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Gender-sensitive integrated farming system: A framework for promoting enhanced women participation and food security

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Abstract

A Gender-Sensitive Integrated Farming System (IFS) provides a sustainable approach for small and marginal farmers, focusing on establishing a resilient production system that ensures consistent food supplies and income, particularly on marginal lands. A gender-sensitive IFS advocates addressing the unique needs and challenges faced by both men and women in agriculture across five essential areas: gender division of labour, resource efficiency, climate resilience, continuous income, and family nutrition. Promoting gender equality in labour allocation through gender analysis, sensitization programs, and equal access to resources can foster more balanced labour divisions and improve gender relations within farming households. Engaging both genders in resource assessment and decision-making can ensure equitable resource utilization. The integration of climate resilience, with gender-inclusive strategies in crop diversification, sustainable land and water management, adaptive livestock management, and climate-resilient technologies can enhance the system's adaptability to environmental challenges. Consistent income flow in IFS can be promoted through cooperative investment planning and resource optimization, with gender analysis identifying specific needs for a responsive system. Gender-responsive nutri-farming models can further strengthen family nutrition, involving women in decision-making and promoting agri-practices that address household food and nutrition security. This approach empowers farm women, ensuring they play a vital role in achieving both economic stability and improved family nutrition through equitable agricultural practices.

Keywords: Gender-sensitive integrated farming system (ifs), resource efficiency, climate resilience, gender equity and nutri-farming

Introduction

The modern agricultural system faces several challenges such as environment degradation, resource scarcity, distressed production, and low economic returns, thus challenging the sustainability of small and marginal farmers (Babu *et al.*, 2021) ^[5]. Addressing the livelihood and nutrition security of farm families requires an integrated approach including multiple components, with efficient resource mobilization, continuous income flow and crop diversification. An integrated farming system (IFS) encompasses several components such as crops, dairy, poultry, and fisheries for increasing productivity of farm, its profitability and environmental sustainability (Fatima *et al.*, 2023) ^[14]. It also serves as a sustainable alternative to commercial farming systems, especially for small and marginal farmers with a focus on developing a permanent production system with guaranteed food and farm income from marginal lands (Devasenpathy *et al.*, 1995) ^[11]. In many developing countries, agriculture is a family-centered occupation where women work alongside their husbands, performing various activities both on the farm and within the household. Women play an important role in smallholder agricultural production and integrated farming system, which offers a potential domain for farm women to enhance their socio-economic conditions (Nahid *et al.*, 2017) ^[23]. There are several factors, which limits women's

participation and contributions in IFS and are mostly governed by societal laws and gender norms, which limit farm women access to agri-resources, results in their poor capacity building and limit their decision-making power as well as technology adoption (Wulandari, 2023) ^[37]. Amongst several factors, gender sensitivity is one of the crucial factors which influence the efficacy of agricultural interventions in addressing nutrition, livelihood, and entrepreneurship. Empowering women farmers and bringing gender equity are considered as prerequisites in achieving global food security. Several studies have reported the significance of Integrated Farming Systems for small-holder agriculture, however inconclusive evidences of Gender-sensitive Integrated Farming System are available. In this paper attempt has been made to formulate a Gender-Sensitive Integrated Farming System framework for promoting gender equity and improved food security. The framework encompasses gender sensitivity across five broader areas viz., Gender division of labours, Efficient utilization of resources, Climate resilience, Continuous income flow and family nutrition. Gender sensitization in each aspect of planning and execution of activities of an IFS will promote enhanced gender equity in the production system, with its broader goals to achieve food security and improved family nutrition.

Roles and issues of farm women in Integrated Farming System

In an integrated farming system both male and female farmers are involved and both the counterparts contribute equally to the multifarious activities in different components of IFS. The gender roles involving timely and judicious participation of farm families have a significant bearing on the development of the production systems (Paul *et al.*, 2015) ^[25]. Women work more hours in farm than men. In both plain and hilly region, it has noticed that activities like land preparation, irrigation, application of fertilizer and manures etc were exclusively performed by male members of the family. However, activities like sowing of seed (72%), weeding (85%), harvesting (50%), winnowing (98%) etc were performed by female members. In livestock enterprise, majority of the activities were performed by the female. While, in poultry and fishery enterprise, there was

equal contribution from both male and female. The extent of female participation in agri-activities was more in hilly areas than in plains. The similar findings revealed by Dhaka *et al.* (2009) ^[13] indicated that some of the operations such as manuring, weeding, harvesting, transplanting are quite arduous and mostly performed by female, even in male dominated operations, women perform a supportive role. Farm women have a greater role in waste recycling and environment enhancing activities (Setboonsarng, 2002.) ^[29]. In small farming systems, women are largely responsible for the selection, improvement, and adaptation of plant varieties. Tiwari *et al.* (1996) ^[33] reported that the women participated up to 90% in livestock-based activities in the arid regions. The gender roles and participation various from IFS to IFS and gender systems are diverse, complex and vary across regions, communities, and countries (Alkire *et al.*, 2013) ^[3].

