Impact Evaluation Report

A Win-Win for Gender, Agriculture and Nutrition
Testing a Gender-Transformative Approach from Asia in Africa

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EXECUTIVE SUMMARY

Women make up about 43% of the agricultural labor force, in developing countries and globally. It is estimated that women invest as much as 10 times more of their earnings than men in their family's well-being, in areas including child health, education and nutrition and are thus key in agricultural research and outreach programs. Women's empowerment and gender equity have become central to global development discourse and practice and development agencies view women not as victims of poverty but as key agents in solving poverty and a host of other social and economic ills in line with Sustainable Development Goal 5: "Achieve gender equality and empower all women and girls." It is widely recognized that women have lower access to resources, and this gender gap imposes costs on the agriculture sector. Filling the gap would generate a significant gain for agricultural sector and for global food security and well-being. Conventional approaches to gender mainstreaming and gender integration have focused on closing these gender gaps in access to resources, information and technologies without addressing the underlying causes of gender inequality, including social norms and other structural barriers.

Between 2016 and 2019, CARE International in Burundi and partners, with funding from the Bill and Melinda Gates Foundation, tested how the EKATA approach – Empowerment Through Knowledge and Transformative Action – improves not only women's empowerment, but also gender equality, food security, nutrition and economic well-being. The project was implemented in six communes in Kirundo and Gitega provinces. The project tested two gender models: EKATA (gender-transformative) and "Gender Light," along with a Control group (no interventions). CARE's hypothesis is that this **gender-transformative approach that focuses on power relations and social norms will not only yield deeper, more lasting gender equality outcomes, but also will have more profound and more sustainable effects on sectoral outcomes, specifically household food security and economic well-being.** The objective of this study was to evaluate impacts of the project on household rice productivity, food security and economic well-being, and impacts on gender equality and empowerment.

The study is based on a primary data set of rural households from Burundi, which combines household- and individual-level data collected at baseline and at the end of the project. Data was captured from a random sample of 1,315 households and 1,849 composed of 790 primary male and 1,059 primary female household members which were surveyed at baseline prior to the start of the project, using the same questionnaire with minimal adjustment. The sample was drawn through a multi-stage sampling technique during the baseline survey. The provinces and communes were purposively sampled based on availability of Village Savings and Loan Associations (VSLAs) and rice production potential to allow effective program intervention. Six collines were selected in each commune and randomly allocated to the two treatments and to a control group. All VSLAs in each sampled colline implemented the same treatment to avoid cross-contamination of approaches.

The main tool for data collection was the project-level Women's Empowerment in Agriculture Index (Pro-WEAI). The project also collected data on rice production and productivity, household dietary diversity and household incomes.

Overall, the amount of rice produced increased 74.7%after all households received agricultural advice and improved technologies. Households that went through the EKATA process recorded the highest increase, more than doubling total rice production, 158 kg per household to 363.9. EKATA groups also had the largest increase of rice sold, mainly due to increased production, with a 166.5% increase. Gender Light groups increased the amount of rice sold by 110%, and the Control group increased by 104.5%. The quantity of rice consumed at home from the season's harvest rose from 95 kg to 120 kg per household – an increase of 27%. In EKATA groups, rice consumption increased by the largest margin, with a rise of 124%, followed by Gender Light at 115% and Control by 110%. Overall, *across all the households,* revenue from rice sales increased by 39.1%, with the largest increase in EKATA groups (58.6%), compared with 28.9% in Gender Light and only 8% in Control groups.

Crop and livestock incomes declined during the reporting period. Gender Light households experienced a 75% decline in crop production, compared with 77% in EKATA and 78% in Control. The decline in livestock income was attributed to a plague that devastated small livestock in 2018 and 2019. There was an increase in the number of people owning small livestock, and a decline in proportions of male and female household members owning large livestock. In EKATA groups, the proportion of respondents who owned and cultivated land rose from 80% to 92%.

An analysis of wealth index shows that 13% of households in EKATA groups improved their wealth status to the first quartile, followed by Control (4%). In contrast, Gender Light had the highest proportions of households whose wealth index reduced by 23%in the first quintile and had the highest proportion moving to the third quintile (27.7%).

Regarding food and nutrition, EKATA households consumed more of their rice harvest, increasing by 124% from baseline to end-line, compared with 115% and 110% in Gender Light and EKATA, respectively. Across all treatments, there were insignificant changes in household dietary diversity scores (HDDS) between baseline and end-line. However, EKATA and Gender Light reported a marginal increase in HDDS, while Control groups recorded a decline. Regression analyses of Difference in differences show that EKATA had significant positive impacts on WDD and FCS ($p<0.05$) compared to control; and male headed-household in EKATA and Control had positive and significant impact on HDD at 5% and 10%, respectively.

Further, EKATA had the highest proportion of households (62%) within acceptable food consumption scores (FCS) and also had the highest improvement in FCS, by 4 points (from 37 to 41), followed by Gender Light, which improved by 2 points. Gender Light and EKATA had nearly equal improvements in FCS of 5.7 and 5.0 times, respectively.

Analysis shows that EKATA achieved the highest increment in Pro-WEAI score of 0.65 (+84% increase from baseline), followed by Gender light, 0.52 (+31%). The proportion of women who were empowered at baseline were 27%, 34% and 22% for Control, Gender Light and EKATA, respectively, compared with 34%, 53% and 68% at end-line. The Gender Parity Index (GPI) improved by 51% in EKATA and by 6% and 7% in Gender Light and Control, respectively. Women achieving gender parity increased by 94%, 51% and 21%in EKATA, Gender Light and Control, respectively. The average empowerment gap between women who did not achieve gender parity with the men in their households decreased by 55% in EKATA, 21% in Control and 15%in Gender Light.

Further, the findings of this study show changes in contribution of Pro-WEAI indicators to disempowered men and women and how they changed between baseline and end-line. In EKATA, the contribution of self-efficacy to disempowerment declined by 100%, while attitudes toward domestic violence also declined by 35% for men and 36% and women. Among the women, however, “group membership” and “influential groups” were no longer key contributors to disempowerment, by 97%and 75%, respectively. For Gender Light, the key indicators that were no longer a contributor to disempowerment were “autonomy in income” and “self-efficacy,” which declined by 100% and 81% for men and women, respectively.

There are systematic differences in costs and benefits of applying EKATA versus conventional gender approaches. Although EKATA cost about US$1,175,924, compared with $770,556 spent on Control, it also generated more benefits. About 42% of the budget was applied on EKATA, compared with 31% and 28% of the budget applied to Gender Light and Control, respectively. Similarly, on average, EKATA had the highest average cost of $306 per farmer, compared with $263 per farmer in Control and $271 for Gender Light.

The net present value (NPV) of benefits created by the project was highest in EKATA groups. The NPV for EKATA was $3,275,088, compared with $1,611,658 for Gender Light and $382,996 for Control. The NPV for EKATA was about twice the value of Gender Light, and almost 8.5 times more than Control. Benefit-cost ratio for EKATA was 5:1, which was the highest, compared with 3:1 and 2:1 for Gender Light and Control, respectively. Evaluating return on investment (ROI) shows that EKATA had the highest return, 410%, compared with 270% for Gender Light and 30% for Control. Based on the three criteria (NPV, benefit cost ratio and ROI), EKATA emerged as the most profitable treatment.

From the findings of this study, a gender-transformative approach –EKATA – has benefits for both agriculture productivity and the empowerment of women, compared with a Gender Light approach. EKATA leads to more long-lasting gains of empowering women and contributing to gender equality. As such, EKATA could be scaled up, using lessons learned to adapt the approach to fit any context. However, project outcomes and learnings need to be shared with the government of Burundi and other partners to ensure sustainability of project gains. Also, efforts should be made to lobby for policies that facilitate farmers’ access to productivity-enhancing technologies and build their capacity for resilience to survive disasters such as floods and drought.

ACRONYMS AND ABBREVIATIONS

3DE	Three Domains of Empowerment
BIF	Burundian Franc
CDDS	Child Dietary Diversity Score
CERDA	Centre Universitaire d'Etudes et de Recherche/ Développement en Agro-économie
EKATA	Empowerment through Knowledge And Transformative Action
FCS	Food Consumption Score
FHH	Female-headed household
GL	Gender Light
GPI	Gender Parity Index
HDDS	Household Dietary Diversity Score
IFPRI	International Food Policy Research Institute
ISABU	Institut des Sciences Agronomiques du Burundi
MHH	Male-headed household
NGSE	New General Self-Efficacy Scale
ODK	Open Data Kit
OPHI	Oxford Poverty and Human Development Initiative
Pro-WEAI	Project-level Women's Empowerment in Agriculture Index
SDG	Sustainable Development Goal
SPSS	Statistical Program for Social Scientists
VSLA	Village Savings and Loan Association
WDDS	Women's Dietary Diversity Score

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1. INTRODUCTION

1.1 Background

Women make up about 43%t of the agricultural labor force, both globally and in developing countries (FAO, 2011; Doss, 2014). Additionally, women invest as much as 10 times more of their earnings than men in their family's well-being, in areas including child health, education and nutrition (Duflo, 2012; Maertens and Verhofstadt, 2013; Akter et al., 2017) and are key in agricultural research and outreach programs (BMGF, 2014).

Women's empowerment and gender equity have become central to global development discourse and practice. Development agencies, donors, corporations and non-governmental organizations no longer view women simply as victims of poverty, but as key agents in solving poverty and a host of other social and economic ills (Cornwall and Edwards, 2010; Prügl, 2015; Bain et al., 2018). This sentiment has been echoed through the U.N. Sustainable Development Goals (SDGs). No. 5 of the 17 SDGs is "Achieve gender equality and empower all women and girls.". Although the nature and extent of gender inequity and the conditions necessary to empower women and the role of women in agriculture vary widely across countries, communities and regions (Alkire et al., 2013; Akter et al., 2017), inequalities between women and men persist in many countries in sub-Saharan Africa (SSA).

Women farmers share a common set of gender-based disadvantages. They tend to have less access to and control of productive resources like land, livestock and labor; less access to credit; and limited control over household income. Moreover, they have less access than men to agriculture extension services, markets and opportunities. In Burundi, for instance, 80% of women depend on agriculture for their livelihoods (Doss, 2011), but deeply rooted gender discrimination and gender-based violence (GBV) contribute significantly to low productivity and profitability of women's economic enterprises, which in turn exacerbates poverty, as well as food and nutrition insecurity.

