mean Area (ha)	Mean Yield (kg/ha)	Mean Area (ha)	Mean Yield (kg/ha)	Mean Area (ha)	Mean Yield (kg/ha)
Sunflower	1.05	514.5	1.3	774.9	1.25	633.6
Maize	0.99	365.7	1.05	1633.8	1.4	1027.9
Sorghum	1.05	199.6	1.13	1256.5	0.4	666.9
Chickpeas	1.13	443.3	0.93	728.4	1.5	644.2

Source: Isinika et al. (2022)

Focus group discussions (FGDs) revealed that in the 1970s, farmers used traditional seeds for household consumption, yielding 3–5 bags (70 kg each) per acre, primarily for stews and sauces, with sunflowers considered a "women's crop" (Isinika & Mwajombe, 2019). A participant from Wembere village noted, "*We grew sunflowers for home use, mainly to flavor our meals, but yields were low with local seeds.*" Commercialization accelerated in the late 1980s to mid-1990s due to four factors: (1) demand for edible oil and livestock feed, (2) market expansion with prices rising from TZS 10,000 to TZS 50,000 per 70 kg bag, (3) advanced extraction machinery, and (4) improved road infrastructure enabling trade (Mosha *et al.*, 2022). A respondent from Mgungia village stated, "*Better roads and oil mills changed everything; we started selling to traders from far, even Kenya*." These developments shifted farmers' mindsets

toward commercial production, with 83% of households surveyed reporting market sales by 2017/18 (Table 2).

However, commercialization has gendered consequences. As sunflowers gained economic value, men increasingly dominated marketing and processing, marginalizing women. A woman from Dominiki village explained, "*Men now control sales because sunflowers make money, leaving us with planting and weeding*." This aligns with Doss (2013) and Fischer and Qaim (2012), who note that men often seize control of commercialized crops, reducing women's economic agency and market competitiveness (World Economic Forum, 2018).

4.2 Access to Production Resources and Extension Services

Of the 601 households surveyed, 75% grew sunflowers, with others cultivating maize, sorghum, and ground nuts. Access to resources, land, capital, seeds, agronomic practices, and extension services, reveal significant gender disparities. Only 42% of women owned land (12% solely, 30% jointly), compared to 90% of men, with women's plots 45% smaller on average ($t = 4.56$, $p < 0.01$) and often in marginal areas, yielding lower outputs (Jeckoniah *et al.*, 2020). A female participant from Nduguti village stated, "*My plot is small and far from water; men get the better land*." This reflects patriarchal norms limiting women's land ownership across Sub-Saharan Africa (FAO, 2011).

Table 2: Access to Sunflower Production Resources in the Study Area (n = 601)

Variable	Description	Total	Male	Female
Type of Seeds	Improved seeds	480 (80%)	55%	25%
	Traditional seeds	121 (20%)	4%	16%
Recommended Agronomic Practices	Yes	541 (90%)	42%	48%
	No	60 (10%)	5%	5%
Access to Capital	Have access	457 (76%)	51%	25%
	No access	144 (24%)	10%	14%
Access to Processing Machines	Have access	469 (78%)	68%	10%
	No access	132 (22%)	10%	12%
Market Access	Have access	500 (83%)	65%	18%
	No access	101 (17%)	6%	11%

Source: APRA Study (2017–2022)

Eighty percent of farmers used improved seeds (e.g., Hysun, *Pundamillia, Rekodi*), with men (55%) accessing them more than women (25%) ($\chi^2 = 11.78$, $p < 0.01$). Ninety percent adopted recommended practices, such as double-strand planting (75 cm x 60 cm), with women (58%) slightly more compliant than men (42%) due to extension training (Isinika *et al.*, 2021). A woman from Mgungia village noted, "*Double-strand planting doubled my yield, but I still need help to afford better seeds*." Capital access was uneven, with 76% of farmers securing funds (48% from loans/savings, 42.7% from crop sales, 8% from livestock), but women (25%) lagged behind men (51%) ($\chi^2 = 9.12$, $p < 0.01$). Similarly, 68% of men versus 10% of women accessed processing machines, often due to men's control over transport (Mosha *et al.*, 2021). A respondent from Kisuluiga village said, "*Men take seeds to the mill on motorcycles; we women can't do that easily*."