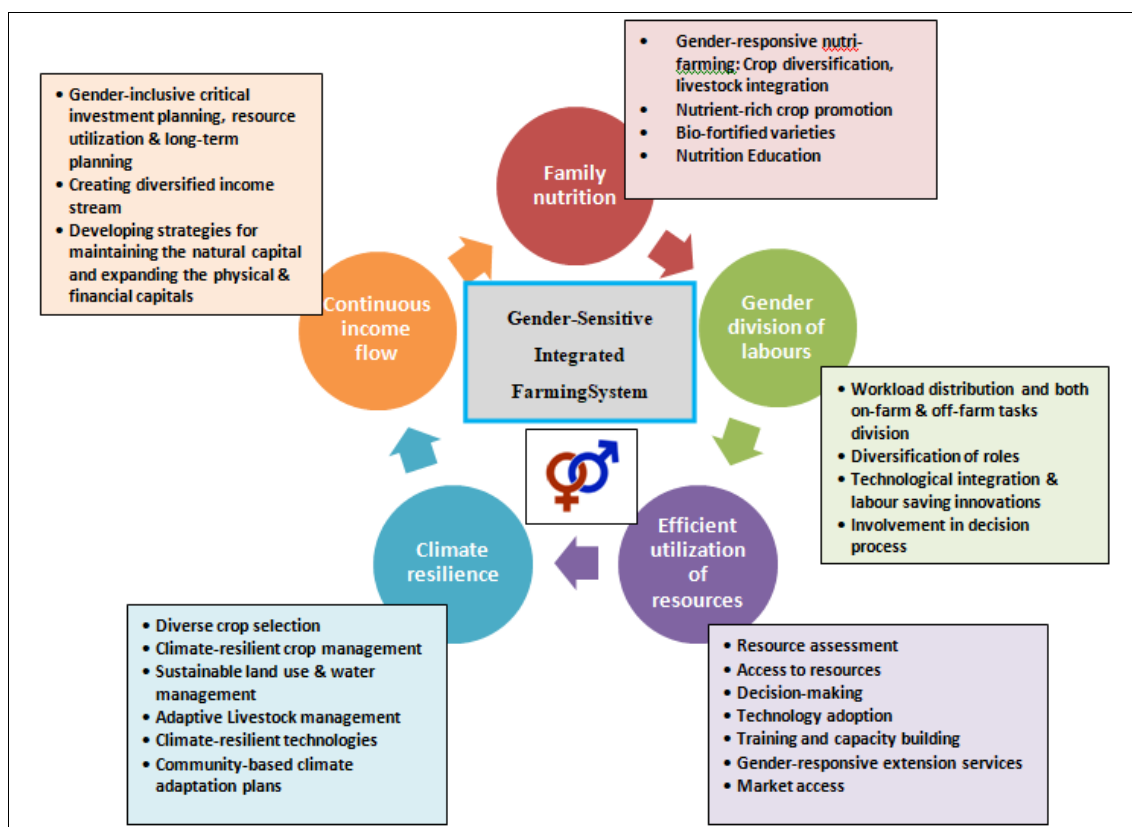
Table 1: Gender issues in Integrated Farming Systems

S. No.	Gender issues and constraints in IFS	Source
1	Women's special needs, preferences and constraints are not considered when innovations for the design or improvement of farming systems are developed	Hemminger <i>et al.</i> , 2014 ^[17]
2	Feminization of agriculture in the long run is expected and developing women-centric farming system models will be a real challenge as men are migrating to rural non-farm sectors	Soni <i>et al.</i> , 2014 ^[32]
3	Economic motivation, market orientation, experience in integrated farming systems, social participation, material possession, annual income, and education level are some of the factors that influence women's participation in decision making in smallholder integrated farming systems.	Innazent <i>et al.</i> , 2022 ^[18]
4	Women are marginalized and take very minor part in leadership and other administration issues both at family, community and other higher levels.	Bizinde and Shukla, 2017 ^[9]
5	Less extension services regarding farming system and Lack of training facility are the major problems women encounter in involving integrated farming activities	Nahid <i>et al.</i> , 2017 ^[23]
6	Women's participation and contributions in IFS are hindered by gender norms, limited access to resources, low adoption of technology and unequal decision-making power.	Wulandari, 2023 ^[37]