Most women in Burundi have very low levels of literacy, few marketable skills, and little access to formal or informal income-generating activities. Women are not permitted to inherit land, the most crucial livelihood asset, leaving them wholly dependent on their husbands or male relatives for their financial security and well-being. The male heads of households typically decide what to do with household resources, leaving women far fewer opportunities to make decisions about crop or livelihood investments, harvesting or selling. Women's low status in the household also means that they have less control over decisions on how food is allocated, with a resulting negative impact on their nutrition and that of children. Threats of violence or abuse often are used to uphold rigid adherence to gender-typical roles and responsibilities, and limit women's decision-making influence and mobility, which are essential to market access and successful economic engagement. Women in polygamous households, or unions not recognized by the state, are even more vulnerable to denial of their rights and food insecurity due to their weak position within the household, in society, and their lack of legal recognition.

It is widely recognized that "the gender gap" imposes costs on the agriculture sector and that "closing the gender gap" would generate a significant gain for that sector and for global food security and well-being (FAO, 2011; UNWomen, 2015). These costs are reflected not only in terms of persistent inequality, but also in missed opportunities to improve development outcomes. However, conventional approaches to gender mainstreaming and gender integration have focused on closing gender gaps in access to resources, information and technologies without addressing the underlying causes of gender inequality including gender and social norms. The critical importance of closing gender gaps is widely recognized. FAO (2011) shows, for instance, that if women had the same access to productive resources as men, they could increase farm yields by 20-30%, raising total agricultural output in developing countries by 2.5-4%, which could in turn reduce the number of hungry people in the world by 12-17%.

Gender-transformative approaches such as EKATA (Empowerment through Knowledge and Transformative Action) address the underlying causes of inequality while building women's consciousness and solidarity. Between 2016 and 2020, CARE and partners in Burundi, with funding from the Bill and Melinda Gates Foundation, tested how the EKATA approach improves empowerment, gender equality and how a focus on power relations and consciousness-raising may also yield sustainable effects on food security, nutrition and economic well-being and changes in gender and social relations.

The project tested two key approaches: (1) a gender-transformative model (EKATA) for gender equality, and (2) a typical gender-mainstreamed approach in the agriculture sector (Gender Light), in which basic gender activities are integrated into a program that has a principal focus and measures of success on women's economic empowerment through agriculture and micro-enterprise development. The project, called ***A Win-Win for Gender, Agriculture and Nutrition: Testing a Gender-Transformative Approach from Asia in Africa***, was tested in six communes in the provinces of Kirundo and Gitega.

Table 1: Components of an EKATA and Gender Light Model

Comparisons of Gender-Transformative (EKATA) Model vs. Gender Light Model	
Gender-transformative model (EKATA)	Gender Light model
The EKATA package focuses on developing critical reflection skills, power analysis and deeper engagement with male relatives of participating women, male community leaders and the wider community on social norms within the context of group dialogue and the evolution of group solidarity.	Modeling standard gender-mainstreamed approaches, the Gender Light model integrates key gender messages and pre-defined discussion topics alongside the program of livelihoods skills sessions. To ensure the program does no harm, spouses and community leaders are informed of the program objectives and gender topics but are not actively engaged in critical reflection processes.
1) Gender-transformative (EKATA) package: 1. Identify and train EKATA trainers. 2. Awareness-raising through power and gender socialization analyses. 3. Critical reflection and communication skills *(leadership, conflict management, negotiation skills).* 4. Active engagement of community and religious leaders, local government and traditional councils. 5. Active engagement with male relatives of EKATA VSLA members) using male change agents (*Abatangamuco) and reflection groups.* 6. Resolution of group action plans through collective action and solidarity between women's (and men's) groups.	1) Gender Light package: 1. Identify and train trainers on gender messages. 2. Inform male spouses of the program objectives. 3. Sensitize community leaders on program objectives and gender topics. 4. Disseminate messages and discuss with women's groups, focusing on: · Gender division of labor · Household decision-making · Control over assets and income
2. Livelihoods skills, nutrition education and market access: · **Financial education, support for savings mobilization and linkages to microfinance.** · **Networking of VSLA groups.** · **Farmer Field & Business Schools (FFBS): agricultural training and extension; introduction of agricultural technologies (including improved seed varieties – rice and vegetables); training in market literacy and engagement.** · **Expansion of women's roles further down the agriculture value chain through training in post-harvest handling, packaging produce for the market** · **Basic income management and entrepreneurial skills** · **Nutrition training and information (dietary diversity, meal planning, cooking demonstrations) for participants and spouses.**	

CARE's hypothesis is that this gender-transformative approach that focuses on power relations and social norms will not only yield deeper, more lasting gender equality outcomes, but also more profound and more sustainable effects on sectoral outcomes, specifically household food security and economic well-being.

The key research question is: "*What is the added value, and what are the associated costs of applying a gender-transformative approach within a livelihoods intervention, in terms of accelerating lasting transformations in gender equality, food security and economic well-being*?"

The aim is to challenge mainstream assumptions in the agriculture and food security sector that addressing women's economic empowerment and changing unequal access to material resources (with minimal gender-awareness messaging) is sufficient enough to catalyze significant social changes in gender equality. This assumption is upheld by many development agencies because it allows for a "lighter," more cost-effective and potentially more replicable and scalable sectoral intervention, without the challenges and skills training associated with deeper political or social change.

The project had three main objectives:

1. To contextually adapt EKATA, a proven and impactful gender-transformative approach, for use in a multi-sectoral agricultural intervention in Burundi.
2. To evaluate the differences in outcomes and processes of the gender-transformative EKATA approach compared against a standard Gender Light approach in the outcome areas of gender equality, and food security and economic well-being.
3. To determine the differential costs and capacities required to support lasting transformations in gender equality and improved sectoral outcomes through a gender transformative approach, as compared with the standard Gender Light model.

This impact evaluation study sought to evaluate the impacts of EKATA and the Gender Light models on livelihood and women's empowerment outcomes that can be attributed to the *Win-Win* project. The specific objectives of the study were to:

1. Evaluate the impact of the project on livelihood indicators including productivity, food security and economic well-being indicators.
2. Assess the impact of the project on gender equality and empowerment of women.

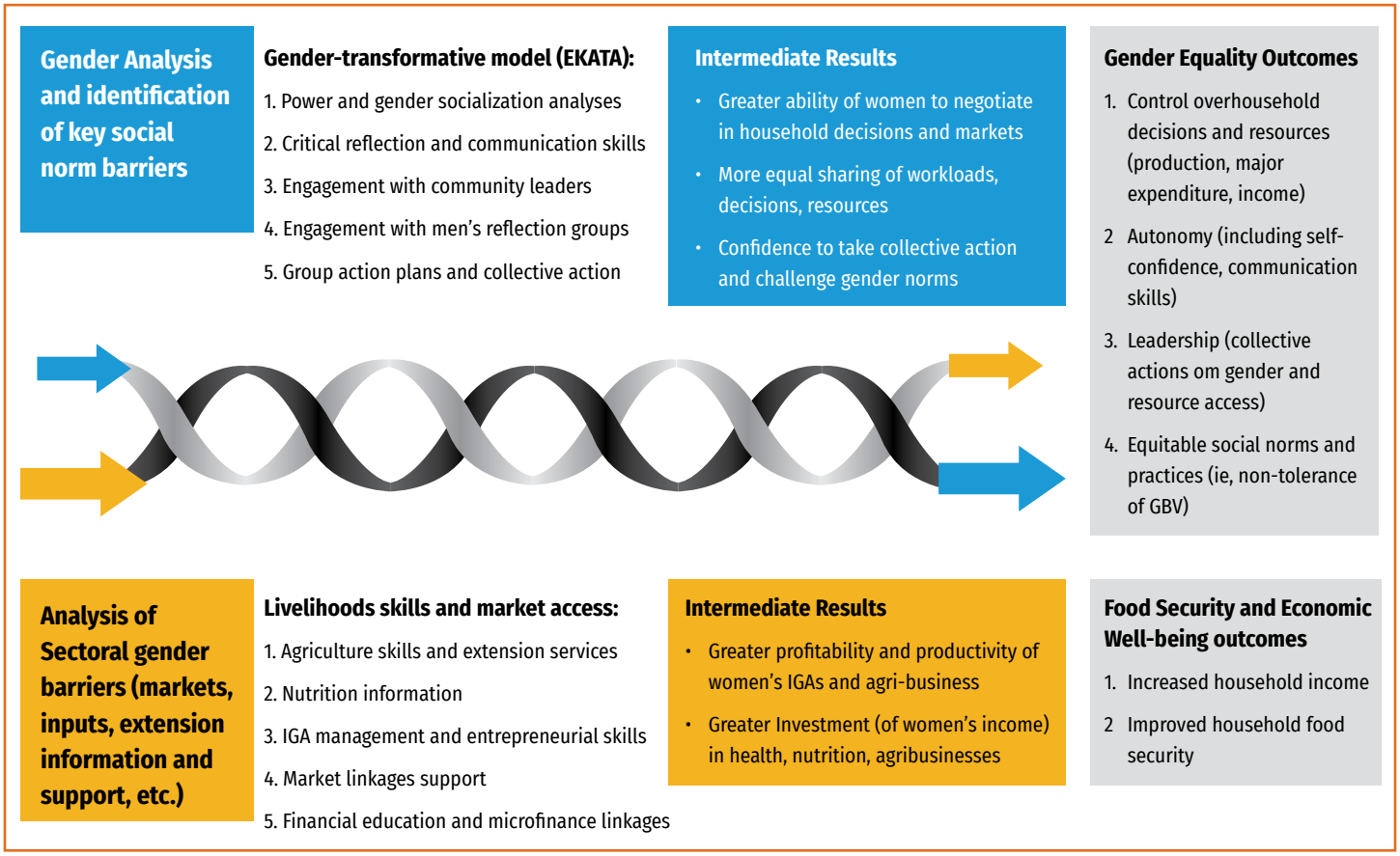
The most frequent challenge in such a study is to develop a counterfactual — a group that is as similar as possible in observable and unobservable dimensions to those receiving the intervention. The counterfactual allows for comparison to establish definitive causality –attributing the observed changes in welfare to the program, while removing confounding factors. A Control group, where only the livelihood activities were implemented (no gender interventions), acted as the counterfactual. The decision to have agricultural and livelihoods activities was based on ethical considerations and the fact that most of the agricultural interventions in Burundi follow this approach, where agricultural and livelihood activities are not accompanied by interventions to address gender inequality.

