

Gender Dynamics in Agricultural Innovation: Insight from Soybean Adoption

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Abstract:- We found that gender relations significantly determine the use of innovation as well as the level of change in farming systems in the Smallholder Farming Systems (SHFs). This paper analyzes the controversies surrounding the gendered nature of technologies for soybean production, especially in terms of how male and female producers gain access to, and utilise, and accrue the benefits of soybean technology. Using cross-sectional data and examples from several successful textile case studies, the paper underscores difficulty in obtaining funding, decision-making, and extension services. Through the study, it was found that women farmers produced more crops but they lacked access to purchase improved soybean seeds, trainings and markets. (Quisumbring & Pandolfelli, 2010; Meinzen-Dick Et AL., 2011).

The study demonstrates that gender aspect of soybean farming benefication is gendered by existing socio- cultural and structural factors. But where they are given specific information, gender sensitive capacity building and training, as well as other infrastructure inputs, women farmers show high levels of uptake and productivity (Njuki Etal., 2016; Kassie Et AL., 2015). This paper establishes that there is need to have policies and programmes that redress the above disparities and encourage women participation in innovative agriculture.

In as much as this paper looks at the gender and soybean adoption, this work sits within the larger academic narrative on gender in agriculture with a view to address how to tap on the potential that women farmers hold in today's changing society to embrace sustainable practices. Others are about focusing the gender dimension of agricultural services for extension, supporting formation of women's groups, and development of market initiatives that will facilitate women in soybean value chains. These interventions present the possibility of nonzero sum, both in a global and intra-generation equity sense, as well as enhanced rural nonfarm income (Doss, 2018; Beuchelt & Badstue, 2013).

Keywords:- Gender Dynamic, Soybean Adoption, Agricultural Innovation, Women Farmers, Gender- Sensitive Policies.

I. INTRODUCTION

Technological advance in agriculture has for a long time been seen as critical in dealing with issues of food deficiency, poverty eradication, and stimulation of generational wealth among peasants in the developing world (Traore, A., 2013). Among these innovations soybean farming has emerged as one of the most popular farming systems due to its nutritional value as food, as input to improve the fertility of the soil through nitrogen fixing and its potential to produce income among the **Smallholder Farming Systems** (SHFs) (Sseguya Et AL., 2019; Giller & Delaune, 2021). Despite this, the uptake and potential of such innovations are still not evenly spread within the farming areas with gender playing a role in who gets to engage, how and what their returns will be (Ragasa Et AL., 2013).

Gender analysis in agricultural systems shows that women and men are not only differently positioned in access to resources, decision-makers, and deployment of new technologies. Female labour force, which constitutes the largest number of people working in agriculture, is subjected to constraints including; restricted land rights, access to credit, training and extension services amongst others (Hill & Vigneri, 2014; Seymour & Peterman, 2018). These constraints not only limit their efforts in adopting the innovative practices but also the overall intervention function of these technologies in enhancing the wellbeing of households and community. These gender dynamics are defined below and brought into focus through the case of soybean adoption to consider their role in realizing more inclusive agricultural transformation.

Using a cross sectional survey, this paper aims at establishing the influence of gender in agricultural innovation with special reference to soybean adoption. With evidence from different parts, it demonstrates the gender gaps in traction of as well as gains from soybean based technologies (Quisumbring & Pandolfelli, 2010). In addition, this paper explores the socio, cultural and structural relations within which these disparities exist and proposes the prospects as well as the constraints for creating gender equality in innovation in the agricultural sector (Meinzen-Dick Et AL., 2011).

The objectives of this study are threefold: First, it reveals how gender relations affect the adoption of soybean technologies; second, it examines the opportunities and constraints of women farmers in soybean production; and third, it suggests gender-sensitive policy and program recommendations. In attaining these objectives, this paper connects to the existing literature on gender and agriculture, with practical insights on how innovation that supports women farmers can be implemented to improve productivity, economic returns, and the quality of life of farming households (Njuki Et al., 2016; Farnworth Et Al., 2019).

II. LITERATURE REVIEW

A. Gender Roles in Agriculture

This paper deals with the gender issue within agriculture, in which several studies made the center of analysis the relations between gender and agriculture, and how other various factors influence men and women into engaging in farming. A huge percentage of women are engaged in farming at a global level particularly in the developing world but their effort is either underpaid or unrecognized (Doss, 2018; Farnworth Et Al., 2015). Research shows that women are largely involved in activities that require heavy manual work including planting, weeding and harvesting than men who dominate activities that involve decision making and things with high market value. Each of these roles affects women's opportunities to acquire agricultural advancement for instance improved seeds like soybean (Ragasa Et Al., 2013).

