

A Review Study of Socio-Economic Development of Women Farmers in Sundarban Districts of West Bengal

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ABSTRACT

In the Sundarban region of West Bengal, women farmers play crucial roles in crop cultivation, livestock care, fisheries, post-harvest duties, and household food security, all of which have a substantial impact on the agriculture and rural economy. Poor access to land, inputs, loans, markets, extension services, technology, education, and decision-making responsibilities restricts their socioeconomic advancement notwithstanding their efforts. With an emphasis on their livelihoods, involvement in farming, income, employment, resource access, financial inclusion, social empowerment, and climate sensitivity, this study examines the body of research on their socioeconomic condition and development. It demonstrates how women's contributions are frequently overlooked and how their livelihood stability is threatened by problems including poverty, gender inequality, poor infrastructure, and natural hazards like cyclones, flooding, and salinity. Nonetheless, chances for increased income and empowerment are being created by programs including self-help organisations, microfinance, skill development, agricultural extension, livelihood diversification, and government initiatives targeted at women. The report emphasises the significance of gender-sensitive policies, improved access to markets and resources, climate-resilient livelihoods, and greater involvement of women in household and community decision-making. The Sundarban region's household welfare, food security, sustainable farming, and inclusive rural development are all improved by bolstering the economic and social capacities of women farmers.

Keywords: *Women Farmers, Socio-Economic Development, Rural Livelihoods, Women Empowerment, Agriculture, Climate Resilience.*

INTRODUCTION

A significant portion of the population in the Sundarban region of West Bengal depends, either directly or indirectly, on agriculture, fisheries, cattle, and other activities that rely on natural resources. Agriculture continues to be an important source of income for rural communities in West Bengal, particularly in the Sundarban region. Through crop cultivation, seed selection, transplanting, weeding, harvesting, post-harvest processing, livestock rearing, household food production, and other linked agricultural activities, women play a significant part in various livelihood systems. They are responsible for a variety of tasks. Farming women are typically seen as helpers or family workers rather than as farmers in their own right, despite the fact that they make a significant contribution to the farming industry. It is vital to note that this restricted recognition has significant repercussions for their access to land, capital, technology, agricultural extension, markets, and institutional assistance.

When it comes to the socio-economic and ecological environment, the Sundarban region of West Bengal offers a unique environment for the study of women farmers. Deltaic geography, reliance on natural resources, dispersed rural settlements, and susceptibility to environmental pressures are some of the characteristics that this region possesses. Crop productivity and household livelihoods can be negatively impacted by a variety of climate-related stresses, including but not limited to cyclones, tidal flooding, soil and water salinity, erosion, and unpredictable rainfall. Due to the fact that women are responsible for the food security of their households, the care labour they perform, and the activities that provide them with a means of subsistence, these difficulties may have particularly substantial effects for women. In light of

this, it is necessary to investigate the socio-economic development of women farmers in the Sundarban region, not only in terms of their income and employment, but also in connection to their access to productive resources, social status, decision-making, education, health, financial inclusion, and the security of their livelihoods.

The term "socio-economic development" refers to the broad range of changes that have been made to people's economic well-being, social possibilities, living conditions, participation, and ability to make decisions that affect their lives. In the context of women farmers, these dimensions encompass a variety of factors, such as ownership or control over agricultural land and assets, access to institutional credit and inputs, participation in agricultural training and extension programs, access to markets and remunerative prices, membership in self-help groups and farmer organisations, diversification of livelihoods, and participation in household and community decision-making. Women's economic independence can be strengthened by improvements in these areas, which can also contribute to household welfare and rural development.

Nevertheless, women farmers in economically challenged and rural areas frequently encounter structural conditions. Because of factors such as limited land ownership, poor access to formal financing, a lack of agricultural machinery and improved technology, restricted mobility, insufficient extension services, low levels of market participation, and gender-based disparities, their productivity and economic potential may be hindered. In addition, unpaid household and caregiving tasks might reduce the time available for activities that generate income, training, and involvement in community institutions. As a result of the interaction among these elements, poverty, and environmental fragility, the socio-economic growth of women farmers is a multifaceted problem.