Gender-Sensitive Integrated Farming System

An IFS typically aims for enhanced productivity, profitability, sustainability and food security. Resource mobilization, environment resilience, adoption of improved technologies, continuous income and employment generation are some critical aspects of IFS. It also meets the household requirement of feed, fodder, fuel and encourages crop diversification, afforestation. It also promotes agricultural oriented industry and eventually improve standard of living of farming community. A gender-sensitive IFS will enable to foster gender equity in the system by providing approaches that promote equal participation and opportunities for both the genders. The gender analysis of the farming system and the relationship between gender elements and various components of IFS can make it gender-sensitive. Quisumbing *et al.* (2010) ^[27] advocated that to achieve sustainable and equitable food

systems, it is necessary to adopt a gender-sensitive integrated farming system that encompass a holistic approach which considers the specific needs, roles of both men and women and addresses the unequal access to resources, services, and decision-making power within farming communities. In this framework, gender-specific interventions are integrated in various dimensions of IFS viz., Gender-division of labour, efficient utilization of resources, climate resilience, continuous income flow and family nutrition. Behera *et al.* (2015) ^[8] also suggested that for an absolute IFS, some essential criteria such as environmental sustainability, nutritional security, energy self-sufficiency and climatic adaptability are fundamentally required. An IFS model should guarantee adequate income generation and employment opportunities to augment the livelihood of the farm family.



Gender-Sensitive Integrated Farming System: A conceptual framework for promoting gender equity and improved food security

Gender division of labours

The functioning of an Integrated Farming System is dependent on several factors such as input availability, resource mobilization, technology interventions, market linkages, etc. Each of these factors is required to be executed timely by the farm members through work division, skill enhancement and collective action. The members of family are important resource in IFS and there is limited reliance on hired labours. The gender division of labour as described by UNESCO is the outlook of each society and how it distributes work among men and women according to what is considered suitable or appropriate to each gender (Ruprecht, 2005). In the context of small-scale farming, the household's gender division of labour describes which agricultural and domestic tasks are normally done by men, which by women and which are done jointly. The gender division of labour can be an important factor for efficient management of IFS and suitable work division with sharing of workload can appear promising in improving farm productivity in long run. In a farming system ecosystem, the roles of farm household are mostly differentiated into three basic categories viz., labourers, decision makers and owners/investors. In addition to farm activities, these households also participate in their existing household and community designated social works. The allocation of these roles among household members and genders varies depending on specific local context, individual arrangements, social construct, individual's level of empowerment and decision-making ability. Hemminger *et al.* (2014) ^[17] indicated that work division among gender influences decision-making process and labour availability in the farm. The major factor which has high degree of influence on division of labour at household and farm labour

is gender-based societal norms, which restrict the mobility of farm women while also providing evidence of their significant influence in agricultural decision-making (Djurfeldt *et al.*, 2018) ^[15]. Furthermore, these norms at the household and village levels intersect with the broader institutional and political context. Thus, gender division of labour is not only a significant factor at intra-household and domestic level but also play a determining role in the economic terms. The decision-making ability of an individual is also linked with their level of empowerment and it involves the process of deliberately selecting the strategic approach to achieve a desired objective (Singh *et al.*, 2015) ^[31]. In case of farm women, the extent of their economic motivation and social participation has a distinguished impact on their level of involvement in decision-making (Das *et al.*, 2022) ^[10]. With 'Feminization of agriculture', the phenomenon of farm women's increasing role in food production is increasing, however poor decision-making ability, limited access to agri-resources and overburdening workload may lead to 'feminization of poverty'. The extent of farm women participation in decision making process in farmstead that functions integrated farming systems, is a decisive aspect in the success of integrated farming systems. Innazent *et al.* (2022) ^[18] suggested that improved participation of women in decision making in integrated farming systems can contribute to improved farming practices, efficient distribution of resources, and potentially higher profits to farm and increased income to household.

Enhancing women's educational status is crucial in empowering them for their expanding roles in agriculture and managing household resource (PDFSR, Farming Systems, 2013) ^[26]. Gender analysis of farming system,

organization of gender-sensitization programmes to promote gender equality and ensuring equal access to resources can influence the gender division of labour. Additionally, the interventions such as region-specific trainings, skill development programmes, and critical need-based support, labour saving and production enhancing farming technologies can also contribute to empowerment of resource-poor farm women in subsistence farming. The gender division of labour and its determining factors are essential elements for ensuring sustainability of the farming system. Judicious utilization of family labour and its integration with innovative farming techniques, labour saving technologies can improve the overall household income.