B. Take-up of Agricultural Technologies

The factors that determine the level of adoption of agricultural innovation comprises of; access to resources, access to information, and the society and culture. To some extent, research in the area borrowed theories such as Rogers' Diffusion of Innovations to explain how new practices are adopted in farming communities (Seymour & Peterman, 2018). According to some of the studies that have been conducted, gender is said to play a big role in influencing the rate of adoption. For instance, women farmers are significantly less likely than their male counterparts to receive extension and training, which is important for accessing improved crop varieties. As a result, women also lack controlling of land and financial resources which in return reduces their bargaining power to invest in new technologies (NJUKI ETAL., 2016).

C. Social Differences Resulting from Soybean farming

Soybean has become an innovation crop because it enhances both household food security and income. Nevertheless, its adoption show various disparities especially in gender. Literature on soybean marketing pathways from sub-Saharan Africa and South Asia confirms that men have the power to market soybeans even though women contribute significantly in production (Giller & Delaune, 2021; Sseguya Et Al., 2019). They also find it difficult to have access to improved seeds, fertilizers and pest management technologies as these organization requirements. On the other hand, those interventions that are proactive into adopting gender sensitive measures like women trainings and form4 cooperatives, have recorded positive results that have given women the ability to improve on productivity and income (Farnworth Et Al., 2019).

D. Patterns and Trends in Gender Discrimination through the Lens of Structural Factors of Agriculture Innovation.

Women also experience other structures that framework them within constraints such as unfavourable land tenure systems, financial sector exclusion and marginalization from decisions that affect agriculture. For instance, women usually lack ownership and or control of land and property assets hence most of the time they cannot get credit or enroll programs that require collateral (Njuki et al., 2016).

E. Best Practices from Gender-Inclusive Programs

Lessons learned from best practices of gender-responsive programs for female students refute these barriers. Measures like gender in mitigating the gender gaps in agriculture extension services, formation of women's cooperative groups and access to inclusive value chains has been observed to have the potential in order to reduce the gender gaps. For instance implemented in East Africa projects, indicating that Gendered training increased the usage of soybean technologies and over all wellbeing of the household. These magnified examples offer important lessons in how to optimize intervention approaches for enhancing equity of agricultural innovation (Farnworth Et Al., 2019).