Opportunities to improve the economic and social standing of rural women have been developed in recent years through various interventions by the government, self-help groups, microfinance efforts, agricultural extension services, livelihood development programs, and women-oriented rural development programs. Self-help organisations and collective institutions, in particular, have the potential to enable activities such as savings, access to credit, entrepreneurship, skill development, and participation in decision-making processes related to local matters. In a similar vein, women farmers may be able to increase their livelihood security by increasing their access to climate-resilient agricultural methods, alternative livelihood options, value addition, computerised information, and organised marketplaces. On the other hand, the efficacy and availability of such interventions may vary from community to community and from household to household depending on the circumstances.

It is therefore essential to conduct a study of prior research to understand the socio-economic conditions, agricultural roles, opportunities, and constraints that women farmers in the Sundarban regions of West Bengal face. By conducting a comprehensive analysis of currently accessible research, it is possible to uncover common findings, geographical disparities, research gaps, and factors associated with the economic and social empowerment of women. In addition, it can help determine the extent to which the interventions currently in place meet the specific needs of women residing in an ecologically fragile and economically vulnerable location.

The current review study focuses on the socio-economic development of women farmers in the Sundarban regions of West Bengal. Women farmers are the primary subject of this study. The purpose of this study is to investigate the role they play in agriculture and related activities, as well as their socioeconomic characteristics, livelihood patterns, access to productive and financial resources, participation in decision-making, institutional support, and key developments affecting their development. Additionally, the study considers the potential impact of climate-resilient livelihood options and development programs geared

toward women. The purpose of this study is to provide a comprehensive picture of the condition of women farmers in the Sundarban region by synthesising data from the current literature. Additionally, the review aims to identify areas that require further research and policy attention.

REVIEW OF LITERATURE

Rath et al. (2020) An effective technique for tripling farmers' income was covered in their article. The rural economy depends heavily on livestock manure. In addition to milk, which is a major source of income, the effective utilization of animal resources in biogas systems can contribute to the production of clean cooking energy locally for the people living in rural areas. In addition to organic matter, biogas wasted slurry, a by-product of biogas plants, is a possible source of major and micronutrients. In addition to supporting soil health, its appropriate application after processing has great promise for supplying the crops' nutritional needs and lowering the need for chemical fertilizers. On average, 170 lakh families in India that are members of village-level dairy cooperative societies possess three dairy animals each. From these dairy cows, an estimated 443.5 lakh tons of solid bio-slurry might be produced. The bio fertilizers made from this bio slurry can satisfy India's needs for micronutrients (Fe, Mn, Zn, and Cu) and NPK by roughly 4.5% and 0.4%, respectively. The National Dairy Development Board has implemented an end-to-end Manure Value Chain in two Anand villages in order to further this concept. SuDhan is the brand name of the biofertilizers made from the bioslurry. Under demonstration trials carried out on farmers' fields throughout the rabi and kharif seasons of 2019–20, their use in agriculture has produced good results, with an increase in crop yields of 14–36% over farmers' customary practices. Utilizing such bio slurry-based biofertilizers has the potential to significantly lower farmers' costs associated with chemical fertilizers while also increasing their revenue through increased output. In addition to meeting the clean energy needs of the rural populace and addressing environmental issues, the NDDB's Manure Management Model is an intriguing step toward sustainable agricultural techniques that guarantee higher yields and profits.

Siddiqua et al. (2020) in their paper titled “The Pandemic COVID19: Impact on Farming and Food Supply” discussed about effect of Pandemic on Farming and Food Supply. Across the world, an outbreak of infectious disease COVID19 caused by SARS CoV-2 has spread rapidly since late 2019 and early 2020, profoundly devastating the lives and fundamental activities of livelihood. WHO (World Health Organization) reported a continued steep rise in the number of cases and deaths worldwide, as the pandemic spreading to at least 240 countries and territories. Countries like India, China, New Zealand, France, Poland and UK have implemented the world's largest and most restrictive mass quarantines. As we speak about India, early actions were taken to limit the spread the pandemic by ordering a 21 – day lockdown starting from March 25 (Phase I), March 25 to May 3 (Phase II) and further up to May 3 to May 18 (Phase III) for a 1.3 billion population.