1.2 Project theory of change

A gender-transformative approach such as EKATA, which addresses underlying social norms and gender inequalities, and includes a fundamental element of critical reflection, power analysis and group solidarity, is expected to yield greater and more sustainable outcomes than the prevailing minimal gender awareness messaging (Gender Light) model, not only in gender equality outcomes, but also in associated sectoral outcomes in food and livelihood security and economic well-being.

The Gender Light model, like most mainstream interventions in the sector, is premised on the capacity of women to take individual actions, without leveraging the critical "consciousness-raising" and collective action component that may be crucial to transformation of social norms and unequal power structures. In contrast to the EKATA approach, a Gender Light model is unlikely to significantly transform the power relations within the household, to fully engage men in sharing caregiving responsibilities, or to enable women to gain control over valuable productive assets or to participate fully in the major household decisions and strategic life choices.

Figure 1: Project theory of change



1.3 Organization of the report

After this introductory section, next is a summary of the research design and the methods used in sampling, data collection and analysis. This is followed by a results section that contains three distinct sections: impact of the project on livelihood outcomes, impact on gender equality and women's empowerment, and the cost-benefit analysis. Each section is organized according to the results and indicators in the theory of change. The analysis compares the different intervention arms and a control group. Given the difference between women in male-headed households and women in female-headed households, some results have been analyzed to compare these categories. For most of the quantitative results, we use a comparison of means and cross-tabulations to analyze for any differences between the control and treatment groups.

2. METHODOLOGY

2.1 The study area

Burundi is a small landlocked country covering about 27.834 km², of which 2,500 km² is lakes and 23,500 km² is potentially agricultural land. Administratively, Burundi is divided into 18 provinces. Each province is subdivided into communes and each commune into collines. The colline is the smallest administrative unit. The population is approximately 10.8 million, making it one of the most densely populated countries in Africa. The agriculture sector accounts for more than 40% of the gross domestic product (GDP) and employs more than 90% of the population (Ndayiragije, 2018).

The climate is equatorial, with two wet seasons: February to May and September to November. Agricultural households account for more than 90% of the population, and 51% of the total population are women. The mean cultivated area is 0.5 ha per household. The low area under cultivation is due to continuous land subdivision. Most households have multiple tiny scattered plots, which are not enough to ensure the food sufficiency of the population, given the low level of technology adoption and inefficient resource allocations. The *Win-Win* project was implemented in the provinces of Kirundo and Gitega (Figure 2).

Figure 2: Map of Burundi showing the provinces of Gitega and Kirundo

2.2 Research design

The research design follows a quasi-experimental approach that was used to test the impacts of the Gender Light and EKATA models against a Control. This type of design is appropriate for development projects, as it has no "real" control. The Control and treatments have incremental interventions, and the design is therefore appropriate from an ethical perspective. A cluster sampling technique was used to randomly select collines. The two gender models and a Control were randomly allocated at the level of the colline, with all VSLAs in a colline implementing one approach to avoid spillover effects.

The two treatments and Control considered were:

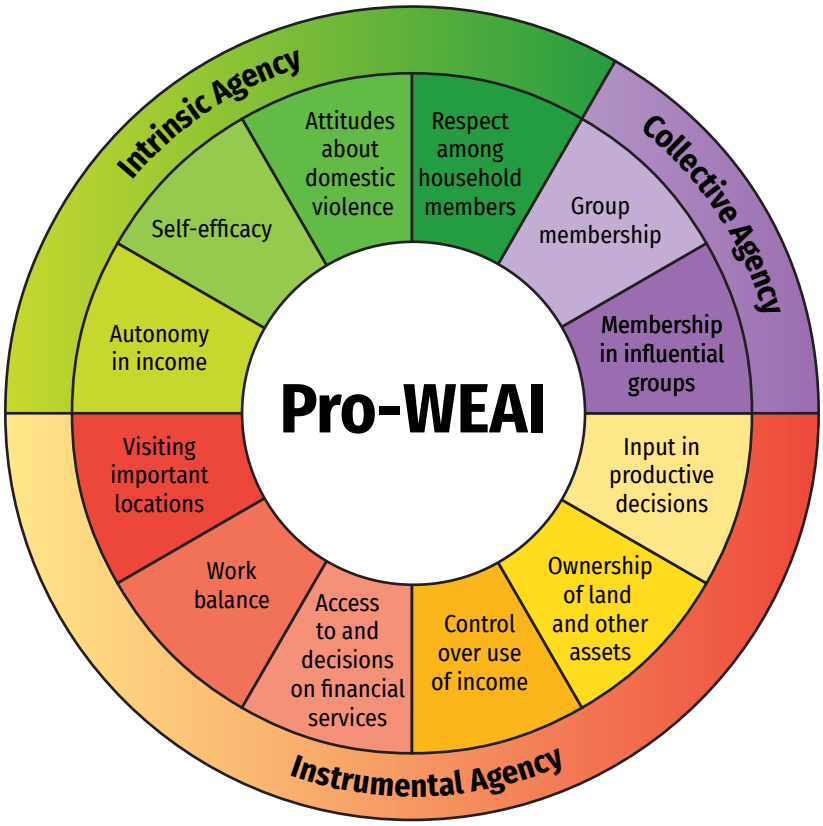
- VSLA + livelihoods skills and market access (Control)
- VSLA + livelihoods skills and market access + Gender Light (Treatment 1)
- VSLA + livelihoods skills and market access + EKATA + active engagement with male relatives using male change agents (*Abatangamuco*) and reflection groups (Treatment 2)

2.3 Data collection tools

This study utilized the baseline survey questionnaire with minimum modifications to cater for relevant data to support the analysis. The tool was designed to collect data on household characteristics, agriculture production (with a focus on rice), household incomes and asset ownership, as well as food and nutrition security. The Project-level Women's Empowerment in Agriculture Index (Pro-WEAI), developed by the International Food Policy Research Institute (IFPRI) and the Oxford Poverty and Human Development Institute (OPHI) for the Feed the Future Program, was used to collect data on gender equality and women's empowerment. Pro-WEAI is composed of 12 binary indicators nested within three domains of empowerment (Figure 3). The domains are: (1) intrinsic agency, covering indicators on autonomy in income, self-efficacy, attitudes about domestic violence and respect among household members; (2) collective agency, which includes indicators on group membership, and membership in influential groups; and (3) instrumental agency, which includes work balance, access to and decisions on financial services, control over and use of income, ownership and other assets and input in productive decisions.

The Pro-WEAI tool was adapted based on CARE Burundi's SASA baseline to reflect the holistic and strategic approach to empowerment, in particular to address issues of autonomy, self-confidence, mobility, gender-equitable attitudes, couple communications, self-efficacy scale and collective efficacy. The Pro-WEAI tool helped to collect data from individual men and women in dual-headed households, as well as women from female-headed households.

Figure 3: Indicators of the Pro-WEAI



Source: Malapit et al., (2019)

The development of the tool was led by the Africa Gender Center in collaboration with CARE Burundi and CARE USA. The questionnaire was developed in English and later translated to French and Kirundi for ease of implementation. The Kirundi version of the questionnaire was programmed and loaded in the tablets that were used for data collection.

Cost-effectiveness was measured using a cost-benefit analysis (CBA), a useful tool that to evaluate investment options such as suitability of government policies (van Wee and Börjesson, 2015) and private projects (Boardman and Forbes, 2011). In principle, CBA captures all benefits due to an intervention, valuing them either at their market value or at the level of consumption that individuals are willing to forgo to obtain them. Hence, it has its conceptual roots in welfare economics, which quantifies social welfare in terms of individuals' willingness to pay (WTP) to increase welfare (Park et al., 2018). Therefore, strict cost-benefit analysis not only increases transparency and engagement in the decision-making process, but also generates more useful information, which is important in ensuring the consistency, compatibility and rationality of decision-making results. Without CBA, resource-constrained policymakers will have limited evidence to guide their selection of efficient programs and policies, or to consider the cost implications of scaling, replicating or reproducing programs and policies found to be effective. As a result, they may rely on their instincts on what works or what does not work, or selectively choose projects that support their instincts or predetermined choices.

CBA is both an evaluative and a planning tool. It seeks to answer the following questions: Has an intervention delivered the intended change for the resources invested? Would it be possible to generate more benefits for the same resources if another approach was chosen? In the future, should we choose to improve an intervention's approach or choose a different adaptation approach altogether? Based on findings of CBA, it is thus possible to determine which interventions should be dropped in favor of other, more effective interventions.

CBA has been used in many agricultural-related research and development projects to inform on project efficiency (e.g., Bizoza and de Graff, 2012; Pemsl and Staver, 2014; Kuwornu et al., 2018). The scale mostly considered in agriculture is at the field level and focus is on components of the project (e.g., Bizoza and de Graff, 2012; Ng'an'ga et al., 2017). The objective of the CBA at this level is financial analysis. It is used as a decision tool after computing all costs against benefits valued in local currency to come up with a "net benefit" or "net income" (Gittinger, 1994). The aim of using financial CBA is to find out whether a given activity or project intervention is financially profitable for participants. An analysis at field and project components levels, however, does not provide the big picture of the project, as it only focuses on explicit costs and benefits. This study goes further to analyze project-wide costs and benefits.

CBA also has been applied in evaluating empowerment and gender equality and policies at different levels, including plots, farms, watersheds and regions (Dietz and Hepburn, 2013). There is much uncertainty about the margin costs of empowerment, giving rise to a lot of debate on the unknowns in the expected impacts of empowerment in the estimates and in ethical consideration (Tol, 2012; van Wee, 2012).

A mixed-method (qualitative and quantitative) approach was used for the CBA study in March 2020. Gathering of data and information was conducted in two main ways: a review of project documents, and primary data collection. A desk review of relevant project documents (project proposal, technical reports – including baseline, annual reports, quarterly reports, monitoring and evaluation reports – financial reports and past studies was conducted to help understand and identify costs and benefits and identify key themes and issues to be undertaken. The desk review was done to obtain information and understanding about the project as well as the framework of cost-benefit analysis. After desk review, the evaluation team came up with the scope of the study.