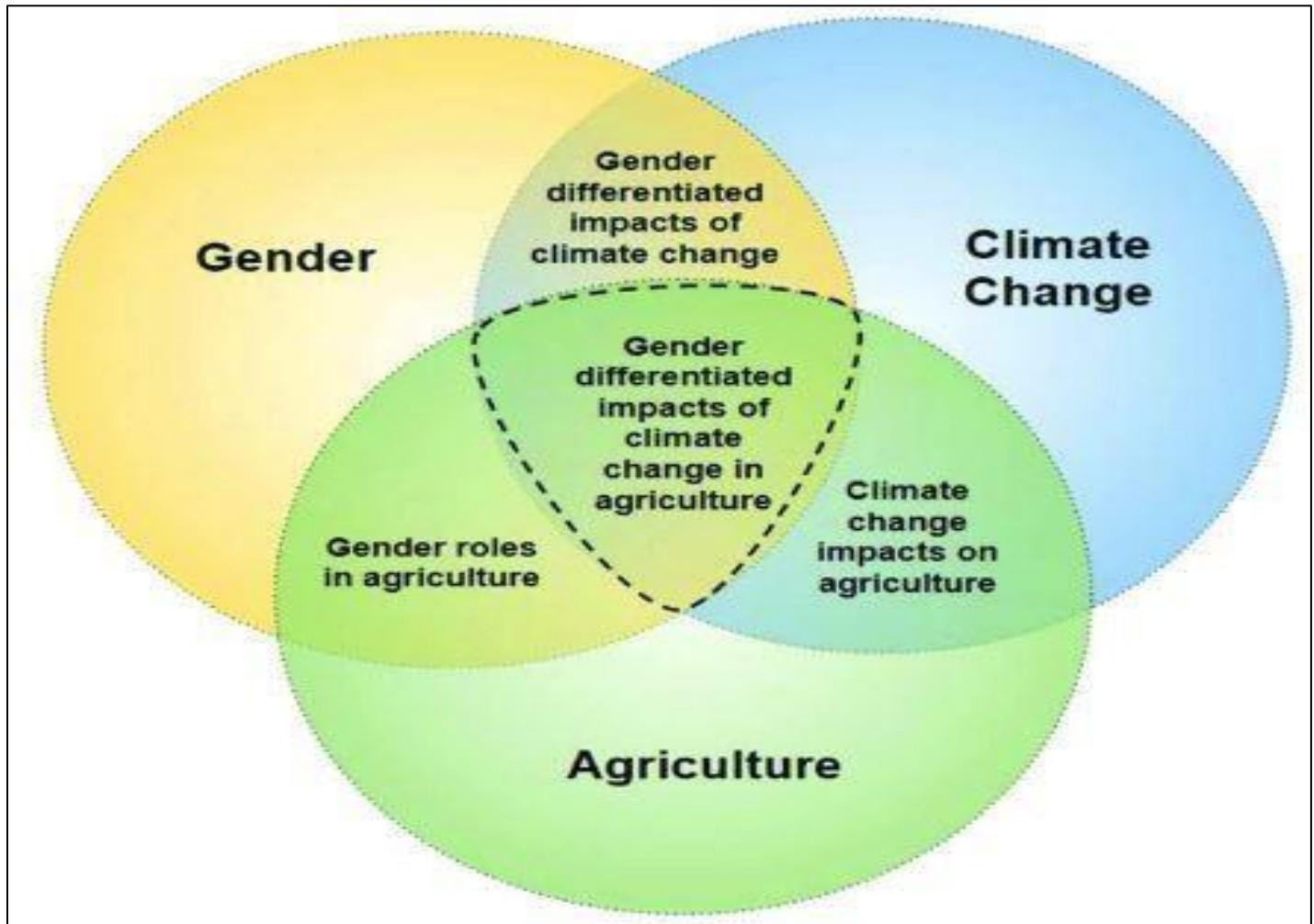


Fig 1: Gender Integration in Climate Changes and Agricultural Policies

Source: Researchgate

III. GENDER DYNAMICS IN SOYBEAN FARMING

A. Socio Economic Analysis and Gendered Division of Labor in Soybean Farming

Both men and women contribute to farming, but the ways that gendered divisions play out change depending on the crop being grown; soybeans are no exception. According to respondents, different gender roles can be observed, as male and female individuals complete different activities based on cultural and social traditions (Hill & Vigneri, 2014; Doss, 2018). Offsetting the gender division of labor whereby women do most of the heavy work during planting, weeding, and processing of cash crops, whereas, men do most of the mechanical work and marketing. For instance, research on sub-Saharan African countries show that women often devote more efforts in cultivating soybeans than men but get lesser earnings. This is influenced by male supremacy, as men dominate major decision-making processes including that of resource and income distribution (Sseguya Et Al., 2019).

B. Access to Resources

Some of the logistical requirements include land, credit, training and other sources which include agricultural inputs are important success factors in soybean farming. Yet issues of gender and distribution of resources and their ownership are still problematic.

- **Land Ownership:** They also cannot own land, or own arable land in many circumstances, which hinders them from growing soybeans on their own. While women own some land, it is discovered that it is less fertile and less in size as compared to men's holding (Mein-Dick Et Al., 2011).
- **Credit and Financing:** Women farmers also have difficulties for acquiring credits; this can be attributed to non-availability of collateral, illiteracy in financial matters and institutional prejudice. This effectively means they cannot be able to afford to buy better soybean seeds, fertilizers and other input in the market (Kassie Et Al., 2015).

- **Extension Services:** Data also show that the majority of extension services remain inaccessible for women farmers. There is serious marginalisation of women in the adoption of soybean technologies due to distorted training programmes that are often developed with little concern to women's time limitations, ability to travel and level of education (Njuki Et al., 2016).

C. Decision-Making Power

Men make most of the decisions concerning soybean management including the choice to adopt or not to adopt technical advances. Studies reveal that despite the fact that women in farming households conduct production significantly, men make decisions as choice of crop, inputs, and marketing strategies (Farnworth Et Al., 2019).

This imbalance has implications to soybean technologies adoption. For instance, restricted making decisions may lead to under-use of improved seeds or other desirable technologies in farming soybeans or other crops by womenfolk because they may not have the final say in that production. To close these

gaps, women need to be enabled to participate fully within their households and the broader communities within which agricultural decisions are made (Quisumbing & Pandolfelli, 2010).

An examination of the impact of soybean adoption based on gender shows that there are unique benefits accruing to different genders. However, this investigation reveals that soybean farming has the possibility to bring increased benefits especially to the woman farmers when gender considerations are incorporated. According to the research, women by adopting improved soybean technologies, realize higher revenues, higher food security, and better nutrition within their households (Njuki Et al., 2016).

For instance, the women cooperative programs or women farmers training and other forms of capacity build programs are among the best performing. In addition to raising women's technical HQ these programs build their bargaining power among other things to negotiate better price for their goods and services.

