

Evaluation of the Role of Women's Agricultural Cooperatives in Improving Sustainable Food Security for Rural Households in Burundi: Evidence from the Bakenyezi Cooperative Tuje Hamwe in Cibitoke Commune

NSABIYAREMYE Maurice¹, NSABIYUMVA Onesphore², BIMENYIMANA Nestor³, NIYINTUNZE Siméon^{4*}, MUSAVYIMANA Diane⁵, NDORICIMPA Siméon⁶

¹Hope Africa University, Burundi Community Development

²Hope Africa University, Burundi, Community Development

³Hope Africa University, Burundi, Community Development

⁴University of Burundi/Doctoral School, Burundi, Development Economy

⁵Hope Africa University Faculty of Business and Professional Sciences Business Management

⁶Management of Agricultural Economics, Department of Community Development, High Institute of Commerce, University of Burundi, Bujumbura 155, Burundi

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*Corresponding author: NIYINTUNZE Siméon

University of Burundi/Doctoral School, Burundi, Development Economy

Abstract

Original Research Article

This study assesses the role of women's agricultural cooperatives in strengthening sustainable food security for rural households in Burundi, focusing on a target population of 130 cooperative farmers in the Cibitoke commune. The survey was conducted in this area, followed by a statistical analysis including descriptive statistics and multiple linear regression. The main obstacles to food security and availability are limited access to agricultural inputs (70%), restricted access to agricultural financial activities (63%), low availability of improved seeds and a lack of arable land (38%), low levels of education (9%), and climate change (72%). The econometric model reveals significant positive effects of capacity building for cooperative members, agricultural extension services, and financial resources on income, while the level of education does not have a significant impact. These results highlight the imperative to improve access to credit, agricultural extension services and the adoption of improved varieties in order to increase profitability and local food security.

Keywords: Food security, women's agricultural cooperatives, rural households, agricultural productivity, women's empowerment.

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INTRODUCTION

Food security remains a major challenge for the development of rural communities worldwide, particularly in developing countries where smallholder farming is the primary source of income. Despite numerous initiatives aimed at increasing yields, smallholder farmers continue to face significant obstacles such as low productivity, limited access to agricultural inputs, inadequate technology, a lack of arable land, and precarious market infrastructure. These structural weaknesses are compounded by the effects of climate variability and disruption, as well as severe

financial constraints. All these factors contribute to increasing the socio-economic vulnerability of populations and perpetuating poverty within rural households. This situation has been historically documented by international bodies that emphasize the persistence of global food insecurity and the need for a transformation of production systems (IFAD, 2021).

In this rural context, women bear a vital responsibility for implementing agricultural activities and providing for domestic nutrition. However, their productive potential is frequently hampered by systemic

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gender inequalities that limit their access to land ownership, credit, technical training, inputs, and decision-making bodies (FAO, 2011; UN Women, 2022). Faced with these restrictions, the emergence of collective structures, particularly women's agricultural cooperatives, is a key mechanism for encouraging solidarity, pooling resources, and optimizing farm profitability (Agarwal, 2018; FAO, 2011). Integration into these organizations not only raises income levels and ensures better food availability, but also actively contributes to the economic and social empowerment of women producers in rural areas.

In Burundi, the agricultural sector sustains the majority of the population, but farming communities are severely affected by chronic food insecurity fueled by poverty, declining soil fertility, and recurring environmental shocks (World Bank, 2023; FAO, 2023). Although the government and its partners promote producer associations as pillars of development, empirical data rigorously measuring the impact of women-led groups on long-term food stability remain limited (IFAD, 2021; Ministry of Environment, Agriculture and Livestock of Burundi, 2023). It is within this context that the present study is situated, aiming to assess the specific contribution of the Bakenyezi women's agricultural cooperative. Tuje Hamwe, located in the Rugombo area of the Cibitoke commune. Through the analysis of its influence on production, income and the empowerment of its members, this research aims to shed light on the potential of these organizations to build sustainable food security in Burundi.