The preliminary literature review helped to map existing literature, studies, tools and manuals, in order to see what knowledge is already available concerning the project and similar projects. In addition, the literature review was meant to identify gaps and so-far unanswered questions. The assessment reviewed the existing literature and key background documents, including program sources such as interim reports as well as similar projects implemented by CARE and its partners in the past. Our approach employed tested participatory and consultative techniques that tap into stakeholders' inputs to ensure that results reflect the desires of the organizations that the study affects.

2.4 Sampling procedures and sample size

This study utilized a sample of households that were surveyed at baseline prior to the start of the project. The sample was drawn through a multi-stage sampling technique during the baseline survey. The provinces and communes were purposively sampled based on availability of VSLAs and rice production potential. It was important to sample areas where rice growing was taking place in order to allow for effective program intervention. From each commune, a cluster sampling of collines was done to select those that would be used for implementation and analysis. Six collines were selected in each commune and randomly allocated to the two treatments and to a Control group. All VSLAs in each sampled colline implement the same treatment in order to avoid cross-contamination of approaches and geographical spillovers. After the selection of VSLAs, a random sample of households was selected for the quantitative survey. To select the households, a sampling frame provided by CARE and partners, with all the names of the VSLA members, was used. A computer package www.randomizer.org was used to select random samples of respondents. The study population was mainly the smallholder farmers growing rice and the respondents were adult female and males in a household.

The CBA utilized systematic data collection and sampling methods. A rigorous sampling framework was developed with project implementing partners to ensure a comprehensive number and diversity of respondents. The sampling framework was selected from the following units: direct beneficiaries, wider members of the beneficiaries' communities, project implementers and government departments relevant to the project. The primary interviews with project stakeholders were conducted to collect information on achievements and impacts. The study undertook an in-depth interview to collect primary data from project partners and stakeholders by focus group discussions (FGDs) and key informant interviews (KIIs) using checklists. Four FGDs and 14 KIIs were held in the project study sites and at project headquarters at CARE Burundi. The benefits of the project were calculated based on the number of project beneficiaries and the average gain per beneficiary. In a case where two household members were in the project, agricultural benefits and costs were estimated at the household level, while the other aspects such as empowerment were estimated at individual levels.

2.5 Sample attrition

There was 19% attrition of the study sample between baseline and end-line surveys (Table 2).

Table 2: Number of surveyed households and individual members at baseline and end-line

Analysis unit	Number and percent of respondents			
1. Households	**Baseline**	**End-line**	**Attrition**	**Percent**
Control	441	388	53	12.0
EKATA	442	369	73	16.5
Gender Light	432	302	130	30.1
Total	**1,315**	**1,059**	**256**	**19.5**
2. Individuals respondents				
Male	949	790	159	16.8
Female	1,315	1,059	256	19.5
Total	**2,264**	**1,849**	**415**	**18.3**

The attrition was mainly attributed to field logistics: Respondents were not home at the time of the survey for several reasons, including off-farm businesses and participation in national political electioneering process for the forthcoming general election. An analysis of attrition bias by comparing baseline characteristics of the people who dropped out and those who didn't showed that most baseline characteristics did not differ significantly ($p<0.05$), hence the sample was more random than non-random and thus despite attrition, the sample is still representative of the baseline sample and any inference from it can be generalized for the original population.

2.6 Training of enumerators and data collection

Data was collected by a team of locally recruited enumerators with the help of CARE Burundi. The selection of enumerators was based on their educational background (at least a bachelor's degree, with knowledge of agriculture and gender), understanding of the local languages and familiarity with the area. The enumerators and supervisors were trained prior to data collection, taken through the content of the questionnaire translated from English to Kirundi. In addition, they were trained on digital data collection techniques using tablets. The main topics of the enumerators training included: understanding the objectives of research, understanding questionnaire content, role plays and discussions on framing of questions, use of tablets in data collection, loading and uploading data from the tablets to the server, carrying out field implementation and procedures to be followed in the field during data collection. The training also entailed pretesting of the questionnaire with households contiguous to the training venue. This was to ensure that the enumerators fully understood the content of the questionnaire, the order of the questions and the skip patterns in the tablet. After the pre-testing, minor revisions were done on the questionnaire. End-line data was collected between mid-March and early April 2020 by the trained enumerators under two supervisors using tablets or mobile phones on an Open Data Kit (ODK) platform.

2.7 Data processing and analysis

2.7.1 Descriptive analyses

Data was cleaned, organized and analyzed in Microsoft Excel, STATA and SPSS software. Descriptive and inferential statistics techniques such as arithmetic mean, percentage and standard deviation were used to analyze the data. Chi-square and t-test were employed to test the statistical significance of dummy and mean value of continuous variables, respectively. The analyses disaggregated the results by treatments, household types and sex of respondents based on key indicators of the project as appropriate.

Impacts of the randomized experimental design are often evaluated using single difference estimation of baseline and endline datasets. The randomized assignment and balance in baseline characteristics minimize concerns of bias in the single difference treatment estimates. However, due to difficulty of achieving a perfect randomization in the real world, as in this study difference in difference approach discussed below was applied.

2.7.2 Difference-in-differences analyses

Difference-in-differences (DD) statistical approach was used to evaluate average impacts of the project key indicators of interest. Baseline and endline survey data were merged to form a panel data that allowed analysis of impact using the following model (1):

$$yi = \beta_0 + B_1 GL + B_2 EKATA + e_i \qquad (1)$$

where yi is the outcome used to assess impact as reported by household i; GL is a dummy variable that is one if household i was allocated to Gender Light treatment arm and zero otherwise; EKATA is a dummy variable that is one if household i was given an EKATA treatment arm and zero otherwise. In this regression, β_0 is then the average outcome in the control group, β_1 provides an estimate of the effect of having being in Gender Light and β_2 provides an estimate of the incremental effect of belonging to EKATA intervention. ε is an error term with normal distribution, that is, ε ~ N(0,1). Equation (1) is estimated with ordinary least squares (OLS) for continuous variables such as income and yields; and by poisson regression analysis for count data such as dietary diversity. In this model each treatment is compared only with the control group; observations for the other treatments are excluded. The decision to participate in the project activities is endogenous. To avoid endogeneity bias this study used an instrumental variable (IV) approach, relying on the random assignment into the treatment groups or control as a valid instrument for project participation. Using the randomization status as an instrument is a common approach in the RCT literature (e.g. Ogutu et al., 2018).

2.7.3 Computation of wealth index

To evaluate impact of the project on the socio-economic well-being of the study households, wealth index was computed using data collected by the Pro-WEAI tool on ownership and access to large and small livestock, poultry and other small animals, non-mechanized

farm equipment, and non-farm business equipment. Other assets include buildings, large consumer durables (refrigerator, TV, sofa), small consumer durables (radio, cookware), cell phone, means of transportation, and ownership of an account for saving money or receiving payments. In addition, the following assets also were considered: access to electricity, toilet types, and sources of water.

Improved water sources include piped water into the dwelling, piped water into the yard, a public tap/standpipe, a tube well/borehole, a protected dug well, a protected spring, and rainwater (WHO and UNICEF, 2006). Improved sanitation facilities are those that separate human excreta from human contact and include the categories flush to piped sewer system, flush to septic tank, flush/pour flush to pit, composting toilet, ventilated improved pit latrine, and a pit latrine with a slab. Because shared and public facilities are often less hygienic than private facilities, shared or public sanitation facilities are not counted as improved (WHO and UNICEF, 2006). The proportion of the population with access to improved sanitation is the 2015 MDG indicator #31 (UNDP, 2003).

From this data, a wealth index was computed, which provided a composite measure of a household's relative socio-economic well-being. A statistical procedure called "principal components analysis" (PCA) (Filmer and Scott, 2012) was employed in STATA (StataCorp, 2015) to compute the asset weights. The PCA is a multivariate statistical technique that can be used to reduce the number of variables in a data set by converting them into a smaller number of components; each component being a linear weighted combination of the initial variables (Vyas and Kumaranayka, 2006). The first component, which explains the largest part of the variation in the data, is chosen as the wealth index (Filmer and Scott, 2012). To compute the PCA, first, these variables were all changed into binary as yes (present) or no (absent) that were coded as "1" and "0," respectively. This is because wealth index works better in binary variables. The frequency of each variable both separately for each treatment and by merging them together is used. If the frequency is between 5% and 95%, it is acceptable to be included in the analysis. Otherwise, if it is rare (less than 5%) or more common (greater than 95%), then such variables are not helpful to differentiate persons using wealth index and was thus excluded. Fortunately, only ownership of mechanized farm equipment (tractor-plow, power tiller, treadle pump) and fish pond or fishing equipment were rare and hence excluded.

2.7.4 Computation of the Pro-WEAI index

Computation of the pro-WEAI follows the methodology of the original WEAI (Alkire et al., 2013).

Pro-WEAI is calculated as the weighted mean of two sub-indices: the Three Domains of Empowerment Index (3DE) and Gender Parity Index (GPI) score (Malapit et al., 2019). The 3DE measures women's empowerment across three domains: intrinsic agency, instrumental agency and collective agency. The GPI is a relative inequality measure that reflects the inequality in 3DE profiles of the primary adult female in a household with that of the primary adult male. Typically, the primary adult female and primary adult male is the husband and wife, but the relationship between the two does not necessarily matter. Households without a primary adult male are excluded from the computation of the GPI. The GPI shows the share of woman who are as empowered as their male counterparts.

The choice of weights for the two sub-indices follows the original WEAI, placing greater emphasis on the 3DE while still recognizing the importance of gender equality as an aspect of empowerment. Improvements in either the 3DE or GPI will increase pro-WEAI scores. The 3DE index is calculated according to the following formula (2):

$$3DE = He + (Hn \times Aa) \quad (2)$$

where: $He + Hn = 100\%$ and $0 < Aa < 100\%$.

The GPI is calculated according to the following formula:

$$GPI = Hp + (Hw \times Rp)$$

where:

$Hp + Hw = 100\%$ and $0 < Rp < 100\%$.

The, Hp is the percentage of women with gender parity and Hw is the percentage of women without gender parity. Rp is the average parity score that women without gender parity experience relative to the primary male in the household. Hence, the GPI can be increased by increasing the share of women who have parity with their male counterparts or by reducing the gap for those women who are less empowered.