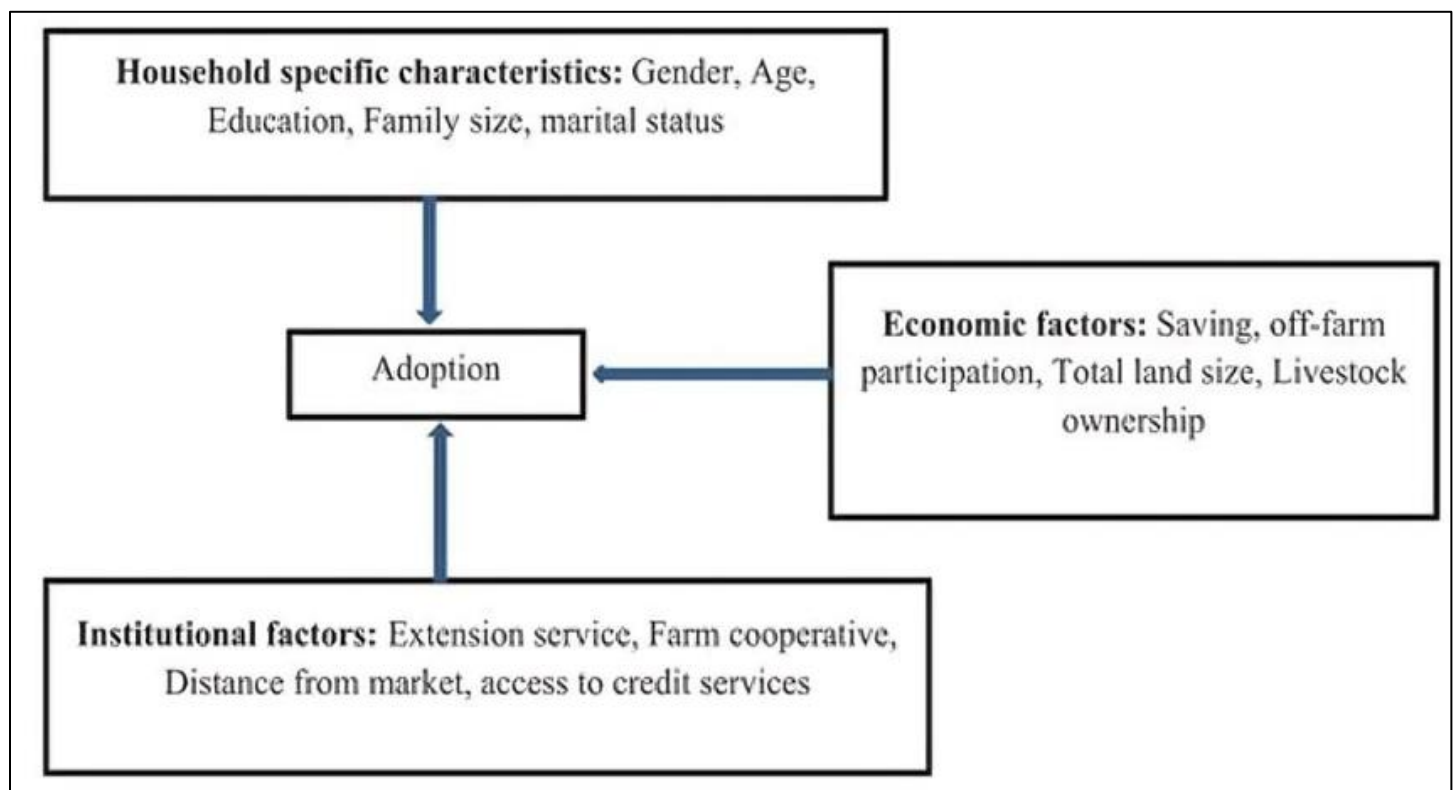


Fig 2: Gender Differences in the Adoption of Agricultural Technology
Source: Taylor and Francis

IV. EVIDENCE FROM CASE STUDIES

A. Case Study: Sub-Saharan Africa

In sub-Saharan Africa soybean farming has been recommended as a way of meeting nutritional needs of the population as well improving on the income gains in the

households. However, the ownership of soybean technologies always has a gender divide in its utilization. Research carried out among Soybean farmers in Nigeria and Uganda reveals that although women and men participate in production of Soybeans, they control the cash aspect of the product (Giller & Delaune, 2021; Sseguya Et Al., 2019).

For example, in Nigeria, most producers of soybeans are female farmers, who are also involved in processing the produce. Despite this, the women comprise a substantial portion of the targeted consumer base, but are marginalized due to culture that only assigns marketing to men (Kassie Et Al., 2016). Therefore, women are locked out of income from soybean sales even while providing most of the labor. Long-term efforts like formation of women cooperatives in agriculture have been effective trying to tackle this problem as it empowers the women to harvest and sell their products in group much as to gain improved profits.

B. Case Study: South Asia

In South Asia especially India, soybean has been incorporated in smallholder production systems as a high value cash crop. Despite its economic opportunity, women farmers in the region continue to experience challenges such as compound increasing barriers to access land and decision making roles. A case study carried on soybean growers of Madhya Pradesh – one of the largest soybean producing state of India– reveals that women are marginalised in extension services, and hence they are not given training regarding improved soybean farming techniques (Seymour & Peterman, 2018).

Efforts by organizations to encourage and increase women uptake in soybean farming have been successful. For instance, efforts that got geared towards training women on how to uptake improved soybean seeds as per their schedule and reading abilities have recorded a huge uptake in their practice. Moreover, equally the women have been empowered on decision making through participatory way has enhanced the crop management, increased yields.