LITERATURE REVIEW

Review of the theoretical literature

Food security and the role of collective structures in rural areas lie at the crossroads of several economic and sociological theoretical currents. Social capital theory, widely popularized by Robert Putnam (1993) and Pierre Bourdieu (1986), offers a fundamental conceptual framework for understanding the emergence and effectiveness of agricultural cooperatives. According to these authors, networks of relationships, norms of reciprocity, and mutual trust constitute intangible resources that facilitate collective action and reduce transaction costs. Applied to women's groups, this theory suggests that cooperation makes it possible to overcome economic isolation and optimize the allocation of factors of production through risk pooling. Amartya Sen (1981), through his capability approach, this approach redefines poverty and food insecurity not simply as a deficit of calories or income, but as a deprivation of fundamental freedoms and agency. For Sen (1981), access to food depends on entitlements, which encompass opportunities for production, exchange, and social transfers. Cooperatives act precisely on these vectors by expanding women's economic opportunities and strengthening their decision-making power within the household and the community.

In parallel, the theory of solidarity economy and common institutions, championed by Elinor Ostrom (1990), demonstrates that the collective management of resources by self-organized groups can prove more efficient and sustainable than regulation by the market or the state. Ostrom (1990) highlights key principles such as the clear definition of participation rules and conflict resolution mechanisms, elements that are structurally found within successful agricultural cooperatives. In the field of agricultural economics, Amartya Sen's (1990) theory of rural household behavior concerning cooperative conflicts (cooperative) is also relevant. Conflicts) shows that the distribution of resources within a family results from ongoing negotiation in which the purchasing power and social status of women play a determining role. When women acquire financial autonomy through a collective entity, the structure of household spending shifts primarily towards nutrition, health, and children's education.

In terms of productive efficiency, the theory of agricultural modernization developed by Theodore Schultz (1964) posits that traditional smallholders are "poor but efficient" because they allocate their available resources optimally, even though these resources are limited by the lack of modern technologies. Schultz (1964) argues that investment in human capital, particularly through technical training and extension services, is the cornerstone of agricultural transformation. Cooperatives serve as institutional incubators, enabling the large-scale dissemination of these innovations. Finally, the economics of organizations applied to the cooperative sector by Joan Robinson (1967) emphasizes that the grouping of small producers allows them to achieve the economies of scale necessary to negotiate input prices and access more profitable markets, thus compensating for the structural deficiencies of isolated rural markets.

Review of the empirical literature

Empirical research conducted internationally and regionally overwhelmingly confirms the stabilizing role of women's farmers' organizations in rural household economies. Bina Agarwal (2018), in a large-scale comparative study conducted in India, demonstrated that collective farms managed exclusively by women have higher yields per hectare than individual male family farms, primarily due to better coordination of labor and effective sharing of local knowledge. Data published by the Food and Agriculture Organization of the United Nations (FAO, 2011) indicate that if women farmers had the same access to productive resources as men, global agricultural production could increase by 2.5 to 4 percent, reducing the number of people suffering from hunger by 12 to 17 percent globally.

In sub-Saharan Africa, empirical data reveals similar constraints but also notable resilience

trajectories. The evaluation conducted by the International Fund for Agricultural Development (IFAD, 2021) highlights that membership in cooperatives structures marketing chains, secures market access, and increases household net income by nearly 15% on average. From a financial perspective, the work of Leora Klapper and Simon Parker (2006) sheds light on the systemic barriers women face in obtaining individual loans, while demonstrating that joint and several liability within women's groups reduces default rates and encourages microfinance institutions to lend to cooperative structures.

At the national level, recent data from the National Institute of Statistics of Burundi (INSBU, 2024) reveal that food insecurity disproportionately affects the northwestern provinces due to high population density and extreme land fragmentation. Alida Kwizera's (2022) empirical analyses of Burundian cooperatives confirm that integrating rural households into agricultural groups significantly improves families' dietary diversity index by breaking their exclusive dependence on traditional subsistence crops. Similarly, Chantal Nahigeje's (2022) study of the Kibimba hills highlights that functional literacy and primary education levels, while modest, are essential drivers for transparent accounting practices within village savings and credit groups. Finally, the report from the Ministry of Environment, Agriculture and Livestock of Burundi (2023) emphasizes the need to structure national food security policies around grassroots community organizations, which prove to be the most resilient channels in the face of exogenous climate shocks.

