



WOMEN CLIMATE ENTREPRENEURS: CHALLENGES AND OPPORTUNITIES

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Information:

Received: 29/06/2024

Accepted: 29/10/2024

Published: 12/2024

Keywords:

Climate change, women, entrepreneur ship

ABSTRACT

Climate change creates a significant risk to the economy and different aspects of life. It disproportionately affects women mostly because of gender-based discrimination and social norms. On the other hand, women, with their unique local knowledge and experience, are instrumental in developing effective strategies for climate change mitigation and adaptation. In this regard, female climate entrepreneurship has emerged as a critical solution to promote a green and sustainable socioeconomic development.

Given rural women play a major role in maintaining the livelihood of the households and the communities, empowering them through climate entrepreneurship is critical. The interrelation of climate, gender and entrepreneurship, however, has been under-examined. This paper provides a systematic review of the existing literature to explore the challenges and opportunities for women climate entrepreneurs in rural areas, which sets the foundation for more research in areas of rural women's economic empowerment and contextualization of entrepreneurship in the face of a changing climate.

1. INTRODUCTION

Climate change, a long-term change in average temperatures and weather patterns, is one of the major challenges facing the world today. Direct consequences of climate change including sea level rise, storms, droughts, and floods, remain the top threat to the environment, the health of the planet and the economic wellbeing (World Economic Forum, 2024). While climate change is a global phenomenon, its negative impacts are disproportionately felt by the most vulnerable and disadvantaged regions and populations (World Bank, 2023). In rural areas, women are more vulnerable than men to climate crisis because they mostly rely on natural resources for

their livelihood (Fonjong and Zama, 2023; World Bank, 2023). Every year, rural women who represent roughly 40 percent of the agricultural labor force globally suffer substantially greater economic losses due to climate shocks than men (FAO, 2024).

Without strong efforts to address environmental concerns and issues related to human development, the ongoing environmental degradation could increase socioeconomic instability. In response, the Paris Agreement and the 2030 Agenda for Sustainable Development provide the foundation for a low-carbon, climate-resilient and sustainable future for all where no one is left behind. Achievement of

these two agendas requires a social and economic transformation. While the role of entrepreneurship in promoting rural development, climate change adaptation and mitigation, and women's economic empowerment has been recently widely discussed, the nexus between climate, rural women, and entrepreneurship is still under-explored.

2. INTERSECTION OF GENDER, CLIMATE CHANGE AND ENTREPRENEURSHIP

Climate change is not gender neutral. According to OECD (2023), women and girls are most disproportionately affected by extreme weather and environmental issues and have less power to influence climate change decision making process. This increases their vulnerability to food insecurity, poverty, gender-based violence, human trafficking, sexual exploitation, and abuse. The situation has become even worse for women in rural communities. The recent report by FAO (2024) demonstrates that on average, households headed by women in low- and middle-income countries lose 8 percent more of their income during heat waves and 3 percent more during floods than the loss to men. It is also estimated that a 1°C increase in global temperature can cause a 34 percent reduction in their income, compared to male-headed households (FAO, 2024). Such losses further widen the existing income gaps between women and men, impairing economic growth and social cohesion (Sommer, 2019; Topuz, 2022).

Unfortunately, the realities facing rural women constrain their ability to effectively adapt to the climate change. Socially constructed norms, roles and relations are the underlying barrier putting women in a disadvantaged position in coping with the adverse impacts of the changing climate (UN Women, 2015; UNFCCC, 2019). In agriculture, through gendered division of labor,

men are often more privileged in decision making while women are considered the men's helping hand (Contzen and Forney, 2017). Women also perform more domestic care work than men which lowers their availability to access training, information and the networks they need to support their growth (FAO, 2024; World Bank, 2023). In many areas, women face more restrictions to mobility which prevents them from migrating in search of alternative livelihood opportunities (FAO, 2024). Men's rural-urban migration leaves women behind and increases their responsibilities on the farm and in the household (Fruttero et al., 2023). Furthermore, discriminatory norms shape unequal access to land, financial capital, technology and other essential services for rural women (World Bank, 2023). The double burden of climate change and gender inequality leaves rural women more vulnerable (Glazebrook et al., 2020) and creates significant barriers in developing and implementing effective strategies for enhancing their livelihoods (Gondwe et al., 2022; Muhanguzi et al., 2023).