The two indices are aggregated into Pro-WEAI by assigning a weight of 90% to the 3DE Index and a weight of 10% to the GPI. The weighting is obviously arbitrary – alternative weights could be used, for instance, by giving more weight to gender imbalances – but to ensure comparability with previous applications, this study used to this weighting. Hence, the Pro-WEAI is computed as follows:

Pro-WEAI = (3DE × 0.9) + (GPI × 0.1).

In applying Pro-WEAI analysis, a respondent is considered adequate in an indicator if she or he reaches a certain threshold (Table 3). For example, a respondent is "adequate" in attitudes about domestic violence if he or she believes a husband is NEVER justified in hitting or beating his wife under any circumstance. The indicators are weighted equally, and a respondent is considered empowered if she or he is adequate in at least 75% t – ornine out of 12 – of the indicators.

Table 3: Pro-WEAI domains, indicators and weights

Domain	Indicator	Threshold	Adequacy	Weight
Intrinsic agency	Autonomy in income	Autonomy in income	RAI>=1	1/12
	Self-efficacy	"Agree" or greater on average with self-efficacy questions	NGSE>=32	1/12
	Attitudes about domestic violence	Believes husband is NEVER justified in hitting or beating his wife	NEVER	1/12
	Respect among household members	Respondent respects relation AND relation respects respondent AND respondent trusts relation AND respondent is comfortable disagreeing with relation.	MOST of the time	1/12
Instrumental agency	Input in productive decisions	Makes the decision, has input in decisions, or feels could make decision if wanted to about ALL of the agricultural activities they participate in	Solely or jointly At least some input At least a MEDIUM extent	1/12
	Ownership of land and other assets	Owning any land or any three assets	Solely or jointly	1/12
	Access to and decisions on credit	Belongs to a household that used a source of credit in the past year AND participated in at least ONE decision about it; OR belongs to a household that did not use credit in the past year but could have if wanted to from at least ONE source	Solely or jointly YES/MAYBE can take a loan	1/12
	Control over use of income	Participates in and has input into decisions related to how to use BOTH income and output from ALL of the agricultural activities they participate in AND participates in and has input in decisions related to income from ALL non-agricultural activities they participate in	At least SOME input	1/12
	Work balance	Works less than 10.5 hours per day	Workload = primary activity + (1/2) childcare	1/12
	Visiting important locations	Visit at least TWO locations at least ONCE PER WEEK [city, market, family/relative] OR visit at least ONE location at least ONCE PER MONTH [health facility, public meeting]	At least once a week/ once a month	1/12
Collective agency	Group membership	Active member of at least ONE group	Yes	1/12
	Membership in influential groups	Active member of at least ONE group that is influential in the community	Can influence the community to at least a MEDIUM extent	1/12

RAI=Relative Autonomy Index
NGSE=New General Self-Efficacy Scale

Source: Malapit et al., (2019)

2.7.5 Identification of costs

The focus of the cost analysis was on definition of the boundary of the analysis and identification of costs. The classification of costs was adapted from J-PAL (2012). This tool is useful because it allows collection of program/project costs to illustrate how much a project/program would cost if it were replicated, and facilitates more general comparisons between related projects. The major costs were:

i. **Program administration and staff costs**. This included the cost of all full-time staff who worked throughout any phases of the intervention and implementation and other costs and overhead related to program administration. These costs were allocated proportionally by the project implementers to reflect the real situation.
ii. **Targeting costs.** The costs incurred to target, identify and raise awareness among potential subjects as part of the intervention. Targeting/identification costs included costs of identifying collines within specific communes that were eligible and meet certain criteria. Also included were the costs of printing and distributing fliers or host information sessions.
iii. **Staff training.** Costs that were incurred to train staff involved in the intervention. This does not include training for enumerators who conducted surveys to collect data for program evaluation.
iv. **Participant training**. Costs incurred by the project to train participants or beneficiaries.
v. **Implementation and program material costs**. Costs of implementing the intervention. This included the cost of items distributed to participants, the cost of distributing the items, staff transportation to provide services/implement the program, and the cost of creating and maintaining technologies or resources developed for the intervention.
vi. **User costs.** This includes the costs that beneficiaries incurred as part of the intervention, including the opportunity cost of participants' time and labor.
vii. **Monitoring costs**. Costs incurred to oversee and monitor program activities, or track program recipients or staff and their progress during the intervention.

2.7.6 Identification of benefits

The benefits of the project were calculated based on the number of households and individuals benefiting from the project and the average benefits per household. Direct costs often are easier to estimate than benefits. The benefits of marketable goods and services from the project were estimated by estimating benefits per project beneficiary and multiplying by the unit market prices. For instance, the average rice production per household was used to estimate the benefits by multiplying the production (kg) per household by unit price. It is important to note that benefits were computed even if the respondents did not sell the rice. The principle of opportunity cost was applied such that even if they did not produce rice, they would have bought from the market at that price.

Contingent Valuation Method (CVM) is a technique of estimating the value that a person places on a good. The approach asks people to directly report their willingness to pay (WTP) to obtain a specified good, or willingness to accept (WTA) to give up a good, rather than inferring them from observed behaviors in regular marketplaces. Because it creates a hypothetical marketplace in which no actual transactions are made, CVM has been successfully used for commodities that are not exchanged in regular markets, or when it is difficult to observe market transactions under the desired conditions (Hanley et al., 1998). Although it is certainly possible to employ contingent valuation for commodities available for sale in regular marketplaces, many applications of the method deal with public goods such as improvements in water or air quality, private non-market commodities such as reductions in the risk of death, or empowerment.

This study used WTP to value empowerment. In the economic theory, the equilibrium value of WTP and WTA are, in principle, equivalent so that the choice between the WTP and WTA measures reflects a choice between alternative welfare measures (i.e. compensating versus equivalent variation). Yet, it has been empirically shown that individuals tend to give higher estimates of WTA than of WTP. This is because people tend to demand higher monetary compensations to give up goods they have, than the price they say they would be willing to pay to buy the same good they do not have. For this reason, the literature recommends the preferable use of WTP (European Union, 2015). Thus, this study mainly refers to the concept of WTP, which is more widely used in the practice of CBA. Respondents were asked to state their WTP to obtain the impacts they had received from the project based on financial measures.

2.7.7 Analysis of costs and benefits

CBA requires a comparison between the costs of an intervention and its benefits. To compare both sides of the equation, it is necessary

to express both in a common unit (money); there must be a "bottom line." This means translation of all impacts into money, regardless of whether these impacts are already expressed and measured in terms of their equivalent money value (such as change in income or production) or not (such as women empowerment or general well-being of beneficiaries and other stakeholders). This is sometimes the most challenging part of the analysis.

In this study, the costs and benefits of the three treatment arms were compared by computing their respective net present value (NPV) and benefit cost ratio. The NPV is the difference between the present value of benefit cash flow and the present value of cost cash flow (Gittinger, 1994). NPV is calculated by equation (3):

$$NPV = PV\,(B_t) - PV(C_t) \tag{3}$$

where $PV\,(B_t)$ and $PV(C_t)$ are total present value of benefits and total present value of costs, respectively. The calculation of $PV\,(B_t)$ and $PV(C_t)$ are shown in equations 4 and 5, respectively.

$$PV\,(B_t) = \sum_{t=0}^{n} \frac{B_t}{(1+r)^t} \tag{4}$$

$$PV\,(C_t) = \sum_{t=0}^{n} \frac{C_t}{(1+r)^t} \tag{5}$$

where B_t and C_t are undiscounted costs and benefits at time t, respectively; t is the discount period; and r is the discount rate. A discount rate represents the opportunity cost of capital or the amount of interest due per period as a result of using capital and reflects the perceived riskiness of a cash flow in an investment. Discounting translates future costs and benefits into present values. As with other investment criteria, its choice entails possibly two types of errors in choosing a profitable project among others: A very high discount rate decreases the NPV and may lead to rejection of a project which might be a good one, and vice versa.

The decision criteria for NPV is that if NPV is greater than 0, the project is acceptable. A positive NPV indicates a positive net benefit. In case of mutual exclusiveness, the project with the highest (positive) NPV is favored, other things being equal. Another measure in project evaluation is the benefit-cost ratio, which is the ratio between PV (B) and PV (C). Finally, return on investment (ROI) was computed from the equation (4): NPV/ PV (C) X100. NPV and PV are defined above.

3. RESULTS AND DISCUSSION

3.1 Socioeconomic characteristics of the households

Analysis of comparability of the treatment and control arms was tested for balance of key selected variables at the baseline survey. As expected, given the random assignment of the treatments, only the education level of the household head was found to be statistically significantly different between the treatment arms and Control (Table 4). At the baseline survey, 69-75% of the sample households across the treatment and Control arms were male-headed, with no significant differences among the treatments, implying that men were the main decision-makers of the households. The mean age of household heads was 43.4 years, with no significant differences across treatments. However, approximately one-third of the household heads in control and EKATA had education attainment of upper primary and above, while those in Gender Light treatment were significantly higher ($p < 0.05$). This implies that over half of the respondents had either no formal education or lower primary educational level.

Table 4: Summary socioeconomic characteristics at baseline and balance

Variable	Control	EKATA	Gender Light	p-value
Male household head (%)	69.0	70.0	75.0	0.432
Mean age of household head (years)	43.9 (13.2)	43.2 (12.3)	43.9 (5.5)	0.961
Mean household size (counts)	5.1 (2.2)	5.5 (1.8)	5.4 (2.3)	0.892
Education of household (1 = upper primary and above) (%)	31.96	34.6	37.2	0.0419**
Main occupation of household head (1 = working on the farm) (%)	88.9	83.1	89.1	0.734

3.2 Impacts on livelihood outcomes

Impact evaluation of the livelihood outcomes focused on three key livelihood outcomes of interest: production and productivity of rice as the key crop the project focused on; food security; and agricultural income.