MATERIALS AND METHODS

Conducting this research required a methodological approach combining quantitative and qualitative data within a targeted geographic area. The study's spatial framework is the Rugombo area, an administrative entity with a predominantly agricultural focus located in the commune of Cibitoke, in the Northwest Region of Burundi. This area was selected due to its remarkable agro-ecological potential, characterized by fertile soils suitable for staple crops, but also because of the recurring socio-economic and environmental vulnerabilities that directly affect the food security of the resident population. The unit of analysis chosen is the Bakenyezi women's agricultural cooperative Tuje Hamwe, which embodies a model of solidarity organization and brings together a basic population of 130 active female farmers in the region.

The data collection tools included a previously tested and validated survey questionnaire structured around several thematic modules: the demographic profile of members, factors of agricultural production, access to finance, and exposure to climate risks. For the

processing and statistical analysis of the collected data, the study relied on specialized quantitative analysis software. The survey data were encoded, cleaned, and then subjected to descriptive analyses to generate frequencies, means, and percentages. Subsequently, econometric modeling based on multiple linear regression was performed to isolate and measure the net impact of key explanatory variables—such as capacity building, agricultural extension services, and access to financial resources—on household income and food security levels.

Data collection

The data collection process took place in the field following a structured, ethical and immersive approach, aimed at capturing the daily reality cooperative Bakenyezi Tuje Hamwe. The first phase consisted of preparatory visits to the administrative authorities of the Cibitoke commune and to the cooperative's leaders in order to obtain the necessary authorizations and establish a climate of mutual trust. This step of social legitimization is crucial in rural areas to guarantee the sincerity of the responses. The questionnaires were administered via direct, face-to-face individual interviews, a preferred method that overcomes the barriers of illiteracy and ensures that the respondents fully understand each question.

The researchers conducted door-to-door interviews and scheduled appointments at farms, respecting the agricultural work calendar to avoid disrupting the women's productive activities. The questionnaire systematically addressed key demographic variables, including the age structure of the community members, revealing a high concentration of dynamic young women in the 18-25 age group. Marital status was also documented, highlighting a predominance of married women who assume direct responsibility for managing the household's nutritional needs. Educational attainment was meticulously recorded, revealing educational disparities within the community, where the majority have only a primary education.

Beyond individual aspects, the data collection focused on quantifiable material data related to farming. Respondents were questioned about their level of effective access to essential inputs such as certified seeds, urea, and NPK fertilizer, as well as the frequency of extension services received during recent growing seasons. A specific section was dedicated to collecting financial data, recording the source, amount, and terms of agricultural loans. Finally, to integrate the environmental dimension, the data collection protocol included perceptual and factual questions concerning rainfall disruptions and yield declines attributable to climate change, allowing for the quantification of the community's perception of global ecological disruptions.

RESULTS

Table 1: Age distribution of women members of the cooperative

Age group	Effective	Frequency	Percentage (%)
18-25 years old	22	0.4	40
26-35 years old	15	0.273	27.27
36-45 years old	10	0.182	18.18
46-55 years old	5	0.090	9.09
56-65 years old	3	0.055	5.46
Total	55	1	100

The results concerning the age groups of women in the cooperative Bakenyezi Tuje Hamwe participants presented a diverse distribution, with a total of 55 participants. According to this table, the 18-25 age group comprised 22 participants (40%), the 26-35 age group 15 (27.27%), the 36-45 age group 10 (18.18%), the 46-55 age group 5 (9.09%), and the 56-65 age group 3

(5.46%). Analysis of these results reveals that the 18-25 age group was the most represented, with 22 participants, or 40% of the total. This generation of young women has significant implications for the cooperative's operations, programming, policy development, service delivery, and outreach efforts.

