



Access Online



Article DOI:

10.5281/zenodo.23016807

¹ PhD, Research Assistant, Poverty and Inequality Lab Asia, India

² PhD, Research Associate, Poverty and Inequality Lab Asia, India

How to Cite:

Pragatika Mishra & Purna Chandra Pradhan (2026), Feminisation of Agriculture and The Structural Transformation of Resource-Poor Women: A Theoretical Meta-Synthesis and Gender-Transformative Framework, International Educational Applied Scientific & Research Journal (IEASRJ), Vol: 11, Issue: 9, 87-100

FEMINISATION OF AGRICULTURE AND THE STRUCTURAL TRANSFORMATION OF RESOURCE-POOR WOMEN: A THEORETICAL META-SYNTHESIS AND GENDER-TRANSFORMATIVE FRAMEWORK

Pragatika Mishra¹, Purna Chandra Pradhan²

ABSTRACT

While there is feminisation of agriculture in rural low- and middle-income economies, the feminisation process does not guarantee that women will have rights to land, status as farmers, control over agricultural production, income security, nutrition, and bargaining power. This theoretical paper builds an integrated conceptual model of factors contributing to the situation of women who do not have adequate financial resources for agricultural production. In order to understand this issue, the paper employs a structured secondary data meta-synthesis of recent academic literature, focusing on 25 peer-reviewed journal articles from the period 2021-2025 and dealing with themes of empowerment, land, nutrition, migration, technology, climate resilience, value chains, collective action, and time poverty. The synthesis shows that feminisation is not empowering and not detrimental to women. Feminisation does not depend on whether women gain more responsibility or not, but depends on how they get rights, resources, agency, services, and recognition from their institutions. This paper introduces a Feminisation-Resources-Agency-Nutrition-Resilience (FRANR) framework and an intergenerational pathway framework. Expected relationships between elements of the frameworks include that land rights, joint control, gender-responsive extension services, collective bargaining, labour-saving technologies, social protection, and nutrition-sensitive production turn additional responsibility of women into empowerment. This paper therefore comes to a conclusion that policy needs to focus less on participation and more on women's control over conservation, cultivation, consumption, commercialization, and capabilities across generations.

KEYWORDS: Agriculture, Climate Resilience, Feminisation, Food Systems, Gender Equality, Women's Empowerment

1. INTRODUCTION**1.1 Background of the study**

Women have been integral in terms of agricultural production, food procurement within the household, seed selection, livestock rearing, processing, marketing, natural resource management, and reproductive labour. However, what has changed in many rural communities is the degree of prominence associated with these roles. Male outmigration, occupational diversification, rural changes, demographic changes, and labour market restructuring may mean that, women assume more responsibility

in running the farms and providing for households. This process is generally known as the feminization of agriculture. Contemporary scholars caution, however, that the process should not be viewed simply as an increase in the numbers of women who work. It can encompass the feminization of agricultural labour, management, decision-making, or responsibility, among others, which can take opposing trajectories (Akter et al., 2022; Leder, 2022).

There is also recent research showing that a bigger female participation does not

necessarily equate to development for women. The woman can prepare a piece of land without owning it, decide about production without controlling the money, do more on the farm without having access to extension services, take responsibility for running the family after the migration of men without having any institutional backup. It has become necessary for literature to differentiate between participation and empowerment, as well as access and control. The differentiation becomes very significant in case of resource poor women who have low land ownership, capital, liquidity, education, mobility, technology, and networking.

The structural aspect of the problem is clear from the institutions dealing with land and inheritance. While legal changes may create equal inheritance rights for all, their effective implementation will be affected by customary practices, family negotiations, bureaucracy, marital residence, societal norms, and the inability of women to claim or register assets. According to research conducted in India, the presence of female ownership leads to better decision-making in agriculture, and according to findings obtained in Peru, actual ownership of land may result in greater crop diversity and food security even in cases where there is no formal title (Agarwal & Mahesh, 2023; Schling & Pazos, 2024). The main point here is not just having a legal right but using it for economic advantage.

1.2 Problem statement

The problem that has been considered in this research paper is that of the increasing responsibilities of women in agriculture and the enduring structure of their disadvantage. The previous literatures have covered different aspects of women's condition in agriculture; however, few studies have provided an integrated perspective that would bring all the components together under one theoretical framework, which would apply specifically to resource-poor women. The empirical information about this issue is scattered by countries, industries, indicators, and levels of analysis.

The issue assumes even greater significance when feminization is coupled with climate stress and nutrition vulnerability. There could be an expectation on the women to produce, procure food, take care

of the children and elderly, gather water and fuel, process food, and cushion themselves despite having fewer productive inputs. Field data from rural India indicates that seasonal increase in time spent in agricultural activities have the potential to lower the consumption of calories, protein, iron, zinc, and vitamin A by women, especially among those without any land and those involved in paddy-based systems (Vemireddy & Pingali, 2021). Similarly, climate-resilient programs which ignore gender considerations can raise women's workload or limit their access to productive assets (Bryan et al., 2024).

1.3 Objectives of the study

This research aims at five goals. The first goal is to review the recent theoretical and empirical literature on feminization of agriculture and the impact of such feminization on resource poor women. The second one is to highlight the interplay of land, migration, labour, care, technologies, extension, markets, social protection, and gender norms. The third is to provide evidence of the research gaps related to the recognition of women as farmers, gender disaggregated data, inter-generational impact and control along the agri-food chain. The fourth goal is to provide the theoretically based model of feminization and its implications on empowerment, nutrition, resilience and inter-generational impact. Fifthly, it reflects the policy architecture which draws its inspiration from the transformational nature of the gender perspective, and a transition to empowerment of women in conservation, cultivation, consumption and commercialization.