Women, however, should not be seen solely as victims. Given "their roles and capacities as farmers, innovators, and guarantors of household food security and nutrition" in the rural areas (FAO, 2020, p. 4), they should be centrally involved in adapting to climate change, eradicating poverty, and promoting sustainable development. Studies found that women's knowledge and lived experiences are helpful for erosion control, flood damage prevention, crop and food preservation and storage, and post disaster recovery (Ajani and Igbokwe, 2013; Wuyep et al., 2014). They are more likely than men to be green, energy saving and adaptable (WEDO, 2007). As the world continues to search for climate change solutions, it is increasingly important to empower women from rural communities to help them cope better with

the changing climate and build sustainable livelihoods for them.

Against that background, entrepreneurship has emerged as a way of rural revitalization (Gladwin et al., 1989) and part of a broader livelihood strategy for many rural women (ILO, 2010). By engaging in entrepreneurial activities, women innovate, initiate and run business enterprises to create jobs, generate income, and contribute to overall economic development (Gulvira et al., 2024; Porluri et al., 2024). In fact, entrepreneurship becomes a fallback option for women in areas where women face difficulty in maintaining their livelihood (Porluri et al., 2024). When women have incomes, they tend to invest in better nutrition, health and education, which yields beneficial results for human development and sustainable economic growth (ILO, 2015).

3. UNDERSTANDING WOMEN CLIMATE ENTREPRENEURS

In recent years considerable attention has been paid to understanding the determinants of green growth, which is often defined as “fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies” (OECD, 2011, p. 9). The concept of climate entrepreneurship has emerged as a significant force behind the transition from tradition toward environmental driven economies. Climate entrepreneurship can go by other names, such as green entrepreneurship, environmental entrepreneurship, eco-entrepreneurship and sustainability entrepreneurship, but they all refer to entities that focus not only on the growth of the venture, but also contribute to greener and more sustainable ecosystems. In other words, the central premise behind climate entrepreneurship is the balance among economic, environmental and social factors in a business. To that end,

climate entrepreneurship consists of three following elements: sensing, seeking and integrating climate change issues (Lee and Ahn, 2019, p. 237), in which “sensing” involves recognizing how climate change affects a business; “seeking” is about exploring business opportunities, e.g. new products and services, to address climate change challenges, and “integrating” represents the assets within the organization, e.g. knowledge, skills, networks and organizational structures, to enable and strengthen green initiatives (Lee and Ahn, 2019; Tekala et al., 2024). At the heart of climate entrepreneurship, therefore, lies innovation and inclusion to drive sustainability in businesses. IFC estimates that climate businesses can unlock \$23 trillion in investment opportunities, create 230 million jobs, and avoid as much as four billion tons of greenhouse gas emissions in developing countries by 2030 (IFC, 2016).

Today more women have opted to start their own businesses than ever before, accounting for 43 percent of all entrepreneurs worldwide (Beckman, 2024). In the face of a changing climate, women climate entrepreneurs have emerged as a potentially transformational force to be reckoned with as they own and lead business ventures that build a net-zero carbon future in two ways: (1) adoption of green business practices to minimize environmental impacts including reducing waste, using renewable energy sources, and conserving natural resources; and (2) development or adaptation of climate smart technologies for climate mitigation and adaptation, e.g. wind energy, hydropower, and early warning systems (IFC, 2023; We-Fi, 2024).

In rural areas, climate change has direct and long-term effects on agricultural productivity and human well-being due to their high dependence on natural resources and climatic factors like temperature and water supply (FAO

et al., 2024; Frona et al., 2021). Climate entrepreneurs are seen as a potential transformational force driving the agricultural sector and rural areas towards a sustainable path to achieve green growth. In essence, rural climate entrepreneurs are different from other types of entrepreneurs in the way that they do not just set up their enterprises in rural areas but also leverage resources of the rural environment and utilize local labor to develop their businesses and make the local economy grow sustainably (McElwee and Smith, 2014; Olmo-Garcia et al., 2023; Priya and Mohanasundari, 2024). Given that women playing significant roles in the production of basic foods and natural resource management in rural areas (FAO, 2020), promoting women-owned rural businesses spanning a wide range of industries with green potential including tourism, food production and processing, handicraft, and apparel and textile is crucial to reduce poverty, create jobs, stimulate innovation, and contribute to greener and thriving communities (Hewitt, 2024; Mehta, 2023).