Table 2: Marital status of female members of the cooperative

Marital status of cooperative members	Effective	Frequency	Percentage
Bachelor	7	0.127	12.73
Married	30	0.546	54.55
widow	10	0.182	18.18
Divorced/Separated	8	0.145	14.54
Total	55	1	100

Results concerning the marital status of women in the cooperative Bakenyezi Tuje Hamwe group presents a diverse demographic, with a total of 55 participants. According to the table, 30 women are married (54.55%), 10 are widowed (18.18%), 8 are divorced (14.54%), and 7 are single (12.73%). Analysis of these results reveals that married women are the most

represented, with 30 participants, or 54.55% of the total. This group of married women has a significant influence on the cooperative's operations, its social engagement, its programs, policy development, as well as its services and awareness-raising activities. Furthermore, these 30 participants play a crucial role in food security and the sustainable development of their community.

Table 3: Education level of women members of the cooperative

Education level of women members of the cooperative	Effective	Frequency	Percentage
No formal training	10	0.18	18
Primary	20	0.36	36
Secondary	15	0.27	27
Vocational training	5	0.1	10
Higher education/University	5	0.09	9
Total	55	1	100

Significant disparities in educational attainment: The data reveal significant disparities in educational attainment. 36% of participants have a primary education, 27% a secondary education, 18% have received no formal education, 10% have completed vocational training, and 9% have a university degree. The majority of participants (36%) have a primary education, indicating that the educational level of many women is relatively limited. However, this also represents an important stage in their educational journey. This proportion suggests that, even though many have had access to basic education, there is

untapped potential for initiatives to promote continuing education and skills development within this population.

Consistent with previous research, similar findings were reported by Nahigejeje (2022) in her study on the dynamics of women's savings and credit groups in Burundi. Her research also revealed that many active members of these groups in the Kibimba hills have a primary education. Furthermore, 27% of the women have attained a secondary education and 10% have received vocational training.

Motivations for joining a cooperative: According to Kwizera (2022), the reasons for joining a

cooperative include improving living conditions, accessing training and seminars, reducing unemployment, changing mindsets, and acquiring new knowledge. The contribution of educated women: Women with secondary or higher education represent a valuable resource, as they can bring new perspectives and skills in management, finance, and strategy, which benefits the entire cooperative.

By leveraging the skills and expertise of these women, the cooperative can optimize its operations, improve its decision-making processes, and ultimately achieve its goals more effectively. Implications for cooperative development: The results of this study have implications for cooperative development, particularly in

the areas of education and training. The cooperative can thus design targeted education and training programs to meet the needs of its members, especially those with limited formal education.

Capacity building: The cooperative is able to focus on capacity building for its members, particularly women with a higher level of education, in order to improve their skills and expertise in management, finance and strategy.

Inclusive decision-making: The cooperative can promote inclusive decision-making processes that take into account the diverse perspectives and experiences of its members.