1.4 Significance of the study

Conceptual and policy-oriented, this contribution avoids the question of whether feminization is good or bad. Instead, it asks the question under what institutional circumstances greater female responsibility translates into productive agency. Such a question is crucial for impactful academic research, which will link agrarian political economy with women's empowerment, food systems, nutrition, climate adaptation, and rural development. By changing the unit of analysis from the woman working in agriculture to the woman as a rights-bearer with capabilities based on her assets, institutions, time, social relations, and voice, the question is rephrased.

Of particular relevance for the context of South Asia and similar low- and middle-income countries, where the agricultural labour of women is extensive, the official recognition of women as farmers may be lagging behind their real contribution. The presented framework can be operationalized using secondary data sources such as agricultural censuses, labour surveys, time-use surveys, household surveys, land records, nutrition data, climate data, and empowerment data at the program level.

2. LITERATURE REVIEW

2.1 Theoretical framework

Three overlapping theories guide the synthesis. First, there is the theory of capabilities and empowerment. In this framework, resources are relevant because they enhance women's capability to exercise meaningful choice rather than being an end in itself. Contemporary literature on measurement based on the WEAI and pro-WEAI (Women Empowerment in Agriculture Index) highlights the importance of agency, control, collective action, and multidimensionality of empowerment (Quisumbing et al., 2023; Quisumbing et al., 2024).

Second, feminist political economy and intersectionality. According to this perspective, agriculture involves institutional processes that distribute land, labour, earnings, power, and visibility unevenly. Gender is interlinked with class, caste, age, marital status, ethnic identity, household composition, and geography. As such, the feminisation process could produce varied results across different categories of women rather than a common one. Research on rural development and women's identity as farmers demonstrates that technologies and commercialisation could empower some stakeholders while restricting others (Clay & Yurco, 2024; Leder, 2022).

Third, there is the gender and food systems approach. It considers the linkages between production and the environment for food, consumption, nutrition, markets, natural resources, and policy institutions. This perspective is valuable since women play multiple roles within the food system. They produce food, transform food, sell food, buy food, cook food, and decide on the diet of the household. In the literature, it has been emphasized that gender equality needs to

consider agency, resource rights, and norms (Njuki et al., 2022).

These perspectives together suggest that feminization should be considered as an exposure or structural change rather than an outcome of some process. Impact of feminization is determined by intermediary mechanisms such as good land rights, control over income, access to technology and extension services, collective action, availability of time, social protection, and gender norms. Through these mechanisms, impacts on proximal outcomes such as productivity and workload affect empowerment, nutrition, resilience, and capabilities.

2.2 Review of related studies

2.2.a *Feminisation, migration, and changing gender relations*

There is growing criticism regarding the universal nature of feminisation, as well as linear thinking of feminisation processes. According to reviews, while migration of men may lead to an increase in the agricultural workload of women, there is a difference between labour feminisation and management feminisation; although women do more physical work, the strategic decisions continue to be made by absent men from the household or other relatives who occupy senior positions. According to Leder (2022), feminisation processes need to be considered in terms of the dynamics of power and resource governance, rather than labour force. Another systematic review conducted recently suggests that although migration improves women's autonomy and participation in decision-making, at the same time, it increases their workload and reduces farm output (Nanda & Ghosh, 2025).

2.2.b *Land rights, inheritance, and recognition*

It has been noted that land is a very critical resource in terms of production and bargaining. In India, there have been findings that show that land ownership by females has increased their participation in decision-making concerning agriculture, and joint ownership has significance as well (Agarwal & Mahesh, 2023). In Peru, it has been seen that ownership effectiveness has enhanced the crop diversity as well as food security for households (Schling & Pazos, 2024), which implies that actual control is important even if formal ownership is not full. The literature on women's

land rights reveals that formal legal ownership can be undermined by the local practices of governance.

2.2.c Productivity, technology, and extension

Gender productivity differences cannot be wholly attributed to differences in women's endowments. There is research from Malawi that has found that the female-run plots can be less productive, even when resource differences have been controlled for, as structural factors account for a significant portion of the difference (Tufa et al., 2022). Cross-country studies similarly indicate that the gender productivity difference is heterogeneous and is influenced by the nature of imperfections in the land and labour markets (Julien et al., 2023; Julien et al., 2025). The Indian case of climate-smart agriculture policy has identified the constraint imposed by women's limited land ownership, credit, information, extension, and time (Barooah et al., 2023).

2.2.d Nutrition, time poverty, and reproductive responsibilities

The agricultural participation of women affects the nutrition of the individual based on allocation of time and ownership of food resources. The research conducted by Vemireddy & Pingali (2021) proves that seasonal agricultural time pressure leads to reduced nutritional intake for rural women of India, especially for landless women. While newer studies have been able to prove the positive effect of women empowerment on the household food security and nutrition of women, the unequal nature of empowerment cannot be overlooked (Haque, 2024; Kumar et al., 2024).

2.2.e Collective action and value chains

The engagement of women in the marketplace may offer new avenues for agency, but such engagement does not automatically lead to equitable rewards. Value chain research is now paying increasing attention to issues of bargaining power, control over income, and gendered segregation in the areas of production, processing, trading, and transportation. According to Pyburn et al. (2023), an intersectional and power-sensitive approach is becoming increasingly significant, whereas gender disaggregated data in fields outside production are rare. Approaches based on groups are also promising since they create social capital and collective agency;

instrumental and collective agency effects were especially strong in 11 agricultural projects reviewed (Quisumbing et al., 2024).

2.2.f Climate resilience, biodiversity, and nutrition-sensitive agriculture

Climate change worsens existing gender disparities because women and men face such climatic events with unequal capacity and decision-making authority. Bryan et al. (2024) point out that the design of climate measures that could end up contributing to increased time and labour poverty among women needs to be improved. Evidence from climate-smart agriculture in several countries indicates that women's participation in household decision-making processes is positively related to climate measures adoption, while land ownership shapes decision-making regarding climate practices (Perelli et al., 2024).