C. Gender-Inclusive Interventions

Practice cases reveal that gender imbalances must be addressed to increase the effectiveness of interventions promoting soybean farming. For instance, one of the programs which have been implemented by an international NGO in Malawi is to supply women farmers with improved seeds, knowledge, and market information. Women groups were also supported to be formed to share knowledge and resources among the participants of the program. The overall outcome was that women farmers reported on yield and income improvement as well as an improved ability to participate in decision-making structures at the family level.

Likewise in Tanzania a gender-sensitive approach came up with solar processing units that shortened the time women spend on matters such as processing soybeans. These innovations gave not only more productivity but also provided the women with a better opportunity to be involved in the whole value chain starting with production and ending with marketing (Njuki Et al., 2016).

D. Lessons Learned

➤ *The Evidence from these Case Studies Underscores Several Key Lessons:*

- Disparities between male and female farmers in access to resource and ability to make decisions affects benefits derived from soybean farming.
- Specific interest through training for women, women cooperatives plus other incentives can help to promote women's contribution and effectiveness.
- Women's inclusion within value chains is a way of ensuring fair distribution of the value added and enhancing the overall household gains.

V. CHALLENGES AND OPPORTUNITIES

A. Challenges

Therefore, the use of gender sensitive approaches in agricultural innovation, especially soybean farming present several challenges mainly due to socio-cultural, economic and institutional factors.

➤ *Socio Cultural Environment and Gender Discrimination*

Conventional social practices and beliefs influencing the nature of relationships continue acting as great barriers that deny women autonomy rights, structuring their access to inputs and decision capabilities. Wherever it is produced, women play a significant role in growing soybeans and their role is not well compensated; they are limited and cannot engage in activities like marketing or training due to cultural norms. They contribute to compromises towards equity and hamper the practices of innovations by the women farmers (Quisumbing & Pandolfelli, 2010).

➤ *Limited Access to Resources*

Women are often denied particularly land, credit, and farm inputs. A key aspect realised in the research is land ownership as this is a key factor when it comes to access to credit and technology inputs. By not having secure rights to land, women are typically locked out of programmes that require collateral, thus their inability to fund improved technologies in soybeans.

➤ *Constraint of Exclusion from Extension Services*

None of the agricultural extension services are planned and implemented with due reference to the gender concerns. Disabilities include; lack of time, limited mobility, and illiteracy which makes women farmers unable to attend training sessions. Furthermore, extension systems targeting agriculture male incline results in lack of technical know-how in soybean farming among women (Fernworth Et Al., 2019).

➤ *Market Inequities*

In other cases, despite the Colombian women being able to successfully embrace soybean farming, they experience market liabilities often. Engaging in marketing activities, men often have the negotiating power that is vital to negotiate for good prices, which is exercised by women. It seems to decrease their income and eradicate most of their opportunities of making wealth from soybean farming.

B. Opportunities

However, as presented in the paper there remain good opportunities to improve the women's agency and their share of gains from soybean production through effective interventions and progressive policies.

➤ *Base for the Promotion of Women Cooperatives*

This paper has demonstrated how women cooperatives are relevant in dealing with resource and market constraints. Farmers: Women joint cafeing of their efforts allows them to acquire and share inputs, knowledge and training, and ready markets more easily. Cooperatives also improve the bargaining power of women through increasing bargaining price for their produce (Meinzen-Dick Et Al., 2011).

➤ *Gender Sensitive Extension Services*

Since the extension programs are able to directly target women in such societies, this will greatly enhance their take up of soybean technologies. It entails training session availability to times convenient to the women and the location of sessions

be conducting by female trainers with emphasis on gender participatory training.

➤ *Access to Finance*

Increasing credit compliance for women also remains relevant in increasing the scale of soybean farming. The application of micro finance, saving societies and sound financial models adapted to the circumstances of female can provide ways of getting away from the hurdles posed by the absence of collaterals and financial non-acceptance (Fernworth Et Al., 2019).

➤ *Inclusive Value Chains*

Addressing how women can be included in soybean value chains or chains of production and processing and marketing also results in fair opportunities for economic development of the poor women. The creation of women processing units, employing sensitized marketing techniques will go a long way to make sure women reap the fruits of their efforts.

➤ *Economic and Program Support*

The situation suggests that the problem cannot be solved without governmental and institutional support regarding gender equity. Favourable policies on women's land rights, financing for women agriculture, and share women's voice in decision making could lead to a favourable environment for gender transformative agricultural innovation (Njuki Et Al., 2016).