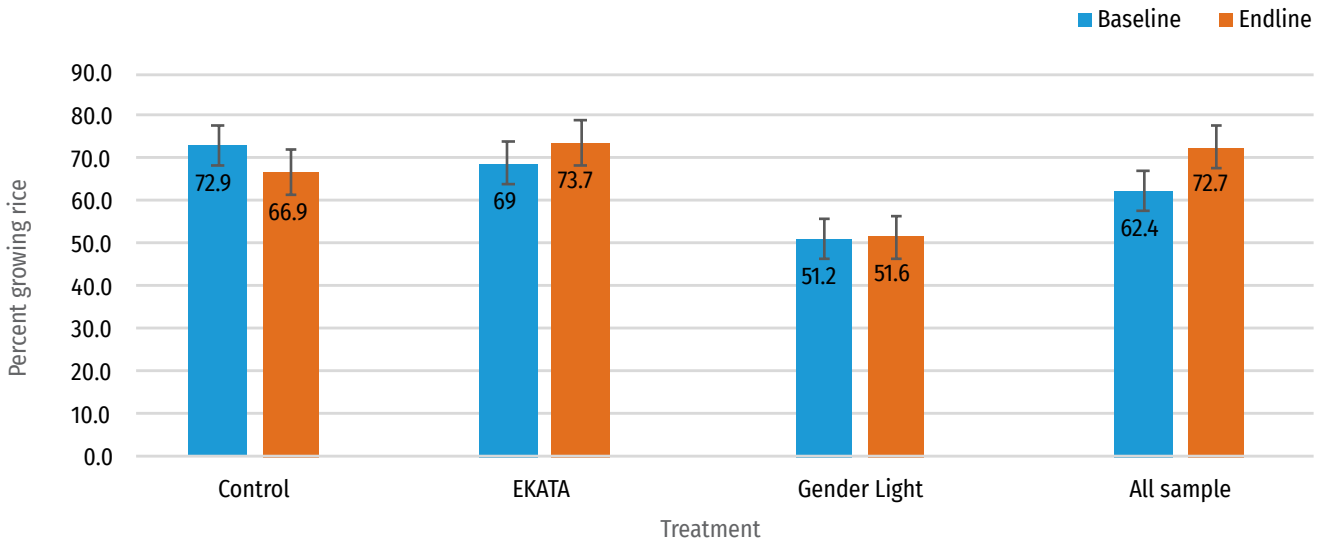
3.2.1 Rice production and productivity

In this study, rice production refers to total quantities of de-hulled grain rice harvested per household (measured in kilograms), while productivity indicates the quantities of rice harvested per unit area of land under rice per household (measured in kg per area under rice, or kg per acre). The two parameters were estimated for the main cropping season preceding this survey. The terms “productivity” and “yield” are used interchangeably.

3.2.1.1 Changes in proportions of households growing rice

Approximately 73% of the households across the treatments grew rice during the cropping season preceding this survey, compared with 64% at baseline (Figure 4). Disaggregating by treatments, the highest proportion of households that grew rice during the two survey periods were from EKATA. While the proportion of rice growers decreased by 9.5% in Control groups, it increased by 7% in EKATA (from 69%t at baseline to 74% at end-line) and remained the same in Gender Light.

Figure 4: Proportions of households growing rice at baseline and end-line

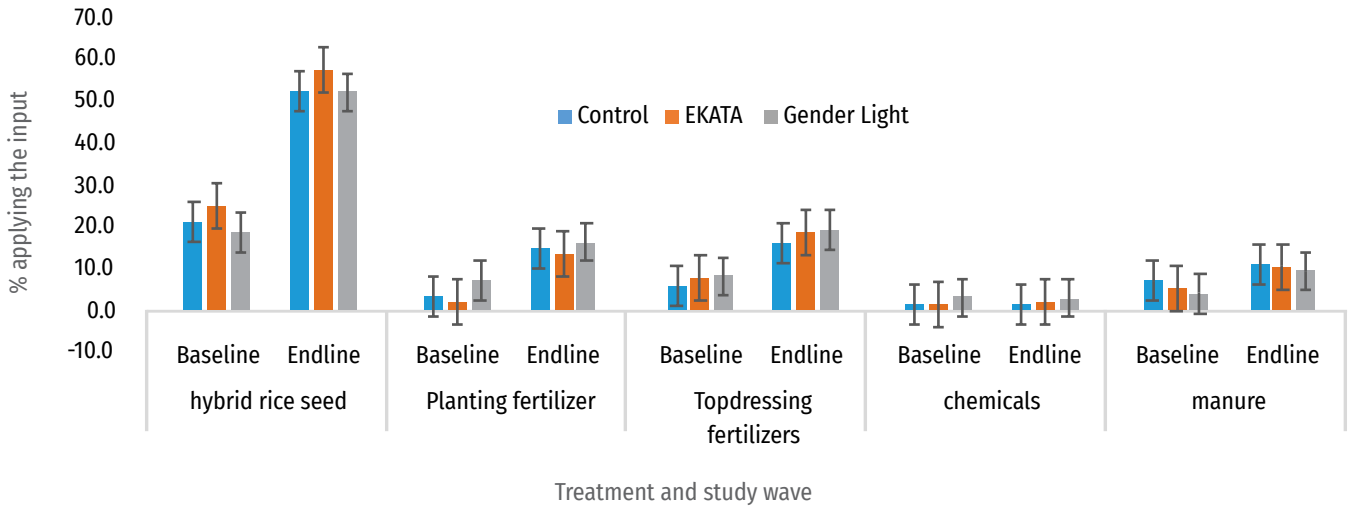


Note: Error bars test significance (p<0.05); overlapping bars shows no significance difference.

3.2.1.2 Change in adoption of technologies in rice production

A basic issue about the growth of agriculture in developing countries centers on enhancing adoption of improved technologies and practices that increase productivity. Overall, there was low adoption of inorganic fertilizers, manure and chemicals for disease and pests management across treatments (Figure 5). While only 22% of all the whole sample households planted hybrid rice seed at baseline, this proportion more than doubled (145%) to 54% at end-line. Disaggregating by treatments, the adoption of improved hybrid rice seeds were 51.9%, 57.4% and 54.2%, for Control, EKATA and Gender Light, respectively. This increased adoption could be attributed to the *Win-Win* project, which set up on-farm demonstrations plots to promote improved rice varieties and crop management practices in the project area, where previously most farmers grew old local varieties (CERDA and CARE, 2019). The highest increase in use of inorganic fertilizers was in EKATA, which had the lowest proportion of 3.7% at baseline, but increased threefold to 12.5% at end-line.

Figure 5: Proportion of households using various inputs for rice production



Note: Error bars test significance; overlapping bars shows no significance difference.

The project also promoted soil fertility management practices, among other practices. However, less than 10% of rice growers applied planting inorganic fertilizers even at end-line. Comparing across treatments, the EKATA had a 1.9% increase in fertilizer use during planting, which was the highest among the treatments. A small percentage of households used fertilizer for top dressing, with only about 7.9% of the total respondents using top dressing fertilizer and another 6% using manure. While there were no significant differences between Control and EKATA at baseline, however, there was indeed significant increase in use of top dressing fertilizers, from 4%to 18% ($p<0.05$) in the EKATA arm.

The use of pesticides (chemicals for disease control) was only adopted by about 1% of the households, though CERDA and CARE (2019) report that pests and diseases are major constraints to rice production. The low adoption of purchased inputs such as inorganic fertilizers and chemicals for disease control in rice production was attributed mainly to cash constraints that the farmers face and policies that don't facilitate farmers' access to inputs. Low application of manure was, however, associated with low numbers of livestock owned per household.

3.2.1.3 Land area allocation, yield and production of rice

Overall, the area under rice production declined, but due to an increase in yield, the amount of rice produced went up. For all households, the area under rice production fell by 34.7%, with the steepest decline being in the Gender Light groups and the smallest in the Control groups. The amount of rice produced went up by 74.7%. The highest increase in amount of rice produced was in the EKATA groups, where total rice produced more than doubled, from 158 kg per household to 363.9 kg per household. This increment in amount of rice produced by households could be attributed to situations where farmers experienced floods on their farms but the floods did not sweep away the rice crop. Since rice is aquatic, the crop could have thrived in such situation to generate high yield. Moreover, the study recorded the farmers who did not harvest at all as missing data rather than zero to avoid distortion of the statistics.

Table 5: Land area, production and productivity of rice

Variable	Control			EKATA		
	Baseline	End-line	% diff	Baseline	End-line	% diff
Area under rice (ARE)	11.5	9.6	-16.5	15.2	12.3	-19.1
Rice harvested (kg) dehulled	148	287.1	94.0	158	363.9	130.3
Rice yield (kg/ARE)	54	56.0	3.7	56.1	56.98	1.6
Rice yield (kg/acre)	2,185	2,269	3.9	2,264.1	2,306	1.9
Variable	**Gender Light**			**Total Sample**		
	Baseline	End-line	% diff	Baseline	End-line	% diff
Area under rice (ARE)	19.4	14.6	-24.7	15	9.8	-34.7
Rice harvested (kg) dehulled	172	283	64.5	158	276	74.7
Rice yield (kg/ARE)	45.8	46.5	1.4	52.5	54.2	3.1
Rice yield (kg/acre)	1,853	1,880	1.5	2,125	2,173	2.3

Note: 1 = acre = 40.47 ARE

3.2.2 Changes in consumption and trade in rice produce

Households increased the amount of rice they sold from 66 kg at baseline to 85 kg at end-line. This increase was across all the treatment groups. Groups with EKATA had the largest increase of rice sold, mainly due to increased production with a 166.5% increase, followed by Gender Light, which increased the amount of rice sold by 110% and the control group by 104.5%.

Mean value of rice sold was 211,098 Burundian Franc (BIF) and was highest in the sites selected for Gender Light treatment (Table 6). The price of rice sold also increased with Gender Light, reporting the highest increase of by more than double (190%) compared with Control (69%) and EKATA (12%). Given that the farmers sell on the similar market channels at harvest, variations in prices could be due to some farmers storing their rice produce and selling later in the season when prices were relatively high.

The quantity of rice consumed at home from the season's harvest rose from 95 kg to 120 kg per household – a rise of 27%. In EKATA, rice consumption increased by the largest margin, with an increase of 124%, followed by Gender Light at 115%and Control by 110%. A similar trend was seen in per capita consumption.

Overall, *across the treatments,* revenue from rice sales increased by 39.1%,with the largest increase in EKATA groups, where revenue increased by 58.6%, compared with 28.9% in Gender Light and only 8% in Control groups.