2.2.g Gender-transformative approaches

The current emerging view is that interventions focusing only on women are not adequate in situations where constraints arise within the institutions in the household and community settings. Gender transformative interventions include engagement with women and men, challenging norms, building capacity and agency, and altering the institutional setting. Results from multi-country impact evaluations reveal that designing interventions for empowerment is more effective than presuming that benefits lead to women's empowerment (Quisumbing et al., 2024). There is limited evidence for norm change over a longer period of time.

2.2.h Data and farmer recognition

One continuing issue of methodological concern is the under documentation of women's engagement in agriculture where surveying identifies farmers as those in charge of the households, owning titles to the land, or managing the farms. Gender-disaggregated data, which would allow one to distinguish between participation and decision-making and control, have been called for in recent literature reviews on the issue. This is especially relevant for poor women since being invisible in the data could mean being invisible in the context of agricultural extension, credit, insurance, subsidies, purchasing, and land.

2.3 Research gaps, originality, and future research opportunities

The findings in literature are evident about individual mechanisms, but their interaction is less well supported by evidence. There are five key gaps.

Gap 1: The feminization process is rarely modelled as multidimensional.

The next generation should differentiate labour feminization, managerial feminization, ownership feminization, decision-making feminization, and responsibility feminization. One measure of female labour participation will not reflect whether women really have obtained empowerment or not.

Gap 2: Legal equality is inadequately related to agriculture.

The future research should focus more on the connection between inheritance reforms, mutation/revenue registration, joint titling, dispute resolution and real farm investment. The crucial element missing in this case is the institutional transformation from a legal right into control.

Gap 3: The nutritional channel is poorly integrated into agricultural work.

While there are already evidences of trade-off between time and nutrition, fewer models exist that cover migration, production feminization, care burden, food distribution, diversity of diet and women's nutrition.

Gap 4: Intergenerational impacts have been insufficiently theorised.

Future research needs to study whether women's ownership of land, food security, bargaining ability, and agricultural skills influence daughters' schooling, goals, nutrition, land ownership, and career paths. Thus, the literature can shift from examining immediate effects at household level to investigating the intergenerational transmission of capabilities.

Gap 5: Data collection needs to be more granular.

Future studies need to track plot manager, land owner, income earner, decision maker concerning technologies, extension, markets, nutrition, and care separately. Combining this data with administrative land data and time use data will allow for robust causal inference.

The current paradigm involves understanding feminisation as a structural transformation, whose impacts on wellbeing are mediated via resources, agency, time, institutions and food system positioning. Thus, this framework calls for a chain of outcomes rather than a single empowerment index. The current framework also makes explicit the control aspects of conservation, cultivation, consumption, and commercialisation.

3. METHODOLOGY

3.1 Research design

This research employs a theoretical meta-synthesis methodology utilizing secondary data in recent scholarly journal publications. This research does not purport to be a statistical meta-analysis since the studies under review have different outcomes, population groups, identification methods, and tools of measurement. This methodology is comprised of literature identification, thematic coding, conceptualization, and theory building. The methodology is suitable for the inter-disciplinary question posed here.

3.2 Population, evidence base, and sampling logic

Peer-reviewed literature on women working in agriculture and food systems in LMICs is used as the population of evidence with special focus being on the publications that appeared during the period between 2021 and 2025. The analytical sample of 25 articles was selected since each of them contributes directly to at least one mechanism discussed in the paper. It includes feminization/migration, land and productive assets, empowerment, nutrition, technology and extension, value chain, time poverty, climate resilience, and gender transformative interventions. Special attention was given to journals usually found in upper Scopus quartiles and/or A/A* categories.

3.3 Instruments and analytical tools

The central tool for analysis was the thematic coding matrix. Every paper was coded according to: (a) population/context; (b) feminization mechanism; (c) resource constraint; (d) agency/bargaining element; (e) agriculture result; (f) nutrition/food security result; (g) time/care element; (h) institutional mechanism; (i) climate/environment element; and (j) measurement method. An evidence map and

recurring mechanisms were generated based on the coding process. Concepts related to empowerment are linked to WEAI and pro-WEAI categories, whereas structural constraints were categorized according to individual, household, community, market, and state contexts.

3.4 Data collection procedure

Keywords used for searching the literature included the following: feminization of agriculture, women farmers, male migration, women's land rights, inheritance, agricultural productivity, women's empowerment, food systems, nutrition, time poverty, climate-smart agriculture, gender-transformative approach, agricultural extension, technology, value chain, and collective action. Preference was given to studies that had been published more recently, were peer-reviewed, and had journal details and a DOI. The set of evidence collected through this methodology is triangulated across empirical research, systematic

review, conceptual review, and synthesis of projects. Such methodology allows for avoiding a sole reliance on a specific research tradition and distinguishing between facts and hypotheses.

3.5 Data analysis technique

Synthesis via thematic approach is done and not pooled effects. In the first step, the papers have been categorized according to mechanisms involved. Next, converging findings were recognized. Contradictory and conditional findings have also been kept in consideration. In the fourth step, mechanisms were synthesized into a causal-theoretic chain. In the last step, causal-theoretic chain was made into testable equations for future panel and quasi-experimental research. This theoretical framework considers the process of feminization as an exogenous or semi-exogenous structural development while resources, agency, time, nutrition, resilience and intergenerational results as endogenous processes.