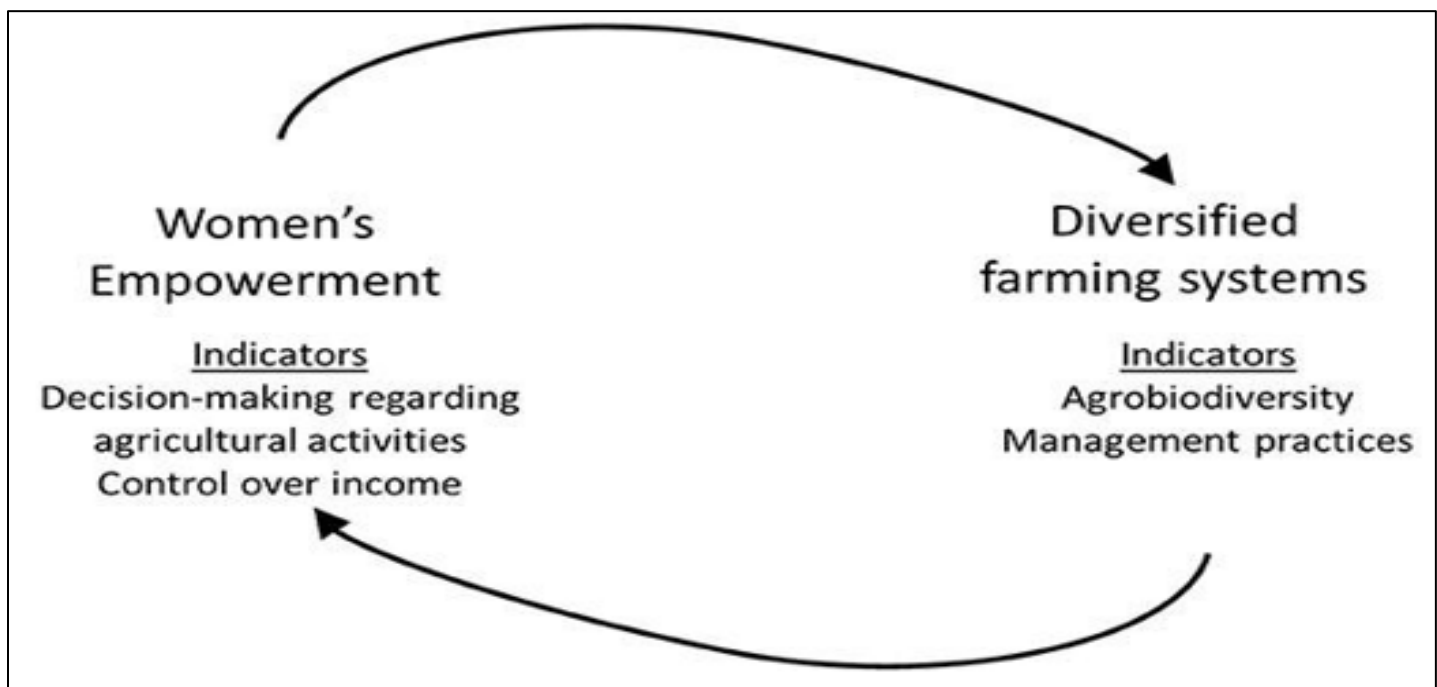


Fig 3: Public Policies for Agricultural Diversification: Implications for Gender Equity