Efficient utilization of resources

The IFS like other environmentally resilient agricultural production system facilitate an efficient resource recycling mechanism and promotes bio-resource flow among several production components which ultimately reduces the input cost and environmental pollution. Rathore *et al.* (2022) ^[28] described IFS as a circular economy-based agricultural production system that depends on principle “take-make-waste”. Resource assessment of IFS involves estimating the available resources to maximize its use efficiency and enhance the farm productivity and profitability. Gender-inclusive resource assessment refers to equal participation of men and women in assessing the IFS resources and decision-making in its equitable utilization. For equitable resource utilization, equal and equitable access to resource is a critical factor. In general, farm women lack access and control over resources such as land, capital, agricultural inputs, and technologies such as improved crop varieties, skill-upgradation programmes, technology information, and marketing services (Fletschner and Kenney, 2014) ^[16]. There is interrelatedness in the issues of farm women, poor access to resources is based on evidences of farm women having unmanageable workload, lack of financial empowerment and self-decision-making power (Alkire *et al.*, 2013) ^[3]. A resource in IFS can be categorized as both tangible and non-tangible with agri-inputs and physical infrastructure as tangible resources, while training programmes, extension services and assured market as non-tangible resources. A gender-sensitive IFS advocates that all the agri-inputs such as land, water, seeds, fertilizers, agricultural machineries, various production units viz., vermicompost unit, mushroom unit, fish pond, cattle shed, apiary unit etc. should be equitably shared in terms of access, utilization and benefit sharing among family members. Technology as a resource should essentially be customized according to family needs and should be practiced by both male and female members (Aker *et al.*, 2017) ^[2]. Additionally, the skill development programmes should preferably be organized as per the requirement and convenience of female farmers to enhance their knowledge in utilization of resources and participation in IFS activities. The popularization of the gender-friendly technologies should ideally be mediated through gender-responsive extension services aiming to address the exclusive needs, roles and constraints faced by both men and women farmers. Additionally there should be provision and mechanism for equitable access to agricultural information, technologies and resources for all genders.

Small and marginal farmers face several challenges due to complex market structure. Women farmers particularly face inadequate access to market outlets. Thus, creating adequate market opportunities can also constitute a substantial resource base for resource constrained farm families. Reducing gender gaps in market access will create a gender-sensitive ecosystem in IFS. The CGIAR Gender and Agriculture Research Network also places a strong emphasis on increasing women's control over resources and income. Since IFS is a family-based approach, the households constitute the unit in which resources should be shared and decision about resource utilization should be made equitably with co-operation of male and female household members (Kauck *et al.* 2010) ^[20]. Improving gender relations are important as the household, its resources, and the resource flows and interactions at this individual farm level are together referred to as a farming system (FAO, 2011) ^[1].

Climate resilience

In the context of changing climate scenario which imposes threat to agricultural production system, IFS appears as a promising approach with enhanced climate resilient features. The increasing role of women in smallholder agriculture is categorically placing rural farm women at a higher risk of adverse climatic impacts (Kakota *et al.*, 2011) ^[19]. The heightened climate vulnerability of smallholder farm women is mostly associated with limited access to resources, insufficient access to effective adaptation strategies and inadequate social protection. The gendered social norms and multiple roles of burdening household and farming activities, amidst migration of male members of households to urban areas further aggravates her vulnerability. The climatic vulnerability of the entire farm family overall impacts their adaptive capacity which, in turn, can significantly impact the resilience and success of Integrated Farming Systems (Wright and Chandani, 2014) ^[36]. Integrating gender-sensitivity and climate resilience in IFS would involve factors such as gender-inclusive decision in diverse crop selection, climate-resilient crop management, sustainable land use and water management, adaptive livestock management, climate-resilient technologies and local climate-resilience strategies. Food and Agriculture Organization of the United Nations (2011) also emphasized the importance of Gender roles and relations and gender participation as essential elements for sustainable development and climate change adaptation. Socio-economic and gender analysis is a critical step for gender-appropriate climate-smart agriculture. It is essential to understand the socially differentiated roles, responsibilities, priorities and resources of gender at both household and community levels for formulating gender-equitable agricultural policies and programmes (Kristjanson *et al.*, 2014) ^[21]. Involving a synergistic combination of several agricultural entities, such as crop cultivation, livestock management, poultry, aquaculture, apiary, mushroom, fruits, vegetables, plantation crops, spices, medicinal plants and agroforestry etc. IFS provides a stable and sustainable production system which enables in risk minimization and withstanding climatic shocks (Ayyappan and Arunachalam, 2013) ^[4]. In IFS there is also efficient waste utilization which also helps to reduce greenhouse gas (GHG) emissions and the pollution of ground water

reserves. The combination of diverse agri-enterprises in IFS allows biodiversity maintenance, thus playing a significant role in supplying ecosystem services (Tuomisto *et al.*, 2012)^[34]. An IFS pays more attention to effective resource use and nutrient recycling, thus making the farming less reliant on external inputs, which helps in minimizing environmental pollution occurring due to indiscriminate use of external inputs (Shukla *et al.*, 2002)^[30].