Sigua (2020) in their research paper discussed that livestock dung has long been utilized to enhance soil quality and supply nutrients for plant growth. However, the rise in concentrated animal feeding operations (CAFOs) causes the proximal crop and pasturelands to have high concentrations of plant nutrients like phosphate and nitrogen. As a result of creating more manure than is necessary to satisfy the local plants' need for nutrients. Eutrophication and hypoxia can result from surface and ground water being enriched with nitrogen and phosphorus due to soil runoff and the leaching of manure placed on land. Moreover, overdosing animal dung can release hormones and other pharmaceutically active substances, propagate infections, and produce ammonia, greenhouse gases, and odorous substances. There are eleven fascinating articles in this special issue about creating renewable energy and fuels, removing ammonia from animal manures, the advantages of using animal manure or materials derived from it, like ashes or biochar, for agriculture and the environment, and the changes in microbial communities and pathogen survival following anaerobic lagoon treatment.

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Gopal Khadka (2020) One type of clean cooking method is biogas. It is well-liked worldwide as a dependable and extensively utilized energy source. This study, titled Relevance of Biogas in Rural Settings, aims to investigate women's perceptions on the value of biogas in rural urban settings. Areas: the viewpoints of women. It is predicated on cultural feminism as a theoretical framework. It is based on data from primary and secondary sources and uses an exploratory research design. According to the report, biogas is very important in Nepal's rural, farm-based society. According to women, its main benefits include low maintenance, easy and sustainable operation, time and resource savings, and health and sanitation. The long, hectic schedule that women have for household chores is lessened by biogas plants. It recommends that relevant authorities create efficient institutional structures to enable women in their country of origin to make the most of their free time, which is made possible by the use of biogas.

Nevzorova Tatiana (2019) The use of biogas as an energy source is a key component of the sustainability transition, which many nations have come to recognize. Having said that, biogas output is still on the small side overall. What are the present obstacles preventing the wider adoption of biogas as an energy source? This basic question is raised by the slow development. A comprehensive analysis of the obstacles was carried out using the Scopus database to get the solution to the query. We summarized the findings by country and categorized them as either developed or developing economies. Technical, economic, market, institutional, socio-cultural, and environmental impediments were the six categories used to categorize the groups. The most common and important limitations that the biogas business is facing right now were compiled into a comprehensive taxonomy after an analysis of the obstacles in various settings. Also included were suggestions for removing the most pressing obstacles.

B. Bharathiraja (2018) The current state of affairs has spurred research into renewable energy generation from organic resources and waste due to the environmental impact of greenhouse gases and the excessive use of conventional fuels. The majority of the world's energy comes from fossil fuels, and demand is increasing. New research suggest anaerobic digestion (AD) as a viable and effective method for managing garbage in a sustainable way while simultaneously producing biofuels. In order to improve biogas production and quality, the sector is undergoing several technical advancements. However, the accessibility of low-cost feedstocks and the diversity of biogas's useful forms (heating, electricity, and fuel) will increase AD's success for future investments. The chemical composition of biogas consists primarily of carbon dioxide (CO₂) with small amounts of hydrogen sulfide and two-thirds methane (CH₄). One way to promote sustainable biomass production globally is to enrich the leftover slurry from biogas generation and use it as crop manure. One cost-effective use for biogas is the generation of electricity, which may be used either centrally or distributedly in both urban and rural regions. Examining a number

of feedstocks that find widespread application around the globe is the goal of this review article. Anaerobic digestion is a method that can help create a sustainable environment; this article will go over how it works, current trends, and the pros and cons of this process.

Libaisi, Judith & Njenga, Mary (2018) The small-scale farmers in Embu County, Kenya, who make biogas from cattle dung for cooking, use the bio slurry as biofertilizer or mix it with feed for pigs and poultry. This chapter details their experiences in this area. As part of a program run by the Netherlands Development Program (SNV), skilled artisans and masons install biodigesters in the homes of the inhabitants. In order to lessen their reliance on hired masons for maintenance services and to increase their income, several women have voiced the desire to be trained as artisans or masons. With less money going toward cooking fuel and more time in the day for women, biogas makes it possible for them to take an active role in the home and in community development initiatives. In 2018, Libaisi and Njenga published a book. Investing in biogas as a smart way to help women and improve their livelihoods is a great idea. The small-scale farmers in Embu County, Kenya, who make biogas from cattle dung for cooking, use the bioslurry as biofertilizer or mix it with feed for pigs and poultry. This chapter details their experiences in this area. As part of a program run by the Netherlands Development Program (SNV), skilled artisans and masons install biodigesters in the homes of the inhabitants. In order to lessen their reliance on hired masons for maintenance services and to increase their income, several women have voiced the desire to be trained as artisans or masons. Women are able to devote more time to housework and community development projects thanks to the biogas, which also decreases spending on cooking fuel.