Construct	Core indicators	Expected direction	Potential secondary data
Feminisation of agriculture	Female farm-labour share; female plot management; male out-migration; female farm responsibility	+ responsibility; ambiguous empowerment	Labour surveys; agricultural surveys; migration modules
Land/resource rights	Individual/joint title; inheritance receipt; effective control; credit/asset access	+ agency, investment, resilience	Land records; household surveys
Women's agency	Production, income, leadership, group membership, decision-making	+ food security, resilience	WEAI/pro-WEAI; household surveys
Time poverty	Agriculture + care hours; seasonal peak workload; leisure deficit	– nutrition and non-farm participation	Time-use surveys
Food/nutrition	Dietary diversity; food security; women's nutrient intake	+ with agency and control	DHS/NFHS; food security modules
Climate resilience	CSA adoption; diversification; biodiversity practices; shock recovery	+ with resources and agency	Climate/agriculture panels

4. RESULTS, PROPOSED MODELS, AND EXPECTED RESULTS

4.1 Results of the meta-synthesis

This synthesis yields five major conclusions. First, feminisation is diverse. While increased agricultural participation by women is always associated with increased responsibility, there is no empirical basis for claiming that all women are becoming empowered as a result. While increased participation can contribute to empowerment in cases where women have access to land, group belonging, decision-making power and other services, increased responsibility without access to any resources usually means intensifying women's workload.

Second, land and effective control matter. In almost all reviewed examples, women's possession of land and effective control of resources were more strongly related to decision-making and food-security outcomes than their participation in the workforce. The Odisha example proves that female and joint ownership of the land could help women in agricultural decision-making while the Peru example shows that women's effective ownership could contribute to increased diversity of crops and thus to food security.

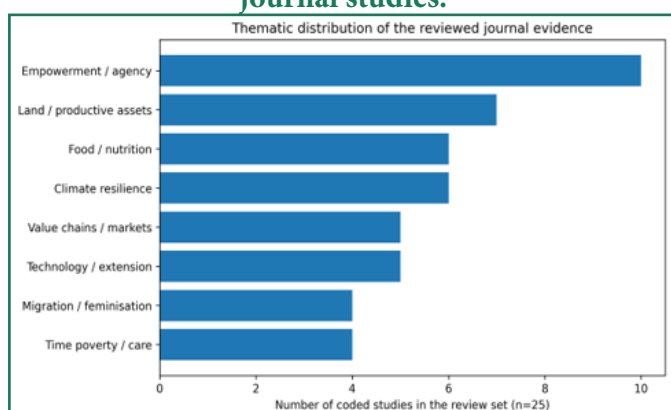
Third, time poverty is an important but neglected explanatory factor. The work performed by women in

agriculture is often overlaid on unpaid household and care work. The evidence from India shows that peak season time pressures can constrain women's nutrient consumption. The conclusion is that programs that enhance output without lightening care and labour burdens will enhance overall production while degrading the well-being of women.

Fourth, collective processes are an opportunity. Approaches involving groups, self-help groups, farmer groups, and collective marketing can boost instrumental and collective agency. But the evidence shows that group membership is not enough unless women are enabled to control assets, earnings, and decisions. It is clear that collective action is to be seen as complementary to, rather than substituting for, rights and services.

Fifth, climate and food systems transformation must be gender transformative. Climate-smart agriculture, mechanization, digital technologies, extension, and marketing can reduce constraints, but they can also perpetuate gender disparities if women are denied land, financing, information, mobility, and decision-making authority. The most significant theoretical implication is that resilience needs to be considered in relation to agency, workload, nutrition, and environment.

Fig. 1: Thematic distribution of the 25 coded journal studies.



4.2 Proposed Feminisation–Resources–Agency–Nutrition–Resilience (FRANR) model

The central proposition is that feminisation affects women's outcomes through a sequence of resource conversion and agency mechanisms. Let F_{it} denotes feminisation intensity for woman i in period t ; R_{it} the

effective resource bundle; A_{it} women's agricultural agency; T_{it} time poverty; N_{it} nutrition and food-security status; and C_{it} climate resilience. The core model is:

$$A_{it} = \beta_0 + \beta_1 F_{it} + \beta_2 R_{it} + \beta_3 \text{Collective}_{it} + \beta_4 \text{Norms}_{it} - \beta_5 T_{it} + \mu_i + \tau_t + \varepsilon_{it} \text{-----} (1)$$

Where, A_{it} represents the level of the outcome or achievement being studied for individual/household i in time period t . The model examines how different social, economic and institutional factors influence this outcome.

F_{it} represents access to or control over financial resources. Greater financial access is expected to improve the outcome, particularly by increasing economic independence and decision-making capacity.

R_{it} represents access to resources or productive assets such as land, credit, technology, employment opportunities or other economic resources. Better access is expected to strengthen the individual's ability to improve their economic and social position.

Collective_{it} captures collective participation, such as membership in self-help groups, cooperatives, community organisations or women's groups. Collective action can provide information, bargaining power, mutual support and greater participation in decision-making.

Norms_{it} represents social and cultural norms. Supportive and progressive social norms are expected to facilitate greater participation and empowerment, whereas restrictive norms may limit opportunities.

T_{it} represents constraints or traditional barriers. The negative sign before $\beta_5 T_{it}$ indicates that stronger barriers are expected to reduce the outcome. These may include restrictive gender roles, discrimination, mobility restrictions, unpaid care responsibilities or limited decision-making authority.

μ_i captures individual- or household-specific characteristics that remain relatively constant over time but may influence the outcome.

τ_t captures time-specific effects, such as changes

in government policies, economic conditions, programmes or broader social changes.

ε_{it} represents other factors affecting the outcome that are not explicitly included in the model.

This model argues that women's achievement or empowerment is shaped not by one factor alone, but by their access to financial and productive resources, participation in collective institutions, and the social environment in which they live. When women have better access to resources and participate actively in collective groups, their ability to make decisions and improve their economic position is likely to increase. At the same time, restrictive social norms and traditional barriers can weaken these gains. Thus, the model highlights the importance of combining economic support with social and institutional changes to achieve meaningful and sustained empowerment.

$$N_{it} = \gamma_0 + \gamma_1 A_{it} + \gamma_2 \text{FoodProduction}_{it} + \gamma_3 \text{IncomeControl}_{it} - \gamma_4 T_{it} + \gamma_5 \text{SocialProtection}_{it} + \mu_i + \tau_t + v_{it} \text{-----} (2)$$

Where, A_{it} (Access to assets): Better access to land, livestock, productive resources, credit, or other assets is expected to improve nutritional outcomes because women have greater resources to support household food security and their own consumption.