In that regard, uncovering issues and opportunities for women climate entrepreneurs in terms of starting and expanding rural climate businesses could potentially help to guide future interventions and accelerate female entrepreneurship in this space.

4. CHALLENGES FOR WOMEN CLIMATE ENTREPRENEURS IN RURAL AREAS

Women in most countries do not start their businesses on equal footing with their male counterparts with 0.80 women for every 1 man for start-up activity (GEM, 2023). With few employment choices, women in developing countries see entrepreneurship as a route to help them earn a better income (Elam and Teleki, n.d.). However, women entrepreneurs are still underrepresented in many sectors, and their

socio-economic contributions are extensively overlooked (Albattat, 2023; GEM, 2023). In rural areas, women often start businesses in highly saturated sectors that offer low profit potential (Haan, 2016; ILO, 2010). Initiating a rural climate business adds further challenges. This section discusses the multiple challenges facing women climate entrepreneurs based on the three factors of the entrepreneurial ecosystem for women in rural areas developed by Kreuzer et al. (2018), including: business environment (e.g. access to business information, access to financial support and services, infrastructures, and relevant policies, etc.); interacting actors (e.g. government agencies, banks, academia, mentors, and role models, etc.), and entrepreneurial culture and attitude (e.g. local culture, social norms, and media, etc.).

4.1 Business environment: Limited access to finance

Acquiring financing assistance such as bank loans and venture capital remains the biggest barrier for women entrepreneurs across all sectors, representing a US\$1.7 trillion financing gap (IFC, 2017). Several studies demonstrate that female founders generally raise less capital than their male counterparts (Brock and de Haas, 2023; Female Founders Fund, 2023; Guzman and Kacperczyk, 2019; We-Fi, 2024). In many areas in the world, such limitation comes from legal barriers that restrict women from opening bank accounts and signing contracts (Perrin and Hyland, 2023). It may be due to the disproportionate burden placed on women for family responsibilities that limits their time for meeting potential investors (de Haan, 2016; GEM 2023; World Bank, 2018). Other restrictions include lack of financial literacy and limited access to information on rural financial products and services (FAO, 2019). As a result, female entrepreneurs are compelled to seek

funding from unofficial sources like private lenders, personal savings, family and friends, which might constrain their business growth (Sherwani et al., 2023; Wang et al., 2022).

The issue is even more acute for women climate entrepreneurs, especially in rural areas because the amount of funding for climate-related initiatives with gender integration is very little, equivalent to just 2.4 percent of climate aid (We-Fi, 2024). They are also less likely to be funded because the growth of green businesses often takes longer than conventional ones (Badjeena et al., 2024), and green technologies have high initial costs (ILO, 2020), which may deter investors from investing in their businesses. In many cases, it may be due to investors' unconscious bias against women's climate innovation (Gast et al., 2017; Potluri and Phani, 2020). Furthermore, their access to finance is limited by their underrepresentation in the sectors that attract the most climate capital such as supply chain and transportation, energy, manufacturing and infrastructure (IFC, 2023). Areas like food and agriculture where women are historically more active receive a disproportionately small portion of global venture capital investment: US\$11 billion compared to US\$16 billion for energy and US\$50 billion for transportation in 2021 (PwC, 2022).

4.2 Interacting actors: Limited access to networks and training

Women-run businesses are often reported to have limited access to new emerging markets, which limits their access to new funding and growth opportunities (We-Fi, 2024). It may be due to their lack of experience and network given that women have the tendency to get involved in private networks rather than in open ones (Potluri et al., 2024). As they have weaker networks than men, their access to role models is also limited; thus, they are discouraged from

joining male-dominated start-up environments like climate sectors (Potluri et al., 2024). Combined, these barriers can explain the reasons of under-representation of women climate entrepreneurs as well as slow and small women-founded green companies.