Source: Frontier

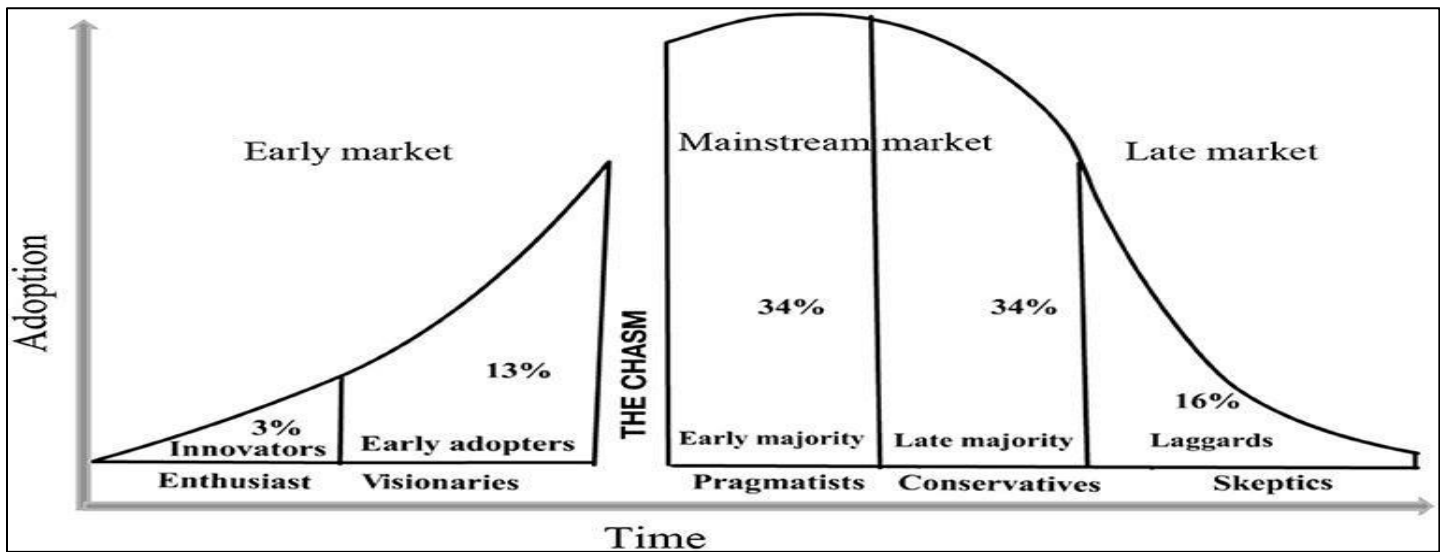


Fig 4: Heterogenous Factors of Adoption of Agricultural Technologies in West and East Africa Countries

Source: Frontiers

VI. RECOMMENDATIONS AND CONCLUSION

Taking into account the outcomes of the analysis carried out in the previous sections, the following conclusions and recommendations could be provided with regard to soybean adoption and women farmer empowerment. The following recommendations are intended to connect the dots and lead to gender-sensitive structural changes in agricultural innovation: Firstly, the current agricultural extension programs should be developed to reflect women specific and localized challenges. This can be done by making the extension services to be in convenient for the women time slot, physically reachable and adequately spaced in terms of literacy level (Hill & Vigneri, 2014). However, female extension officers should be employed at times, or the training sessions should be conducted exclusive to women only to get more participation. Further, offering relevant, gender-aware training on better innovative practices of soybean production; foregoing pest control to crop way, water planning, and searching for eco-friendly approaches, therefore it is essential to boost women's uptake to new advancements (Njuki Et Al., 2016).

In addition, there is a need to increase women's share in access to land, credit and other inputs to enable them engage soybean farming. Some of them are; encouraging policies that would give women key to land and effective land tenure systems. Granting credit facilities and motivating women to acquire micro credit funds and low interest bearing loans will empower women to improve on the use of modern methods of farming, as well as procurement of various essential input for enhanced yield. It is equally important that women have an option of accessing such improved seeds, fertilizers and equipment vital for high quality soybeans (Fernworth Et Al., 2019).

Another important milestone is to increase women's role in decision-making. Therefore, gender sensitive decisions at the household and community level is very paramount in passing of the inputs for soybean farming. This can be done through availing women any opportunity to participate in decision-making processes in choices for crops, resources and income (Doss, 2018). In addition, leadership training of women followed by promoting their engagement in agricultural cooperatives as well as in local farmer groups will guarantee that women's opinions are taken into consideration. Counselling men to support and share decision making also enhances more fairness in roles played by females within the farming families.

Since women stand to benefit greatly from soybean farming, it is important to provide them access to markets and increase their leverage. These include formation of women-self help groups and marketing organizations where women can amalgamate their produce and negotiate for better prices for their soybeans. Supporting gender equity in small farmer trade initiatives is another way of making sure women are paid fairly for their produce. Moreover, by improving women's skills to run businesses through business development programs that will promote value-added soybean products including food and nutritional supplements will additionally open up more market opportunities for women (Fernworth Et Al., 2019).

Non governmental institutions and governments should therefore focus on policy approaches that support the advancement of gender equity in agricultural innovation. National and Local policies are needed to support women's land rights, financial, and access to technologies that help in agricultural. There should be steps to take adequate measure on gender mainstreaming through the inclusion of gender issues in the planning, implementing and evaluating of agricultural development schemes. Gender-sensitive data collection is also

needed for improved identification of women farmers' needs and issues as well as to assess the impact of gender-promoting measures (Quisumbing & Pandolfelli, 2010).

Naturally, discussing gender issues relating to innovation adoption and returns of soybean farming also blesses the conclusion. Despite the fact that women play a central role in soybean production, many of them experience limited availability of input resources, decision-making capacity, and outputs resulting from them and coordinated innovations. Overcoming these gender asymmetry calls for interventions that entail; gender equitable extension services, resource access, and institutional arrangement that fairly involve women in market systems (Diirro & Mekuria, 2015). From case papers and successful interventions about women it has become clear to me that women when empowered through knowledge, tools and support can play a vital role in the use of new inventions in farming and thus leading better living standards in their households. One of the biggest challenges towards achieving sustainable and inclusive agricultural development is lack of participation of women in agricultural innovation due to some barriers which are rooted in the system. When acted upon, the recommendations provided in this paper shall help our policymakers, development workers and agricultural organizations to promote and support Women farmers and increase positive impacts of soybean farming for over all rural development (Quisumbing & Pandolfelli, 2010).