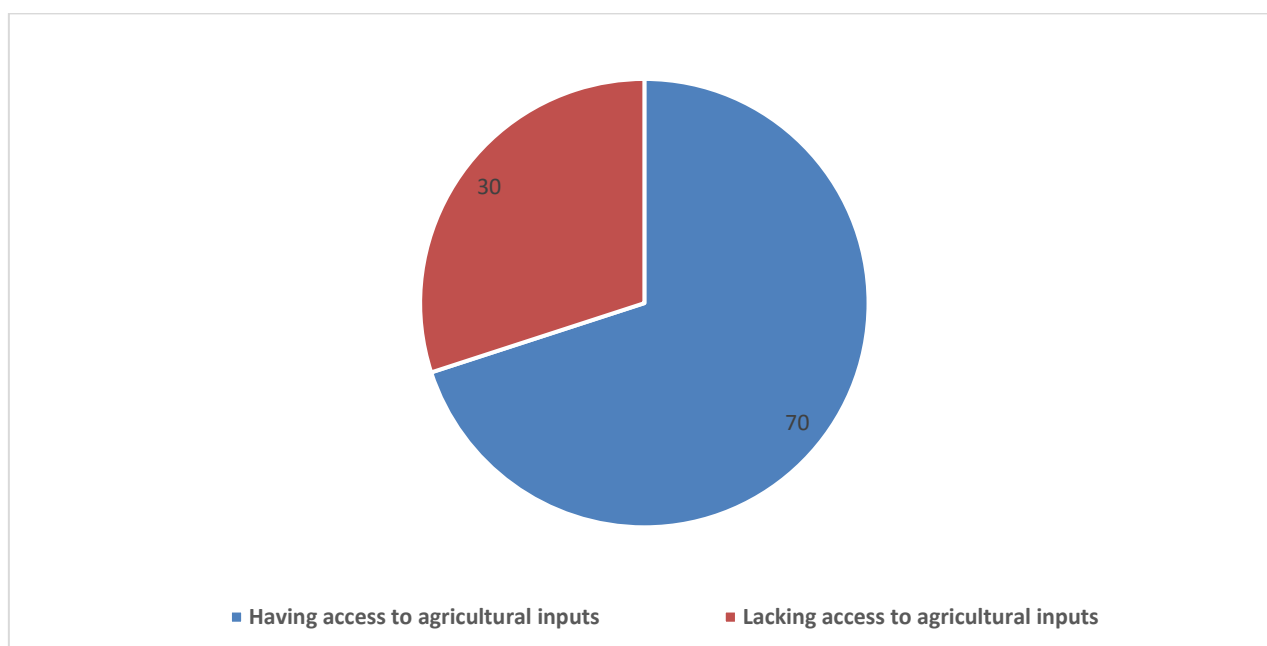


Figure 1: Access to agricultural inputs

The results regarding access to agricultural inputs reveal that 70% of respondents reported having access to essential resources for their agricultural activities.

This is a positive trend, as adequate access to inputs such as seeds, fertilizers and tools is crucial to improving agricultural productivity and yields.

Enabling women farmers to acquire these resources not only contributes to food security but also paves the way for innovations in agricultural techniques and product diversification. However, it is crucial to note that a significant proportion (30%) of participants reported not having access to these inputs. This situation risks exacerbating production disparities between those

who have access and those who do not. Lack of access to inputs can be attributed to various factors, including high costs, limited availability on the local market, and difficulties in accessing remote sales outlets. This underscores the need for an inclusive approach that ensures all farmers, particularly women, have equitable and affordable access to these resources. Unequal access to agricultural inputs also perpetuates gender inequalities in the agricultural sector. Women often face additional constraints, such as restrictive cultural norms and difficulties accessing finance. This can prevent them from making informed decisions about the optimal use of inputs, thus limiting their productivity potential. To address this situation, training programs on input use and initiatives aimed at the economic empowerment of rural women could prove beneficial.