Table 6: Household consumption and trade in rice

Variable	Control			EKATA		
	Baseline	**End-line**	**% diff**	**Baseline**	**End-line**	**% diff**
Rice sold (kg)	60.0	104.3	73.8	68.0	166.5	144.9
Rice price per kg (BIF)	984.0	1665	69.2	1776.0	1986	11.8
Rice consumed at home (kg)	88.0	110.5	25.6	120.3	123.8	2.9
Per capita rice consumption	16.6	20.8	25.3	22.7	23.2	2.2
Rice total revenue	158,957	171,737	8.0	209,707	332,677	58.6
	Gender Light			**Overall**		
	% diff	**Baseline**	**End-line**	**Baseline**	**End-line**	**% diff**
Rice sold (kg)	70	110.5	57.9	66	85.3	29.2
Rice price per kg (BIF)	713	2073	190.7	1201	1235	2.8
Rice consumed at home (kg)	103	115	11.7	95	120.8	27.2
Per capita rice consumption	19.4	21.7	11.9	17.9	22.8	27.4
Rice Total revenue	123,572	159,242	28.9	166,078	231,095	39.1
Rice sold (kg)	**70**	**110.5**	**57.9**	**66**	**85.3**	**29.2**

Note: Average household size is 5.4 individuals.

3.2.3 Household Food Security

Household dietary diversity score (HDDS), Food Consumption Score (FCS) and Women's Dietary Diversity (WDD) was applied to evaluate the impact of the project on nutrition. Compared with income-based measures of household food security, these consumption-based food insecurity measures (HDD and FCS) were preferred for this study, as they tend to reflect a household's ability to meet their basic needs, are less vulnerable to measurement errors, and are closely associated to the utility that people effectively extract from income. Studies have shown that dietary diversity is highly correlated with dietary quality and quantity (Marshall et al., 2014; Hoddinott and Yohannes, 2002; Nkonya et al., 2020) and positively associated with nutrient adequacy (Torheim et al., 2003). Additionally, dietary diversity is associated with other positive health outcomes, including greater birth weight, child anthropometric status, hemoglobin concentration, and reduced hypertension, cardiovascular disease and cancer (Hoddinott and Yohannes, 2002; Ruel, 2003).

HDDS evaluated the number of food groups that a household had consumed 24 hours prior to the survey, based on 12 food groups (1 = cereals; 2 = roots and tubers; 3 = vegetables; 4 = fruits; 5 = meat, poultry, offal; 6 = eggs; 7 = fish and seafood; 8 = pulses, legumes, nuts;

9 = milk and milk products; 10 = oil/fats; 11 = sugar/honey; and 12 = miscellaneous). Each food group receives a score of 1 if consumed, and thus HDDSs range from 0 to 12 (Swindale and Bilinsky, 2006).

The results show that while households in the EKATA and Gender Light groups had an increase in HDDS between baseline and end-line, households in the Control groups recorded a decline, although these changes were not significant (Table 7). Although there was no significant changes in diet diversification levels in terms of number of different food items consumed, it cannot be concluded that the project failed to improve the households' nutritional status. Rather, it reflects the mean outcome, which is not a good measure for a count variable such as the number of food categories consumed as discussed below.

Table 7: Mean number of food groups eaten by the households in 24 hours

Treatment	Baseline	End-line	% difference
Control	5.2	5.1	-1.9
EKATA	5.1	5.4	5.9
Gender Light	5.1	5.2	0.0

One key challenge of using the HDDS is that there is no international consensus on which food groups to include in the scores and no established cut-off points in terms of number of food groups to indicate adequate or inadequate dietary diversity. Subsequently, WFP (2008) recommends the use the mean score or distribution of scores for analytical purposes and to set project targets or goals. The HDDS is a particularly useful approach for measuring household food access, when resources for undertaking such measurement are scarce.

Given that HDDS is a count variable and most likely skewed, that is, some households have a lower or higher HDDS, means cannot show a clear picture. However, Poisson distribution captures well such a pattern. Typically, the mean and variance of the Poisson distribution are equal, that is, $y = var(y)$. But there is the potential of over-dispersion — that is, when $y = var(y) > (y)$, in which case, the negative binomial distribution is appropriate for estimation of the model. When the dispersion parameter nears zero, the negative model distribution is equivalent to the Poisson distribution. The negative binomial distribution approaches the Poisson distribution. This study adopted negative binomial models to estimate the impact on food security (Table 8) using difference in difference analysis. The results show that male headed-household in EKATA and Control had positive and significant impact at 5% and 10% , respectively.

Table 8: Impact of the project on household dietary diversity across sex of household head

HDDS	Control	EKATA	Gender Light
Treatment*sex_head	0.0649 (0.035)*	0.0825 (0.0447)**	0.0492 (0..035)
Education of household	0.0026 (0.0009)*	-0.0026 (.0009)*	0.0026 (0.0009)*
Household size (count)	0.0078 (0.006)	0.0075 (0.006)	0.0074 (0.006)

Note: Figures in parentheses are standard errors; * and ** mean significant at 5 and 10%, respectively.

To evaluate food diversity of women, WDD was used. The interpretation of WDD is like that of HDDS. The WDDS is below the recommended minimum of five food groups across the treatments. The changes in WDDS between baseline and endline were not significant (P>0.05 (Table 9). However, WDD increased by 3% in EKATA and decreased by 6% in Control and 1% in Gender Light.

Table 9: Women's Dietary Diversity Score

Treatment	Baseline	End-line	% difference
Control	3.24	3.06	-5.56
EKATA	3.14	3.24	3.18
Gender Light	3.16	3.13	-0.95

The FCS attempts to capture food sufficiency and diversity (WFP, 2008). To generate the FCS, households are asked about their food intake over the past seven days. Each category is assigned a weight based on its nutritional value. More nutrient- and energy-dense foods, such as meat and dairy, are assigned higher weights, whereas foods with few calories, such as vegetables and fruit, are assigned lower weights. Pulses are weighted slightly more heavily than cereals because of their nutritional composition, which generally includes more protein than staple grains. Based on the recommended WFP weights, the FCS was calculated as follows:

FCS = (4 × *meats)* + (2 × *staples-cereals*) + (3 × *pulses*) + (1 × vegetables) + (1 × fruits) + (4 × milk and milk products) + (0.5 × oil/fats) + (0.5 × sugar and honey) + (0.5× Miscellaneous)

Table 10 shows the FCS of the treatment arms. Overall, at end-line the mean FCS ranged from 37 in Control to 41 in EKATA, out of a maximum of possible score of 112.

Table 10: Household mean food consumption scores and the thresholds

Treatment	Control		EKATA		Gender Light	
FCS score	**Baseline**	**End-line**	**Baseline**	**End-line**	**Baseline**	**End-line**
Mean FCS	36.7	37.3	36.9	40.7	36.4	38.6
FCS thresholds						
0 to 21 (food-insecure)	8.3	15.5	12.2	10.8	12.73	9.27
21.5-35 (borderline)	44.4	32.5	38.9	27.7	41.9	37.1
35-112 (food-secure)	47.1	52.1	48.9	61.5	45.37	53.6

Based on the WFP (2008) classification thresholds, EKATA had the highest proportion of the households (62%) within acceptable FCS range, followed by Gender Light. EKATA had the highest improvement of FCS by 4 points (from 37 to 41), followed by Gender Light, which improved by 2 points. In terms of thresholds, Gender Light and EKATA had nearly equal improvements in FCS of 5.7 and 5.0 times, respectively.

3.2.4 Regression analysis of impacts: Difference in Difference of WDD and FCS

Further regression analysis show that EKATA had significant positive impacts on WDD and FCS ($p<0.05$) compared to control (Table 11). However, there were no significant changes in the two outcomes in the Gender Light treatment arm. These results demonstrate the superiority of the EKATA treatment arm on the nutritional outcomes but no significant impacts were detected in rice yields as discussed earlier.

Table 11: Results of difference in difference analysis

Treatment	Outcomes	Coefficient.	Std. Err.	z	P>|z|
	Nutrition				
Gender Light	WDD	0.0454	0.0317	1.43	0.152
	FCS	1.6263	1.6074	1.01	0.312
EKATA					
	WDD	0.089	0.031	2.91	0.004***
	FCS	3.277	1.594	2.06	0.04**
	Rice yield				
EKATA	Rice yield	149.4039	661.5199	0.23	0.821
Gender Light	Rice yield	111.0653	601.9621	0.18	0.854

Note: Figures in parentheses are standard errors; * and ** mean significant at 5 and 10%, respectively

3.2.5 Agricultural income

The average income from crops and livestock generally declined from baseline to end-line. Crop income was the most affected, experiencing a 75% decline in Gender Light, compared with 77% in EKATA and 78% in Control (Table 12). This could be attributed to low production and low sales, resulting in households consuming most of their produce, and leaving less for sale. Similarly, there was a decline in livestock income. This was expected from the results presented earlier in this study, showing a decline in the number of livestock during the period under consideration. The decline in livestock numbers was associated with an outbreak of a plague that caused deaths of goats in 2018 and pigs in 2019 (FAO, 2018). The plague is reported to have killed about 8,500 goats in Karuzi, Kirundo, Gitega and Muramvya provinces of Burundi.

Table 12: Average household income from crops and livestock

Treatment	Crop incotme (BIF)			Livestock income (BIF)			Livestock products income (BIF)		
	Baseline	**End-line**	**% diff**	**Baseline**	**End- line**	**% diff**	**Baseline**	**End-line**	**% diff**
Control	465,031	102,438	-78	446,707	94,804	-79	273,420	139,977	-48.8
EKATA	561,481	130,368	-77	311,867	243,976	-22	161,843	96,543	-40.3
Gender Light	426,943	106,403	-75	397,131	192598	-52	151,557.14	123,984	-18.2

Note: % diff = percent change computed as: (end-line minus baseline values/baseline) X 100

However, the percentage decline in livestock income was not as high as for crops. The Control group recorded the highest decrease of 79%, while EKATA reported the least (22%). Moving to livestock products, the Control group again reported the highest decrease of 48%, while Gender Light reported the least (18%). The main factor for the decline in crop income was due to floods that devastated large proportion of the study area, followed by drought. In view of the decline in income at endline survey, compared to baseline, no further analyses were conducted to evaluate the impacts of the project on incomes.