Continuous income flow

Integrated Farming Systems aim at increasing income of small-holder farmers through continuous year-round production from different enterprises and reduced input cost by efficient resource mobilization (Behera *et al.*, 2019)^[7]. To maintain a consistent income stream, the farm families should collectively focus on crucial investment planning, optimizing resource usage, and long-term strategies. In each process gender equitable approach is necessary to ensure equal participation by men and women. For continuous income generation in IFS, in addition to diversified income sources, the natural capital should also be maintained and physical capital and financial resources of the system should also be expanded. Paul *et al.* (2015)^[25] recommended that skill of farmers' especially female farmers should be strengthened by providing technical knowledge on various components so that the farm household get a consistent income throughout the year from their farming system. Kumar *et al.* (2013)^[22] indicated that a farm family can have a continuous flow of money from IFS through meticulous planning for batch production of variety of farm produce (*viz.*, cereals, pulses, milk, egg, poultry, fish, vegetables, fruits etc.). In addition to multiple enterprises, diversified farming approaches such as intercropping, mixed cropping, multiple cropping crop rotation, contour strip cropping, cover crops and agroforestry also help to minimize risk and enhance farmers' income (Ayyappan and Arunachalam, 2013)^[4]. In comparison to single enterprise farm, IFS has the potential to improve farm profitability by 265% and employment opportunities by 143% (Paramesh *et al.*, 2022)^[24]. The product diversification in IFS especially through integration of livestock component (dairy, goater, poultry and piggery) has the potential to generate daily income for small and marginal farmers as these enterprises act as farm insurance at the time of crop failure. Behera and France (2016)^[6] indicated IFS as tool to double the income of farmers and as a prospective approach for rural entrepreneurship. Integration of gender dimensions in the component of income generation of IFS can bring economic empowerment of farm families.

Family nutrition

Integrated farming systems assures food and nutrition security along with sustaining environmental quality. Integration of crops, livestock, fishery and other allied activities, increases better food availability and nutrition security in comparison to intensive production systems relying on single farm enterprise (Paramesh *et al.*, 2022)^[24]. The crop diversification in IFS ensures regular availability of staples, legumes, oilseeds, fresh fruits and vegetables. Wezel *et al.* (2014)^[35] reported that introduction of legumes, vegetables, oilseed crops and agroforestry system improve nutritional security in an IFS. Inclusion of nutrient

rich crops, bio-fortified varieties, and increasing awareness and sensitization among farm families through nutrition education programmes will promote nutrition security in existing IFS models. Integration of livestock component in IFS is significantly important for poor small and marginal farmers to meet the protein requirement of farm families through provision of eggs, milk, and meat (Devendra and Thomass, 2002)^[12]. Facilities for on-farm processing and value addition will also provide additional nutrition security dimension through provisioning of nutrient-rich value-added products during lean periods. A gender analysis to identify the needs of various members in a family will make the IFS gender-responsive. Adopting Gender-responsive nutri-Farming models will also augment the nutritional requirement of farm families. A gender-sensitive IFS aiming at improving family nutrition, should critically involve farm women in every decision-making process and promote gender-equitable agricultural practices for empowering farm women in addressing food and nutrition security of their households.

Conclusion

IFS works as a system of systems and optimizing the total system would involve synergism between various enterprises and activities. Gender-Sensitive Integrated Farming System (IFS) will offer a transformative framework for promoting women's active participation in agriculture, ensuring equitable access to resources, and strengthening household food security. By addressing gender-specific needs in areas like labour division, resource utilization, climate resilience, nutrition security and income stability, this approach can empower farm women to make vital contributions in to agricultural productivity and sustainability. Through inclusive training, decision-making opportunities, and tailored support, a Gender-Sensitive IFS can help reduce gender disparities, foster economic resilience, and enhance the nutritional well-being of rural households. Ultimately, this framework will only uplifts farm women but also creates a more resilient, sustainable, and food-secure future for farming communities.

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