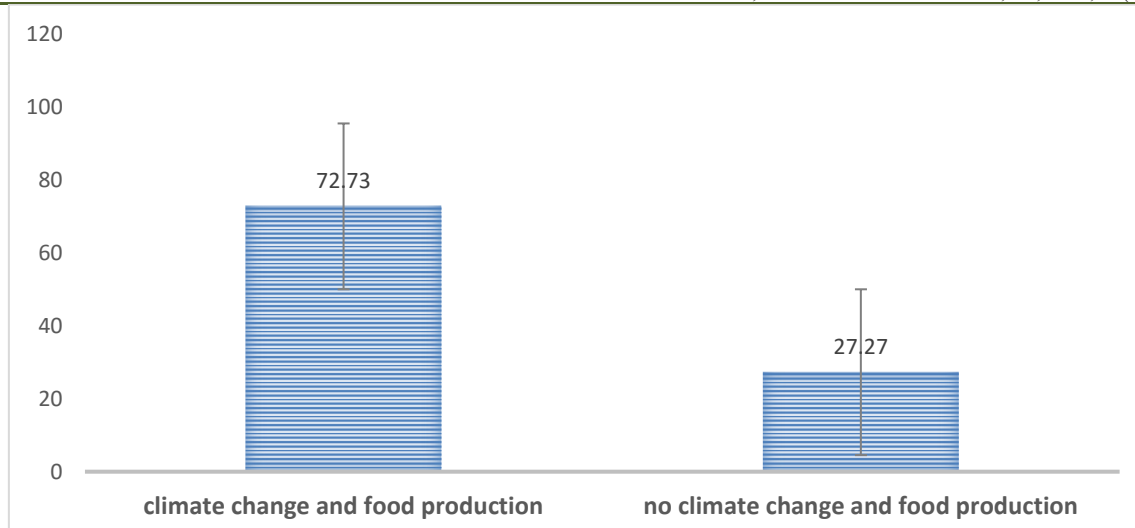


Figure 2: Level of climate change and food production

The results concerning the impact of climate change on food production reveal a major concern among farmers. Indeed, 72.73% of respondents state that climate change affects their farming practices and, consequently, their food production.

This observation underscores the importance of considering environmental dimensions in agricultural planning. Rising temperatures, variations in rainfall patterns, and extreme weather events are all factors that can compromise the yields and sustainability of agricultural systems.

The fact that 27.27% of participants did not observe a clear impact of climate change on their production may be linked to several factors, such as the diversity of agricultural practices, the diversification of income-generating activities, and access to appropriate

technologies or favorable ecological conditions. However, it is essential not to overlook this minority, as it could reveal specific situations that, if not supported or strengthened, risk becoming precarious in the future. It would therefore be relevant to study the reasons why these farmers did not experience the impact of climate change, in order to identify resilient practices that could be adopted on a larger scale.

The impact of climate change on food production is not limited to yield variability; it also affects food security, access to food, and, more broadly, the economic stability of rural communities. This can lead to higher food prices. Therefore, it is crucial to adopt public policies that promote the adaptation of agricultural systems to new climate realities, particularly through the integration of sustainable and resilient farming practices.

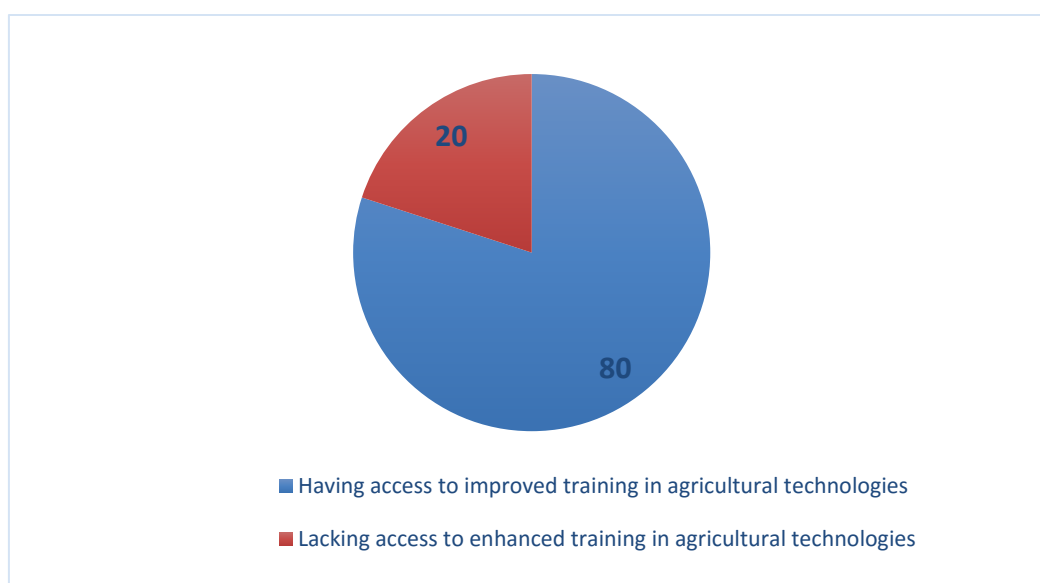


Figure 3: Improved training in agricultural technologies

The results concerning access to improved agricultural training show that 80% of the female farmers surveyed have access to training in this area. This majority indicates that learning and skills development opportunities are relatively accessible to a large part of the agricultural community.