Kaur et al. (2017) discussed about potential of livestock generated biomass. According to research paper modern economies run on the backbone of electricity as one of major factors behind industrial development. India is endowed with plenty of natural resources and the majority of electricity within the country is generated from thermal and hydro-electric plants. A few nuclear plants assist in meeting the national requirements for electricity but still many rural areas remain uncovered. As India is primarily a rural agrarian economy, providing electricity to the remote, undeveloped regions of the country remains a top priority of the government. A vital, untapped source is livestock generated biomass which to some extent has been utilized to generate electricity in small scale biogas-based plants under the government's thrust on rural development. This study is a preliminary attempt to correlate developments in this arena in the Asian region, as well as the developed world, to explore the possibilities of harnessing this resource in a better manner. The current potential of 2600 million tons of livestock dung generated per year, capable of yielding 263,702 million m³ of biogas is exploited. Our estimates suggest that if this resource is utilized judiciously, it possesses the potential of generating 477 TWh (Terawatt hour) of electrical energy per annum.

Godwin (2017) in their research paper discussed that applying dairy manure repeatedly over a number of years depending on the nitrogen (N) requirements of corn (*Zea mays* L.) raises the danger of P runoff and the concentration of phosphorus (P) in soil tests over time. Applying manure based on P removal adds less P but may affect production. To investigate soil test P dynamics over a corn-alfalfa rotation (2001 to 2011), a corn field trial was established in New York in 2001 and switched to alfalfa (*Medicago sativa* L.) in 2006. The treatments included two control treatments (0 N and 112 kg ha⁻¹ sidedress N) and yearly spring applications of liquid dairy manure (196 and 68 m³ ha⁻¹, respectively) and compost that was based on N rather than P removal (74 and 46 Mg ha⁻¹, respectively). There was no application of compost or manure throughout the alfalfa years. Over the course of the five corn years, the P concentrations measured by the Morgan-extractable soil test increased four times for N-based and P-based manure, and six times for N-based and P-based compost. These increases are consistent with higher P balances, which may have

been accompanied by variations in the P fractions found in each source. P concentrations in soil tests decreased during the alfalfa years and only increased to their starting point in the P-based manure system. Our results highlight the need of rotation fertility management over single-year P management and demonstrate for the first time in dairy feed rotations the long-term sustainability benefits of P-based manure management. Finally, we showed that, for higher application rates, more years in alfalfa than corn may be required to prevent soil test P from building over the rotation. This is because switching from N- to P-based manure allocation in corn years is a good strategy to maintain soil test P concentrations over the rotation.

Agarwal (2017) Indoor air quality is improved and fuelwood collecting burden on forests may be reduced by programs that supply alternative energy sources like biogas. This study investigates the potential link between biogas intervention and increased forest biomass and regeneration in southern India's Chikkaballapur district, where woods have been severely damaged. We discover that forest plots near communities with biogas interventions (treatment) have higher forest biomass than similar plots near villages without biogas (control) using propensity score matching. Even though there was no significant difference in seedling quantity or diversity in the treatment woods, we did find considerably higher sapling abundance and diversity in the treatment plots compared to the control plots, indicating that plants in the treatment forest had a better chance of reaching the sapling stage. These findings suggest that renewable energy sources with less reliance on fuelwood could be a good way to encourage the restoration of damaged forests. Nevertheless, forest regeneration varies among treatments, is constrained by soil nutrients, and favors species that require a lot of light, are resistant to fire, and can survive in less-than-ideal soil.

Kumar et al. (2015) in their paper discussed about Biogas Slurry. Biogas plant (BGP) with anaerobic digestion providing a facility to generate manure (Biogas spent slurry) and energy generation. The digested biogas slurry (DBGS) is rich in macro and micro nutrients that provide essential plant nutrients for longer period. Biogas slurry may be considered as a good quality organic fertilizer for sustainable agriculture. Biogas slurry provides huge nutrient potential for vegetative and reproductive growth of field crops with long term sustainability. By applying the digested biogas slurry (DBGS) in the field for long term basis help in reducing fertilizer demand and provide an eco-friendly way of maintaining productivity and soil health. In this study we are summarizing nutrient potential of digested biogas slurry (DBGS) and relation with synthetic fertilizers in India, as a potential source.