$\text{FoodProduction}_{it}$ (Food production): Greater involvement in food production can improve nutrition by increasing the availability of food for household consumption and reducing dependence on purchased food.

$\text{IncomeControl}_{it}$ (Control over income): When women have greater control over household or personally earned income, they are more likely to influence spending on food, healthcare, and other necessities, thereby improving nutritional well-being.

T_{it} (Time burden): The negative sign indicates that a higher time burden—particularly the combined burden of agricultural work, household work, childcare, and other unpaid responsibilities—is expected to reduce nutritional well-being. Excessive time constraints may leave women with less time for

preparing nutritious food, eating adequately, resting, or accessing health services.

$\text{SocialProtection}_{it}$ (Social protection): Access to social protection programmes, cash transfers, food assistance, pensions, or other welfare support is expected to strengthen household food security and protect women from nutritional deprivation.

μ_i : Captures characteristics of individuals, households, or regions that remain relatively constant over time, such as social structure or location-specific conditions.

τ_t (Tau t): Captures changes over time that affect everyone, such as inflation, economic conditions, climatic shocks, or policy changes.

v_{it} (Neu it): Represents other factors affecting nutritional well-being that are not explicitly included in the model.

This model examines how women's access to assets, participation in food production, control over income, time-related constraints, and social protection influence their nutritional well-being. This model also tests whether women are better nourished when they have greater access to productive assets, participate in food production, control income, and receive social protection, while also examining whether excessive time burdens undermine their nutritional well-being.

The central argument is that women's nutritional outcomes are not determined by food availability alone; they also depend on women's economic resources, decision-making power, productive participation, social protection, and the amount of time they have available for food, health, and personal well-being.

$$C_{it} = \delta_0 + \delta_1 A_{it} + \delta_2 \text{LandControl}_{it} + \delta_3 \text{Technology}_{it} + \delta_4 \text{Extension}_{it} + \delta_5 \text{Diversification}_{it} - \delta_6 \text{ClimateShock}_{it} + \mu_i + \tau_t + \xi_{it} \text{-----} (3)$$

Where, C_{it} : Agricultural/ household conditions

δ_0 (constant): Represents the expected level of C

when all explanatory factors are held at zero.

A_it (Asset ownership/access): Indicates how access to productive assets affects C. Greater access to assets is expected to improve the outcome.

LandControl_it: Captures the effect of a person's or household's control over land. Stronger control over land can provide greater security and improve productive decision-making.

Technology_it: Measures the role of access to and use of agricultural technology. Better technology is expected to enhance productivity and improve C.

Extension_it: Represents access to agricultural extension, training, advice, and institutional support. Greater extension support is expected to have a positive influence.

Diversification_it: Captures the effect of diversifying crops, livestock, or other income-generating activities. Diversification can reduce dependence on a single source of livelihood and strengthen economic resilience.

ClimateShock_it: Has a negative sign, indicating that droughts, floods, irregular rainfall, heat, or other climate-related shocks are expected to reduce C.

μ_i (Meu i) : Controls for characteristics of individuals or households that do not change over time.

τ_t (Tau t) : Captures year-specific effects, such as changes in government policies, prices, or broader economic conditions.

ξ_{it} (Zeta_it) : Represents other factors affecting C that are not directly included in the model.

This model examines the factors that influence C_{it} , which may represent a particular outcome related to agricultural or household conditions. In simple terms, it suggests that this outcome is shaped by access to assets, control over land, technology, agricultural extension services, crop diversification, and exposure to climate shocks.

Practically speaking, the theory proposes that

individuals or households will benefit more if they can control their productive resources, have land, adequate technology, knowledge about agriculture and diversified means of livelihoods. This will help them develop an ability to make money, take risks and react appropriately to changes in agriculture. On the other hand, the climate shocks are likely to diminish the benefits by affecting the crops, productivity, livelihood insecurity and putting further strain on household resources. The model thus shows that enhancing access to productive resources and institutions, along with building resilience from climate related risks is vital for improving C_{it} .

The equations suggest that feminization in itself does not carry a consistently predictable sign. β_1 will be positive if women acquire decision-making power but become negative or inconsequential if the responsibilities increase without the resources.

4.3 PROPOSED INTERGENERATIONAL MODEL

The second contribution is an intergenerational pathway. Let IG_{it} denotes the capability position of the next generation. The model is:

$$IG_{it} = \theta_0 + \theta_1 LandControl_{it} + \theta_2 WomenAgency_{it} + \theta_3 Nutrition_{it} + \theta_4 Education_{it} + \theta_5 AssetAccumulation_{it} + \theta_6 RoleModelExposure_{it} + \mu_i + \tau_t + \omega_{it} \text{ ----- (4)}$$

Where, Land Control (θ_1): This captures whether women's control over agricultural land and productive resources improves inclusive growth. Greater control over land may strengthen women's economic security, productive participation, and bargaining power within the household and community.

Women's Agency (θ_2): This represents women's ability to make decisions about income, employment, household expenditure, agriculture, and other important matters. Higher agency is expected to contribute positively to inclusive growth because women are better able to use resources for their own and their families' well-being.

Nutrition (θ_3): Better nutritional conditions can improve women's health, physical capacity, productivity, and ability to participate in economic

activities. Therefore, improved nutrition is expected to support inclusive growth.

Education (θ_4): Education enhances women's knowledge, skills, employment opportunities, awareness of rights, and ability to make informed economic decisions. A positive coefficient would indicate that better educational opportunities are associated with stronger inclusive growth.

Asset Accumulation (θ_5): This refers to women's ability to build and retain assets such as savings, livestock, productive equipment, housing, land, or other forms of wealth. Asset accumulation provides greater economic stability and reduces vulnerability to financial shocks.