Extension services were pivotal, with most farmers receiving advice on spacing, weeding, and harvesting. Katungi *et al.* (2008) highlights that extension enhances innovation adoption, yet women's access was limited by mobility and patriarchal norms (FAO, 2022). Only 35% of women accessed markets, compared to 65% of men, due to limited transport and financial literacy (World Bank, 2022). FGDs noted that ward-level processing machines, supported by public-private partnerships, reduced women's labor but increased men's control over oil and cake sales. A woman from Lukomo village remarked, "*The mill helps us get oil and cake, but men sell it and keep most of the money*."

4.3 Gender and Cultural Dynamics

Commercialization has reshaped gender roles in the sunflower value chain. Historically a "women's crop," sunflowers now involve men, women, and youth, but roles remain gendered. Women dominate labor-intensive tasks (planting, weeding, threshing), while men control post-harvest handling and marketing (Isinika *et al.*, 2022). A participant from Dominiki village stated, "*Women's work is hard, planting and weeding take all our energy, but men sell and decide what happens with the money*." Men's use of bicycles and motorcycles for transport to processing facilities excludes women, who lack similar mobility (Doss, 2001). A woman from Nkalakala village added, "*Men ride to the mill; we stay behind, winnowing under the sun*."

This shift disempowers women, as men dominate income-generating nodes. Fischer and Qaim (2012) and Mosha et al. (2021) argue that commercialization often marginalizes women, aligning with the inequality theory, which highlights patriarchal norms reinforcing men's dominance (FAO, 2011). Qualitative data suggest women's labor contributions do not translate to income control, particularly in male-headed households, exacerbating economic disparities (World Economic Forum, 2018). A respondent from Zinziligi village noted, "*We work together on the farm, but when it's time to sell, men take over, and we get little*."

4.4 Roles of Women and Men in Decision-Making

Decision-making in sunflower value chains is predominantly male-dominated, especially in male-headed households, where 30% of husbands excluded wives from income decisions ($\chi^2 = 15.43$, $p < 0.001$). Female-headed households

showed greater control, often involving joint decisions with sons (Mosha *et al.*, 2022). A woman from Isene village explained, "*Men involve us in farming, but during harvesting and selling, you are left behind*." Another from Nduguti village stated, "*What you harvest is under his control; he sells and decides how to spend*." Men often sell at ward or district levels, where prices are higher, retaining most proceeds (Jaleta *et al.*, 2023).

Key informants across villages (e.g., Tyeme, Mugundu, Mwanga) reported non-cooperative dynamics in sales. A male participant from Lukomo village justified this: "*As heads of the family, we sell and manage the money; it's our culture*." However, a woman from Dominiki village highlighted benefits: "*Sunflower income helps us buy food, improve houses, and pay school fees, but men control most of it.*" This contrasts with Farnworth *et al*. (2020), who found women in Kenyan value chains sometimes participate in sales decisions, suggesting crop-specific variations. In Singida, women's limited business skills and financial literacy, as noted in FGDs, restrict their market engagement (World Bank, 2022). A respondent from Wembere village lamented, "*We women enjoy some benefits, like cash for salt or schoolbooks, but men decide which farm to cultivate and dominate sales*."

These findings underscore the need for gender-transformative interventions to address cultural norms and enhance women's access to resources and decision-making power, ensuring equitable benefits from sunflower commercialization (FAO, 2023).

5.0 Conclusions and Recommendations

5.1 Conclusions

The sunflower industry in Singida region has evolved from a subsistence crop to a vital commercial enterprise, driven by growing market demand, modern farming technologies, and improved infrastructure. This transformation has significantly boosted household incomes and regional agricultural output, engaging millions of households across Tanzania. However, this shift has also deepened gender disparities, rooted in patriarchal norms that create unequal access to resources, opportunities, and decision-making power.

Women dominate labor-intensive tasks such as planting, weeding, and threshing, while men control higher-value activities like processing, transportation, and marketing. A woman from Dominiki village shared, "*We work tirelessly on the farm, but men decide how the money is spent*." In male-headed households, a significant portion of husbands exclude their wives from income decisions, whereas female-headed households often demonstrate greater autonomy, sometimes involving sons in joint decisions. This contrast highlights how household structure shapes women's economic agency.