The importance of these training programs cannot be overstated, as they enable farmers to acquire modern knowledge and sustainable practices that can significantly improve productivity and profitability.

It is concerning, however, that 20% of respondents do not have access to these training programs. This situation may reflect inequalities in the distribution of educational resources, thus limiting the positive impact these programs can have on the entire agricultural community. Women farmers who remain outside these programs risk being confined to traditional farming practices, which can prevent them from meeting

current challenges such as climate change and market fluctuations.

It is therefore essential to identify the reasons for this exclusion in order to guarantee access to agricultural education for all. Access to quality agricultural training also contributes to strengthening food security and promoting sustainable rural development. By providing farmers with modern tools and knowledge, this training can lead to better resource management, a reduction in the use of harmful chemicals, and increased crop productivity.

Studies conducted by Klapper (2006) highlight the benefits that women derive from their participation in cooperatives and note that when women are integrated into cooperatives, they are more likely to invest in their children's education and improve their families' food security, which has positive effects on the community as a whole.

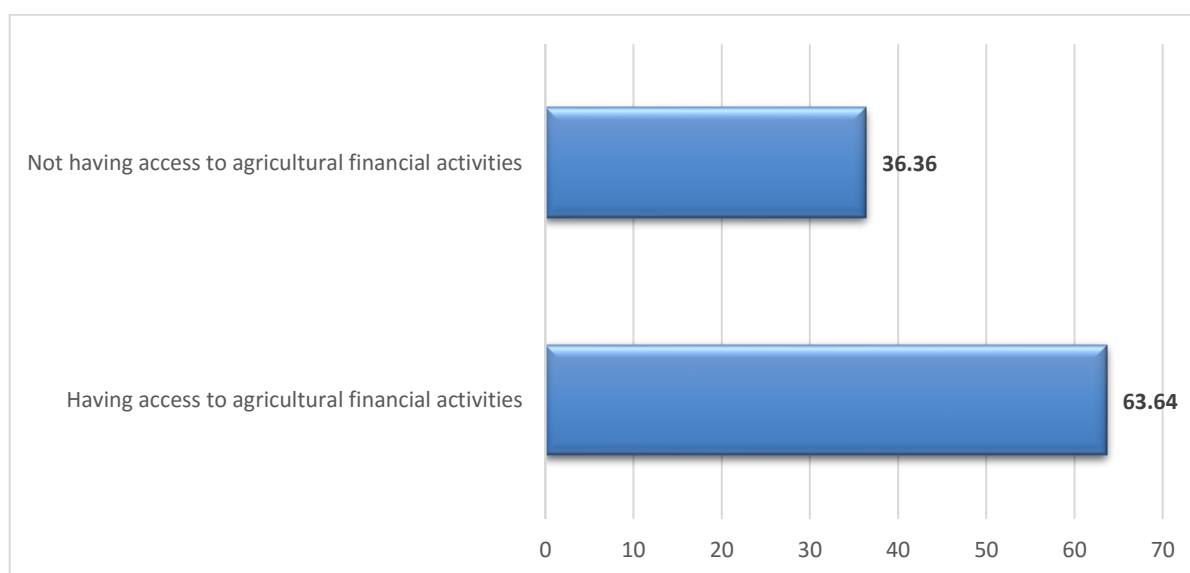


Figure 4: Access to agricultural financial activities

The results concerning financing for agricultural activities reveal that 63.64% of the women farmers surveyed have access to financial resources to support their operations, while 36.36% do not. This distribution indicates that a relatively small majority of farmers have access to the necessary funds, highlighting the essential role of financing in improving agricultural techniques and increasing yields. However, it is also significant that nearly half of the women farmers lack access to these loans or financial aids, which can directly impact their ability to invest in and develop their farms. The fact that 36.36% of women farmers lack access to financing raises questions about the obstacles hindering this access. These obstacles include mistrust of financial institutions, overly restrictive eligibility criteria, a lack of required collateral, and a lack of information about available financing opportunities. To address this situation, it is crucial to understand these difficulties and

implement appropriate solutions, such as awareness programs or flexible loan mechanisms that take into account the specific circumstances of women farmers.