Role Model Exposure (θ_6): Exposure to successful women—such as women entrepreneurs, farmers, professionals, community leaders, or elected representatives—can influence aspirations, confidence, and economic behaviour. Positive role models can encourage other women to participate more actively in economic and social activities.

μ_i (Individual/Unit Effects): This captures characteristics of individuals, households, villages, districts, or other units that remain relatively unchanged over time but may influence inclusive growth.

τ_t (Time Effects): This captures changes occurring over time, such as government policies, economic conditions, technological development, inflation, or broader social changes.

ω_{it} (Error Term): This represents other factors affecting inclusive growth that are not explicitly included in the model.

This model examines the factors that influence inclusive growth (IG) over time. It assumes that inclusive growth is not determined by economic resources alone, but also by women's control over resources, decision-making power, nutrition, education, asset ownership, and exposure to positive role models.

Simply put, the model tries to find out whether

increased control over land, increased decision-making authority of women, improved nutrition and education, increased assets, and increased exposure to positive role models help achieve more inclusive economic growth.

The model basically postulates that the level of inclusive growth increases if women have increased control over productive resources, increased freedom and authority in decision-making, increased nutrition and education, increased ownership of assets, and increased exposure to positive role models. In such an approach, women are seen not only as recipients of development but also as the sources of development in terms of their economic independence, capabilities, agency, and productive resources.

The anticipated impact chain is such that the increased effective control of women over productive assets and income increases their bargaining power; increased bargaining power will lead to proper distribution of food, investments in education and diversification of production activities; which, in turn, may influence the human capital, aspirations, career opportunities, and ownership of productive assets of daughters and sons.

4.4 Programme design model: Conservation–Cultivation–Consumption–Commercialisation (4C) model

The implication is that agricultural interventions need to assess four types of control. Conservation is about women's control of seed, biodiversity, soil, water, livestock, and indigenous ecological knowledge. Cultivation is about control of crops, inputs, labour, technology, and production. Consumption is about control of food distribution within the household, diet diversity, and nutrition. Commercialization is about marketing, pricing, contracts, revenue collection, saving, and re-investment. An intervention is said to be gender-transformative only if women progress from participating in one node to controlling many nodes.

4C domain	Minimum programme action	Outcome indicator
Conservation	Women's seed banks, biodiversity groups, water/soil committees	Control over conservation decisions; biodiversity practices
Cultivation	Women named as farmers; direct extension; labour-saving technology	Production decisions; technology adoption; productivity
Consumption	Nutrition education + women's control of food budgets	Dietary diversity; women's nutrient intake
Commercialisation	Collective marketing; price information; direct payment	Income control; bargaining power; net farm returns

4.5 Expected results and testable hypotheses

Hypothesis-1: More feminisation of agriculture responsibility raises women's workload unless there are other measures of labour-saving and institutional support.

Hypothesis-2: Effective land control has a positive correlation with women's agricultural decision making than labour participation.

Hypothesis-3: Agency among women is an intervening variable between resource control and food security at household levels.

Hypothesis-4: Time poverty will moderate the positive correlation between agricultural involvement and women's nutrition, especially during the high season of agriculture.

Hypothesis-5: Collective action makes women's ability to convert resources into bargaining capacity more effective, especially when individual market power of women is lacking.

Hypothesis-6: Access to gender-sensitive extension and technology access strengthen positive correlations between resource control by women and climate-smart agriculture adoption.

Hypothesis-7: Improved women's land control, nutrition, agency, and asset acquisition result in positive intergenerational capabilities.

5. DISCUSSION

5.1 Interpretation of findings

The first key theoretical result is that the feminisation of agriculture should not necessarily be seen as an indicator of empowerment in itself. More women in agriculture could signify more opportunity, shifting of power relations, adaptation to migration, and/or reclassification of men's unpaid work as paid women's work. They can all happen at once. This accounts for the different results found empirically: on the one hand, women become empowered, but on the other hand, they bear larger work burdens and lower efficiency.

The second key theoretical result is the central role of resource control in the transformation process. The results from India and Peru indicate why formal access to resources is not enough; women have to be able to exercise their rights and convert them into decision-making power about production, investment, credit, technology, and earnings. It follows that a gender-based land reform has to involve administrative and other implementation issues apart from just formal equality.

The third finding addresses the interface between agriculture and nutrition. The role of women as producers and managers of food does not guarantee good nutrition for themselves. Timing is key since increased engagement in agricultural production activities at peak seasons does not imply reduced domestic workload, resulting in a dual burden. In this respect, the nutrition-sensitive agriculture approach must focus on women's time utilization and nutritional intake rather than the amount of food available to households.

The fourth finding pertains to collective bargaining. Women operating in poor-resource areas encounter market thinness, lack of mobility, limited information, and imbalance in their dealings with traders. Collectives help in lowering transaction costs as well as voice. However, the evidence indicates that the success of collectives depends on asset and service reforms within which the collectives are set up.

The fifth finding has to do with climate resilience. Climate initiatives that ignore gender can worsen rather than alleviate inequality. Mechanization, irrigation, better seeds, digital advisories, crop insurance, and climate-smart approaches may prove highly valuable, but only if women have access to them and control over them. It follows that a gender transformative approach to climate change will have to take into account not just whether women adopt a new technology, but also who makes the decision, who pays, who reaps the benefits.

5.2 Comparison with previous studies

Moreover, the analysis is consistent with the current literature regarding the measurement of empowerment in that the multidimensional nature of empowerment necessitates similar measurement of agency and control (Quisumbing et al., 2023). This analysis also expands on the structural argument raised in recent reviews of food systems: resource, technology, market and service access are influenced by the norms and institutions, thus isolated actions will not be sufficient in narrowing gender gaps (Njuki et al., 2022; Lecoutere et al., 2024).