Lack of education and training opportunities is one of the biggest challenges facing women climate entrepreneurs (Potluri et al., 2024). The lack of capacity can hinder them from realizing their ambitions as they have a limited knowledge of climate-focused business models (We-Fi, 2024). Unclear understanding about such models may put them at risk of being accused of greenwashing.

4.3 Entrepreneurial culture and attitude: Discriminatory gender norms and gender stereotypes

Women's ability to start and grow businesses in climate sectors is often restricted by gender norms and stereotypes (IFC, 2023; We-Fi, 2024). In many developing countries, particularly in marginalized communities like rural areas, women are still expected to conform to traditional gender roles that dictate male dominance over women. For example, research shows that 80 percent of men and 60 percent of women in Vietnam agreed that businesswomen should be the primary childcare givers despite entrepreneurial pressure (World Economic Forum, 2022). High domestic care burden and work-family conflict leave little time for women to engage in business activities (ICRW, 2019; Stefan et al., 2021).

While women's participation in Science, Technology, Engineering, and Math (STEM) careers including entrepreneurs is deemed crucial for innovation and sustainable economic growth (Corbett and Hill, 2015; Nathan, 2022), they are still underrepresented, both in university and in industry (Mann & DiPrete, 2013).

Worldwide, women made up only 35 percent of the STEM workforce (NGCP, 2024), and 35 percent of STEM graduates without any progress over the past 10 years (UNESCO, 2024). Such gender differences can be attributed to deeply rooted societal stereotypes in which STEM fields are associated with men and masculine traits (Makarova et al., 2020; van der Vleuten et al., 2019). The perception that STEM is a male domain discourages women from pursuing advanced education and jobs in the sector. This may limit the talent pipeline of women climate entrepreneurs to shape the green economy using technological advancement (We-Fi, 2024).

5. OPPORTUNITIES FOR WOMEN CLIMATE ENTREPRENEURS IN RURAL AREAS

As the planet continues to be impacted by climate crisis, redefining socio-economic growth to foster a sustainable and inclusive future is more important than ever before. Despite challenges, opportunities still exist for women to become climate entrepreneurs in rural communities.

5.1 The quest for inclusive entrepreneurial ecosystem

As collaborative efforts are key to realize Agenda 2030, a more inclusive entrepreneurial ecosystem for women in rural areas is needed. If women and men participated equally as entrepreneurs, global GDP could rise up to 6%, equivalent to US\$5 trillion annually (GEM, 2023). Such an amount could be used to finance climate change mitigation and adaptation (We-Fi, 2024).

According to We-Fi (2024), having women entrepreneurs at the forefront of green markets contributes to increasing female participation in climate workforce (We-Fi, 2024). While women currently hold only one-third of green jobs (International Monetary Fund, 2024), women

entrepreneurs can help create more jobs for more women. Evidence indicates that early-stage female-founded enterprises hire 2.5 times more women, and the established ones tend to hire up to 6 times more (We-Fi, 2022).

5.2 A catalyst for green innovations

Studies reveal that women entrepreneurs tend to create more environment-friendly and sustainability-focused businesses (We-Fi, 2024). Moreover, women who account for around 80 percent of all purchasing decision show a higher green consumption intention, making them well-positioned to build business practices that can reduce waste and save the planet (UNDP, 2022; Zhao, 2021). Women climate entrepreneurs, therefore, are powerful advocates who help accelerate the widespread adoption of climate-friendly solutions.

While women make up nearly half of the agricultural workforce, agriculture is among major sectors that have huge opportunities for innovation and shift of practices to tackle climate change issues. In fact, agriculture and food sectors where women are well-represented are ripe for investment in climate smart technologies (Stuart et al., 2014; Xu et al., 2021). With global demand for food rising by 60 percent in future, green agricultural technologies could support climate change mitigation, thereby posing positive impacts on rural development (World Bank, 2020).

6. CONCLUSIONS

With only six years left to deliver on the promise of the United Nations Sustainable Development Goals (SDGs), gender equality under SDG 13 (climate action) remains low (Equal Measures 2030, 2022). The current gender-blind plans, policies, and actions, which fail to address women's realities, have the potential to exacerbate gender inequality and result in the slow pace of green growth. Understanding the

challenges and opportunities for women climate entrepreneurs in rural areas is paving the initial step to create an inclusive environment that energize and empower them in the entrepreneurial ecosystem.

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