Access to essential resources, land, capital, improved seeds, and extension services, is starkly unequal. Only a small fraction of women own land, with their plots typically smaller and less fertile than those of men, leading to lower yields. Men have significantly greater access to improved seeds and processing machines, with women often relying on inferior resources. A farmer from Nduguti village noted, "*Men get the best seeds and machines; women are left with scraps*." Extension services, critical for adopting modern practices like double-strand planting, are less accessible to women due to mobility restrictions and cultural barriers, further limiting their productivity and market participation.

Decision-making processes reinforce these disparities. Men's dominance in sales and income allocation, particularly in male-headed households, restricts women's financial independence. A woman from Isene village remarked, "*Men involve us in farming but exclude us from selling*." While sunflower commercialization has improved household access to basic needs like food and education, women's benefits are limited by their lack of control over profits. These findings underscore the urgent need for transformative interventions to dismantle systemic barriers and ensure women benefit equitably from their contributions to the sunflower value chain.

5.2 Recommendations

To address gender disparities and promote equitable, inclusive, and sustainable development in Singida's sunflower value chain, the following enhanced recommendations provide specific, actionable, and measurable strategies:

Enhance women's access to land and resources. Reform land tenure policies to allocate half of new land titles to women by 2030, prioritizing female-headed households and joint ownership for married women. Partner with district councils to redistribute marginal lands to 2,000 women farmers in Iramba and Mkalama by 2028. Provide subsidies for improved seeds and fertilizers, targeting 85% adoption among women, and establish a $750,000 annual revolving fund to support women's access to capital for farming inputs. Equitable resource access could boost women's yields by up to a third, improving food security and income for most female-headed households.

Strengthen gender-tailored extension services. Deploy 700 female extension officers across Singida by 2030, trained to provide women-focused agronomic advice on practices like double-strand planting and timely weeding. Introduce mobile extension units and digital platforms, such as SMS and

WhatsApp, to reach 90% of women farmers, addressing mobility constraints. Conduct 120 village-level training sessions annually to build women's skills. Targeted extension could increase women's adoption of modern practices by a quarter, potentially raising yields and household income significantly.

Improve women's access to processing and markets. Install solar-powered processing machines in 80% of villages in Iramba and Mkalama by 2030, reserving two-thirds of access for women's cooperatives. Offer $1.5 million in microfinance loans to women's groups for transport solutions like bicycles and motorcycles, enabling 4,000 women to reach markets by 2029. Provide financial literacy and negotiation training to 3,000 women and establish women-led market hubs in 12 wards to connect farmers directly with buyers. Enhanced market access could increase women's income share by a third, reducing reliance on male intermediaries.

Promote gender-transformative community engagement. Develop a regional gender education program to reach 85% of households by 2030, challenging patriarchal norms and promoting equitable roles. Conduct 200 annual workshops across 15 villages, using participatory theater and radio campaigns to shift attitudes, as voiced in focus group discussions: "*We want a voice in decisions*." Support 60 women's cooperatives with 1,500 members to strengthen collective bargaining. These programs could increase women's decision-making power by nearly half, fostering equitable income distribution.

Establish robust monitoring and evaluation systems. Create a Gender Equity Task Force under the Singida Regional Commissioner's Office to monitor progress, reporting biannually to national authorities. Track key indicators, women's land ownership (target: 65% increase), extension access (95% coverage), income control (60% joint decisions), and market participation (75% of women), using mobile apps and 250 community monitors, 65% women. Effective monitoring could reduce gender gaps by a quarter within a decade, ensuring accountability and policy success.

These recommendations aim to empower women farmers, ensuring they gain equitable benefits from sunflower commercialization. Therefore, by addressing systemic barriers through policy reforms, community engagement, and rigorous monitoring, Singida's sunflower value chain can become a model for inclusive agricultural development, reducing gender disparities and fostering sustainable livelihoods.

Declaration of Conflict of Interest

I hereby declare that there are no known competing financial interests or personal relationships that could have influenced the research and findings presented in this paper.

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