Klapper's (2006) research also confirms that women face increased difficulties in obtaining agricultural loans, often due to their precarious legal status and the lack of collateral. This finding underscores the need for targeted interventions to address the specific challenges women farmers face in accessing finance.

DISCUSSION

The results from econometric modeling and descriptive analyses highlight complex socio-economic dynamics that both confirm and refine theories of rural organization. The positive and statistically significant effect of agricultural capacity building and extension

services on members' incomes corroborates Theodore Schultz's (1964) postulates on the paramount importance of investing in human capital to break the cycle of rural poverty. When 80% of women farmers report having access to modern training, this translates into an immediate improvement in technical practices and an optimization of overall productivity. These results align with the empirical findings of Alida Kwizera (2022), validating the fact that technical support is a more powerful driver of economic empowerment than the simple passive distribution of aid.

The lack of significant impact of formal education level on immediate economic profitability, as revealed by the model, warrants particular attention. Although 18% of women have no formal education and 36% have only primary schooling, the cooperative manages to bridge these gaps through peer learning and informal skills transfer. This demonstrates, in line with Elinor Ostrom's (1990) theories on collective action, that the cooperative institution creates mechanisms of inclusion capable of compensating for the shortcomings of the state education system. However, the low proportion of women with access to higher education (9%) constitutes a long-term constraint on access to strategic decision-making positions and complex financial management, thus echoing Chantal Nahigejeje's (2022) concerns regarding the governance of rural groups.

The stark contrast between access to inputs (70%) and effective access to agricultural credit (63.64%) highlights the persistent shortcomings of rural financial markets in Burundi. Although a relative majority manage to obtain financing, the proportion of 36.36% of women excluded from credit circuits remains a cause for concern. This exclusion is explained, as Leora Klapper and Simon Parker (2006) pointed out, by the lack of solid land tenure security, as rural women rarely own the land they cultivate due to traditional constraints. Furthermore, environmental vulnerability, exacerbated by the fact that 72.73% of respondents are directly impacted by climate change without a financial safety net, increases the risk of chronic food insecurity. The inadequacy of state support, deplored by 72.73% of participants, confirms the urgent need to rethink adaptation and social protection policies for rural Burundian women.

CONCLUSION

Evaluation of the Cooperative Bakenyezi Tuje Hamwe in the commune of Cibitoke demonstrates that collective action led by women is a powerful driver of food security and socio-economic resilience in rural Burundi. By structuring access to technical training and agricultural innovations for 80% of its members, the cooperative successfully addresses basic educational disparities and directly stimulates productive skills and household incomes. This dynamism, further fueled by a

high proportion of young married women directly involved in managing family nutritional needs, confirms theoretical principles regarding the optimization of human capital and the redirection of domestic spending towards community well-being. The solidarity-based organization thus establishes itself as a crucial incubator, breaking the economic isolation of small-scale women producers and fostering more inclusive decision-making within a peasant economy that has traditionally been restrictive towards them.

However, this empowerment dynamic faces deep structural and environmental barriers that limit the sustainability of its effects and perpetuate the vulnerability of rural communities. The results highlight a critical gap between technical opportunities and effective access to financial resources, as more than a third of women farmers remain excluded from credit due to the lack of solid land guarantees, thus exacerbating gender inequalities in access to factors of production. Adding to this economic insecurity is a major climate threat, with more than 72% of respondents bearing the brunt of current environmental disruptions without adequate safety nets or state support. Therefore, for women's cooperatives to fully realize their transformative potential, it is imperative that national public policies urgently focus on targeted interventions aimed at climate adaptation, flexible financial mechanisms, and the genuine economic empowerment of rural women.

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Conflict of Interest: The authors declare that they have no conflict of interest.

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