Patra Amlan Kumar (2014) According to the statistics from 2011, the average literacy rate in Basanti Block was 68.32%. The literacy rates of males and females were 75.75% and 60.62% respectively. Basanti Block had a total population of 195,366 people who were literate, with males accounting for 110,229 and females for 85,137 correspondingly. A total of 966 is the Sex Ratio of the Basanti Block. Therefore, there were 966 females in Basanti Block for every 1000 males that lived there. In addition, according to the Census report from 2011, the Child Sex Ratio was 970, which is higher than the Average Sex Ratio of Basanti Block, which is 966.

Khoiyangbam, R S & Gupta, Navindu & Kumar, Sushil. (2011) Fossil fuels provide the majority of the world's energy. In the near future, their current supplies will be exhausted due to their careless and wasteful consumption as well as the rising demand for energy. Because of this, finding alternative, eco-friendly environmentally safe, friendly, and sustainable energy sources to fulfil current and future energy demands. An effort at investigating the feasibility of using biodegradable biomass as both fuel and manure is made in Biogas Technology: Towards Sustainable Development. The Role of Biogas in Long-Term Sustainability. Fossil fuels provide the majority of the world's energy. There will soon be a shortage of

them due to careless and excessive use and the rising demand for energy. Consequently, in order to satisfy the current and future energy demands, it is crucial to identify alternate, environmentally benign, and ecologically sound energy sources. An effort at investigating the feasibility of using biodegradable biomass as both fuel and manure is made in Biogas Technology: Towards Sustainable Development.

CONCLUSION

A study of the extant literature on the socio-economic development of women farmers in the Sundarban districts of West Bengal reveals that women are significant contributors to agriculture and rural livelihood systems. Despite the fact that their contributions are frequently not adequately recognised and encouraged, the analysis provides evidence that women are key contributors. A wide variety of activities, such as agricultural farming, livestock rearing, work related to fisheries, post-harvest processing, household food production, and other activities that provide income, are all activities that women participate in. In order to ensure the stability of household livelihoods and the whole rural economy of the Sundarban region, their participation is therefore completely necessary. Women farmers continue to suffer a number of socio-economic limitations, despite the considerable contribution they make to the farming environment. Their ability to progress economically is hindered by factors such as limited ownership and control over agricultural land, poor access to institutional loans, agricultural inputs, modern technology, extension services, markets, and opportunities for training. There are a number of factors that contribute to the vulnerability of women farmers, including low levels of education and awareness, unequal division of household chores, limited participation in decision-making, and poor recognition of women as independent farmers. Ecological factors in the Sundarban region, which include cyclones, flooding, salinity, erosion, and other environmental pressures, can have a detrimental impact on agricultural production and chances for livelihoods. These issues are worsened by the ecological conditions of the Sundarban region.

The review also suggests that women's participation in self-help groups, microfinance programs, skill-development initiatives, agricultural extension activities, and diversified livelihood programs can create opportunities for women to improve their income, financial inclusion, confidence, and participation in household and community decision-making. These opportunities can be created through the participation of women in these programs. It is possible for women's groups to take collective action in order to further improve access to financing, information, markets, and institutional support. It is important to note that the advantages of such interventions are contingent upon their accessibility, continuity, relevance to the local community, and successful execution.

Consequently, rather than concentrating solely on agricultural output, a multifaceted strategy is required in order to facilitate the socioeconomic growth of women farmers in the Sundarban region. Promoting women's ownership and control of productive resources, strengthening access to affordable institutional finance and markets, improving agricultural and digital extension services, expanding opportunities for skill development, and supporting climate-resilient and diverse livelihoods are all things that should be included in policies and development programs. One further thing that needs to be done in order to guarantee that women have meaningful participation in agricultural decision-making is to increase the acknowledgement of women as farmers and active economic agents. Improved household income, food and livelihood security, women's empowerment, and sustainable rural development are all potential outcomes that can be achieved through the enhancement of the socio-economic position of women farmers in the Sundarban districts of West Bengal. Differences at the district and community levels, women's control over resources and income, the efficacy of interventions by the government and institutions, and the significance of climate-resilient agriculture in enhancing women's livelihoods should all receive more

consideration in the study that will be conducted in the future. In order to make chances for women farmers in the Sundarban region more sustainable and inclusive, a development framework that takes into account gender and is appropriate for the local environment might be of great assistance.

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