The results confirm the evidence that structural variables can account for a significant part of gender productivity gaps. The evidence from Malawi shows that productivity gaps exist between men and women despite the similarities in their endowments, emphasizing the importance of market and institutional structures (Tufa et al., 2022). This finding confirms the transition from an 'equip women' to a 'transform the structure within which women utilize resources' approach.

On the other hand, the paper challenges the reductionist understanding of the feminisation process. The recent review by Mandal et al. (2025) reveals both benefits and costs of feminisation in the wake of male out-migration. The current framework accounts for the seeming paradox through the consideration of migration impacts against the backdrop of the resource-agency-time paradigm. Feminisation empowers when responsibility goes hand in hand with rights and additional services; when responsibility increases and control does not, feminisation exploits.

Finally, the suggested 4C framework draws on value chain studies and establishes a connection between production and participation in the market and conservation and consumption. In such a way, it provides a holistic understanding of the role of women in the agri-food sector and facilitates the creation of comprehensive indicators.

5.3 Implications for policy and programmes

- Recognize women as farmers in the administrative processes, farm registries, procurement systems, extension services, insurance plans and input programs.
- Convert inheritance rights into functional rights via gendered land registration, joint titles where appropriate, cheap documentation, legal education and accessible dispute resolution.
- Measure control not participation. Program monitoring should focus on identifying who owns, manages, accesses, sells and controls agricultural assets and incomes.
- Mitigate time poverty via investments in water and energy systems, child care, labour-saving technology, labour-saving mechanization and reduced travel time for service provision.
- Develop gender responsive extension services using women's communication preferences, women extension workers when needed, flexible scheduling and access to climate and market information.
- Increase the power of collective bargaining through women-led producer organizations, self help groups, cooperatives, collective procurement, aggregation, storage and transparent pricing.
- Design nutrition into agriculture by promoting diversified production, adequate nutrition of women themselves, nutritional education and control of food-related incomes.
- Design climate resilient and biodiverse programs on the basis of women's knowledge and management capacity, not as vulnerable beneficiaries.
- Generate gender disaggregated data at a granular level on labour, land, time use, production, incomes, nutrition, climate exposure and administrative data.

5.4 Limitations

There are two primary shortcomings of the

paper. First, it is a theoretical meta-synthesis and not a statistical meta-analysis, meaning that the relationships put forth cannot be considered to be aggregated causal effects. Second, the journals may not sufficiently include studies that have not been published and those that are available only in local languages.

6. CONCLUSION

The feminisation of agriculture is perhaps one of the most significant gender-based transformations in current rural economic systems, but its significance cannot be explained simply by increasing participation of women in farm labour. Feminisation can offer the prospect of empowerment, autonomy, and spaces for agency for poor women, but equally it can mean a transfer of labour and risks without power or resources. The critical question then is whether women can translate agricultural responsibility into asset control, decision-making, income, time, nutrition, and ecological resources.

In this theoretical meta-synthesis, I offer the FRANR framework that integrates the concepts of feminisation, resources, agency, nutrition, and resilience, and intergenerational pathway whereby the skills of women today can be translated into human and productive capital of the future. I also introduce the 4Cs framework of conservation, cultivation, consumption, and commercialization for designing and implementing transformative agriculture programs.

This implies that the implications of the policies would need to be clear. The implication for policies would entail that there needs to be an end to viewing women as an anonymous labour force and beneficiaries of any intervention. The legal reforms would also need to be complemented by institutional mechanisms; technology would need to be complemented by access and control; climate resilience would need to be complemented by agency; and productivity would need to be complemented by nutrition and good time-use.

Future studies could attempt testing the model using panel data sets that include information on the records of land, time use, migration, agriculture, nutrition, climate exposures, and women's

empowerment. Attention would need to be given especially to inter-generational impacts of daughters and sons, seasonality, caste/class differences, and the distinction between de jure and de facto rights. This would enable taking the discussion not about whether agriculture is becoming feminised, but rather what institutional arrangements make feminisation a path toward rural transformation?

REFERENCES

1. Agarwal, B., & Mahesh, M. (2023). Does the landowner's gender affect self-cultivation and farm productivity? An analysis for India. *The Journal of Development Studies*, 59(5), 758–777. <https://doi.org/10.1080/00220388.2022.2162883>
2. Aziz, N., He, J., Raza, A., & Sui, H. (2022). A systematic review of review studies on women's empowerment and food security literature. *Global Food Security*, 34, 100647. <https://doi.org/10.1016/j.gfs.2022.100647>
3. Barooah, P., Alvi, M., Ringler, C., & Pathak, V. (2023). Gender, agriculture policies, and climate-smart agriculture in India. *Agricultural Systems*, 212, 103751. <https://doi.org/10.1016/j.agry.2023.103751>
4. Bryan, E., Alvi, M., Huyer, S., & Ringler, C. (2024). Addressing gender inequalities and strengthening women's agency to create more climate-resilient and sustainable food systems. *Global Food Security*, 40, 100731. <https://doi.org/10.1016/j.gfs.2023.100731>
5. Clay, N., & Yurco, K. (2024). Beyond the 'gender gap' in agriculture: Africa's Green Revolution and gendered rural transformation in Rwanda. *Journal of Rural Studies*, 112, 103444. <https://doi.org/10.1016/j.jrurstud.2024.103444>
6. Elias, M., Zaremba, H., Ragasa, C., Valencia, A. M. P., Choudhury, A., & de Haan, N. (2024). Towards gender equality in forestry, livestock, fisheries and aquaculture. *Global Food Security*, 41, 100761. <https://doi.org/10.1016/j.gfs.2024.100761>
7. Genicot, G., & Hernandez-de-Benito, M. (2022). Women's land rights and village institutions in Tanzania. *World Development*, 153, 105811. <https://doi.org/10.1016/j.worlddev.2022.105811>
8. Haque, S. (2024). Women's empowerment and its role in household food security to achieve SDGs: Empirical evidence from rural Bangladesh. *Sustainable Development*. <https://doi.org/10.1002/sd.2893>
9. Heckert, J., Martinez, E. M., Sanou, A., Pedehombga, A., Ganaba, R., & Gelli, A. (2023). Can a gender-sensitive integrated poultry value chain and nutrition intervention increase women's empowerment among the rural poor in Burkina Faso? *Journal of Rural Studies*, 100, 103026. <https://doi.org/10.1016/j.jrurstud.2023.103026>
10. Hidrobo, M., Kosec, K., Gartaula, H., Van Campenhout, B., & Carrillo, L. (2024). Making complementary agricultural resources, technologies, and services more gender-responsive. *Global Food Security*, 42, 100778. <https://doi.org/10.1016/j.gfs.2024.100778>
11. Julien, J. C., Bravo-Ureta, B. E., & Rada, N. E. (2023). Gender