REFERENCES

- [1]. Beuchelt, T. D., & Badstue, L. (2013). Gender, Nutrition, And Climate-Smart Food Production: Opportunities And Trade-Offs. *Food Security*, 5(5), 709-721. <https://doi.org/10.1007/S12571-013-0290-8>.
- [2]. Doss, C. R. (2018). Women And Agricultural Productivity: Reframing The Issues. *Development Policy Review*, 36(1), 35-50. <https://doi.org/10.1111/Dpr.12243>
- [3]. Farnworth, C. R., Sundell, M. F., Nzioki, A., Shivutse, V., & Davis, M. (2019). Transforming Gender Relations In Agriculture In Sub-Saharan Africa. *Gender, Technology And Development*, 23(1), 48-65. <https://doi.org/10.1080/09718524.2019.1649795>
- [4]. Fisher, M., & Carr, E. R. (2015). The Influence Of Gendered Roles And Responsibilities On The Adoption Of Technologies. *Agriculture And Human Values*, 32(4), 593-605. <https://doi.org/10.1007/S10460-015-9588-5>
- [5]. Galiè, A., Jiggins, J., & Struik, P. C. (2013). Women'S Identity As Farmers: A Case Study From Tanzania. *Women'S Studies International Forum*, 40, 46-56. <https://doi.org/10.1016/J.Wsif.2013.04.003>
- [6]. Giller, K. E., & Delaune, T. (2021). Gender And The Soybean Story In Sub-Saharan Africa. *Agriculture For Development*, 42(3), 20-24.
- [7]. Hill, R. V., & Vigneri, M. (2014). Mainstreaming Gender Sensitivity In Cash Crop Markets: Evidence From Ghana. *World Development*, 64, 42-62. <https://doi.org/10.1016/J.Worlddev.2014.03.007>
- [8]. Kabeer, N. (1999). Resources, Agency, Achievements: Reflections On The Measurement Of Women'S Empowerment. *Development And Change*, 30(3), 435-464. <https://doi.org/10.1111/1467-7660.00125>
- [9]. Kassie, M., Stage, J., Diirro, G., & Mekuria, M. (2015). Gendered Food Security In Rural Malawi. *World Development*, 74, 363-379. <https://doi.org/10.1016/J.Worlddev.2015.05.003>
- [10]. Meinzen-Dick, R., Quisumbing, A. R., Behrman, J., Biermayr-Jenzano, P., Wilde, V., Noordeloos, M., Ragasa, C., & Beintema, N. (2011). Engendering Agricultural Research, Development, And Extension. *Ifpri Discussion Paper No. 973*.
- [11]. Njuki, J., Parkins, J. R., & Kaler, A. (2016). Transforming Gender Relations In Agriculture In Sub-Saharan Africa. Routledge.
- [12]. Quisumbing, A. R., & Pandolfelli, L. (2010). Promising Approaches To Address The Needs Of Poor Female Farmers: Resources, Constraints, And Interventions. *World Development*, 38(4), 581-592. <https://doi.org/10.1016/J.Worlddev.2009.10.006>
- [13]. Ragasa, C., Berhane, G., Tadesse, F., & Taffesse, A. S. (2013). Gender Differences In Access To Extension Services And Agricultural Productivity. *Journal Of Agricultural Economics*, 64(3), 465-492. <https://doi.org/10.1111/1477-9552.12040>
- [14]. Seymour, G., & Peterman, A. (2018). Understanding The Gender Dimensions Of Agricultural Productivity. *Food Policy*, 83, 36-50. <https://doi.org/10.1016/J.Foodpol.2018.11.003>
- [15]. Sseguya, H., Mazur, R. E., & Njuki, J. (2019). Gendered Roles In Soybean Production And Marketing In Uganda. *International Journal Of Agricultural Sustainability*, 17(1), 57-72. <https://doi.org/10.1080/14735903.2019.1625758>
- [16]. Traore, A., The Impact Of Soybean Adoption On Households'Crop Production Value In Mozambique: Agenetic Matching Approach, Management And Economic Journal, Volume 2024, Page 1-15. <https://doi.org/10.18535/Mej/V2024.04>.
- [17]. Udry, C., Hoddinott, J., Alderman, H., & Haddad, L. (1995). Gender Differentials In Farm Productivity: Implications For Household Efficiency And Agricultural Policy. *Food Policy*, 20(5), 407-423. [https://doi.org/10.1016/0306-9192\(95\)00035-D](https://doi.org/10.1016/0306-9192(95)00035-D)
- [18]. World Bank, Fao, & Ifad. (2009). Gender In Agriculture Sourcebook. Washington, Dc: The World Bank.
- [19]. Yila, J., & Resurreccion, B. P. (2013). Gender Perspectives On Adoption Of Climate-Smart Agricultural Practices. *Climate And Development*, 5(3), 288-300. <https://doi.org/10.1080/17565529.2013.812954>