- and agricultural productivity: Econometric evidence from Malawi, Tanzania, and Uganda. *World Development*, 171, 106365. <https://doi.org/10.1016/j.worlddev.2023.106365>
12. Julien, J. C., Bravo-Ureta, B. E., & Rada, N. E. (2025). Gender differences in agricultural productivity: Puzzling evidence from West Africa. *World Development*, 187, 106856. <https://doi.org/10.1016/j.worlddev.2024.106856>
13. Kumar, N., Raghunathan, K., Quisumbing, A., & Scott, S. (2024). Women improving nutrition through self-help groups in India: Does nutrition information help? *Food Policy*, 128, 102716. <https://doi.org/10.1016/j.foodpol.2024.102716>
14. Leder, S. (2022). Beyond the 'feminization of agriculture': Rural out-migration, shifting gender relations and emerging spaces in natural resource management. *Journal of Rural Studies*, 91, 157–169. <https://doi.org/10.1016/j.jrurstud.2022.02.009>
15. Nanda, M., & Ghosh, S. (2025). How does male out-migration impact the lives of left-behind women? Trade-off between feminization of agriculture and empowerment of farm women. *Evaluation and Program Planning*, 111, 102603. <https://doi.org/10.1016/j.evalprogplan.2025.102603>
16. Njuki, J., Eissler, S., Malapit, H., Meinzen-Dick, R., Bryan, E., & Quisumbing, A. (2022). A review of evidence on gender equality, women's empowerment, and food systems. *Global Food Security*, 33, 100622. <https://doi.org/10.1016/j.gfs.2022.100622>
17. Perelli, C., Cacchiarelli, L., Peveri, V., & Branca, G. (2024). Gender equality and sustainable development: A cross-country study on women's contribution to the adoption of climate-smart agriculture in Sub-Saharan Africa. *Ecological Economics*, 219, 108145. <https://doi.org/10.1016/j.ecolecon.2024.108145>
18. Pyburn, R., Slavchevska, V., & Kruijssen, F. (2023). Gender dynamics in agrifood value chains: Advances in research and practice over the last decade. *Global Food Security*, 39, 100721. <https://doi.org/10.1016/j.gfs.2023.100721>
19. Quisumbing, A. R., Cole, S. W., Elias, M., Faas, S., Galiè, A., Malapit, H. J., Meinzen-Dick, R. S., Myers, E., Seymour, G., & Twyman, J. (2023). Measuring women's empowerment in agriculture: Innovations and evidence. *Global Food Security*, 38, 100707. <https://doi.org/10.1016/j.gfs.2023.100707>
20. Quisumbing, A. R., Meinzen-Dick, R., Malapit, H. J., Seymour, G., Heckert, J., Doss, C., Johnson, N., Rubin, D., Thai, G., Ramani, G., & Myers, E. (2024). Enhancing agency and empowerment in agricultural development projects: A synthesis of mixed methods impact evaluations from the Gender, Agriculture, and Assets Project, Phase 2 (GAAP2). *Journal of Rural Studies*, 108, 103295. <https://doi.org/10.1016/j.jrurstud.2024.103295>
21. Quisumbing, A. R., Meinzen-Dick, R., & Malapit, H. J. (2022). Women's empowerment and gender equality in South Asian agriculture: Measuring progress using the project-level Women's Empowerment in Agriculture Index (pro-WEAI) in Bangladesh and India. *World Development*, 151, 105396. <https://doi.org/10.1016/j.worlddev.2021.105396>
22. Schling, M., & Pazos, N. (2024). Effective land ownership, female empowerment, and food security: Evidence from Peru. *World Development*, 181, 106680. <https://doi.org/10.1016/j.worlddev.2024.106680>
23. Slavchevska, V., Acosta, M., Ndiaye, T., & Park, C. M. Y. (2024). Gendered pathways for resilient and inclusive rural transformation. *Global Food Security*, 43, 100818. <https://doi.org/10.1016/j.gfs.2024.100818>
24. Tufa, A. H., Alene, A. D., Cole, S. M., Manda, J., Feleke, S., Abdoulaye, T., Chikoye, D., & Manyong, V. (2022). Gender differences in technology adoption and agricultural productivity: Evidence from Malawi. *World Development*, 159, 106027. <https://doi.org/10.1016/j.worlddev.2022.106027>
25. Vemireddy, V., & Pingali, P. L. (2021). Seasonal time trade-offs and nutrition outcomes for women in agriculture: Evidence from rural India. *Food Policy*, 101, 102074. <https://doi.org/10.1016/j.foodpol.2021.102074>
26. Waid, J. L., Wendt, A. S., Sinharoy, S. S., Kader, A., & Gabrysch, S. (2022). Impact of a homestead food production program on women's empowerment: Pro-WEAI results from the FAARM trial in Bangladesh. *World Development*, 158, 106001. <https://doi.org/10.1016/j.worlddev.2022.106001>