3.2.6 Household wealth

The scores on wealth indices are interpreted as relative wealth levels (Table 13). In most applications the wealth distribution is divided into quintiles (could also be divided by percentiles), with the lowest 20% of the population defined as the poor and the upper 20% as the rich. The households in the first quintile are perceived as belonging to relatively higher wealth categories than those in the second and third quintiles, respectively.

The results of wealth indices show that EKATA had the greatest proportion (12.6 percentage points) of the households that moved up to first quintile, meaning improved wealth, as well as the largest decline in those in the third quintile (a reduction of 13%). Gender Light had the highest percentage of those to move down from the first quintile (22.6%) and the highest proportion that moved to the third quintile (27.7%), implying reduced wealth.

Table 13: Proportion of households in different wealth quintiles by treatment

Treatment	Quintile*	Baseline	End-line	% difference
Control	1	30.3	31.5	4.0
	2	31.4	31.9	1.6
	3	38.3	36.6	-4.4
EKATA	1	34.3	38.7	12.8
	2	33.0	33.2	0.5
	3	32.7	28.2	-13.8
Gender Light	1	36.7	28.4	-22.6
	2	34.8	35.2	1.1
	3	28.5	36.4	27.7

* 1st quintile is the wealthiest and 3rd the poorest

Wealth indices are considered effective indicators of long-term socioeconomic position, living standard or material well-being of households (Howe et al., 2012). They often perform as well or better than expenditure data in explaining variation. Also, the fact that the required data can be more reliably measured than those needed for computing income or expenditure measures, the most obvious alternatives, has contributed to their success (Filmer & Scott, 2012). In spite of these positive properties, wealth indices suffer from one great disadvantage: They are not comparable among countries and time points. For each survey usually, a separate wealth index is constructed on the basis of the assets available in the survey data. Such a separate index is tailored toward the specific wealth distribution in the survey year in the country on which it is based. This means that it is a valid indicator of wealth differences in that specific situation in a given year.

3.3 Impacts on gender equality and women's empowerment outcomes

Gender equality and women's empowerment outcomes were analyzed according to Pro-WEAI outcomes of instrumental agency, intrinsic agency and collective agency. Instrumental agency deals with the role of men and women in household decision-making around production and income, including ownership and access to productive capital. Land is the major asset for farmers and the extent of land rights are essential in enhancing or reducing investment on land. Intrinsic agency deals with women's autonomy, their self-efficacy, attitudes toward gender-based violence, and respect from family members. Collective agency deals with membership in groups as well as membership in influential organizations.

3.3.1 Women's ownership of land and other assets

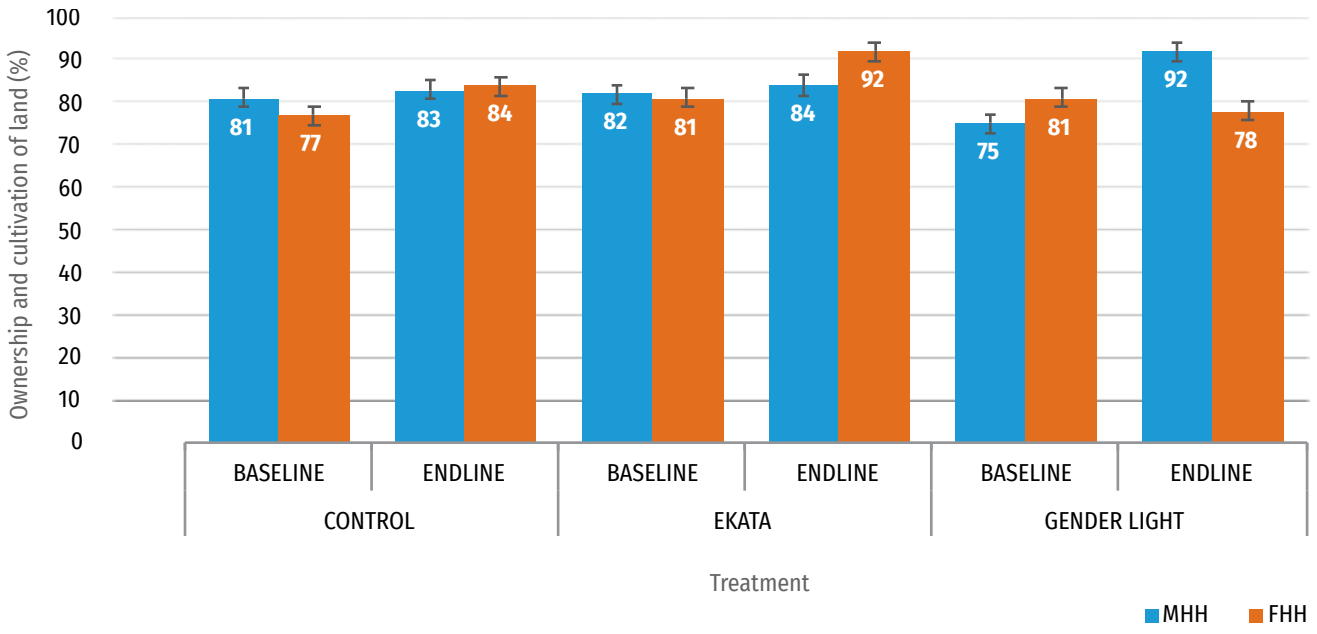
3.3.1.1 Ownership of land

Conventional wisdom suggests that secure ownership of land by a household or an individual household member improves utilization compared with leased land, which has lower property rights. A number of studies have demonstrated that security of land ownership has a substantial effect on application of agricultural practices and overall agricultural performance of farmers (Mwesigye et al., 2020; Lawry et al., 2017).

This study investigated land ownership rights and cultivation of land by female household members from male- and female-headed households. The results show that most female respondents regardless of their household type, either owned or cultivated land (Figure 6). About 75% of the respondents either owned or cultivated land at both baseline and end-line surveys. Overall, there was no significant variation across the treatments.

There was a higher proportion of women from female-headed households in the EKATA treatment at end-line than those from households with an adult male and female ($p<0.05$), implying that women in female-headed households have more autonomy in accessing and using land than those in male-headed households. In EKATA, the proportion of women in female-headed households that owned land increased by 11 percentage points, from 81%to 92%. The corresponding increase in the Control arm was 7 percentage points, while in Gender Light, there was a decline of 3 percentage points. The pattern in the male-headed households was different, with the largest increase in the Gender Light group of 17 percentage points. In EKATA, only 2% more women owned land at end-line compared with the baseline.

Figure 6: Proportion of women in male- and female-headed households who owned or cultivated land



Note: Error bars test significance; overlapping bars show no significance difference.

Most of the land was owned jointly by men and women. At baseline, 38% of the land was owned solely, while 61% was jointly owned. Nearly, three-quarters of the men reported owning land jointly, while only 57% of the women owned land jointly. There was no marked change in joint land ownership across the treatments between baseline and end-line surveys (Table 14).

Overall, sole ownership of land by women increased by 7.7%, resulting in a decline in joint ownership by 8.4 percentage points in the EKATA arm. In comparison, women's sole ownership of land went up by 9.4% in the Gender Light group, while joint ownership went down by 8.1%. The gender interventions marginally increased women's sole ownership of land, which was reflected in a reduction in joint ownership of land with spouses. In the Control group, there was no discernible change in joint ownership of land by women. Due to the short duration of the project, it was not clear whether this change in ownership patterns was due to project interventions or changes in reporting by men and women during the baseline and end-line surveys. What is clear is that across all treatments, more men reported joint ownership of land at end-line compared with baseline.

Table 14: Proportion of men and women owning land solely and jointly

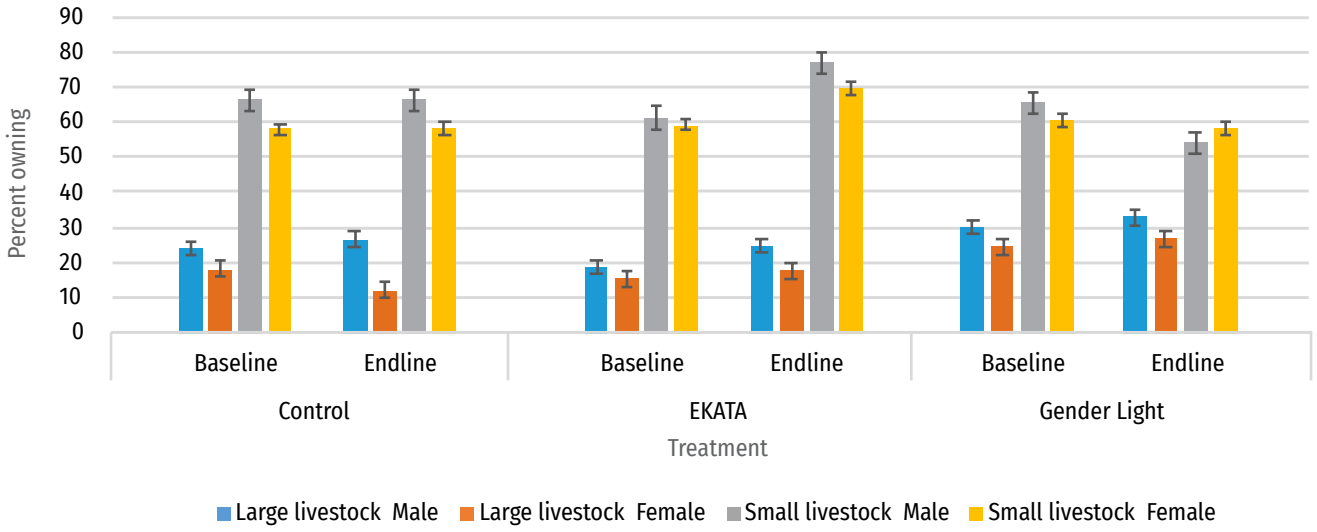
		Control		EKATA		Gender Light		Total Sample	
		Baseline	End-line	Baseline	End-line	Baseline	End-line	Baseline	End-line
Male	Solely	29	24.5	21.9	23.8	28.6	25.0	26.3	24.3
	Jointly	69.9	75.5	75.3	76.2	70.4	75.0	72.0	75.7
	Both	1.1	0.0	1.4	0.0	0.5	0.0	1.0	0.0
Female	Solely	38.0	38.6	33.7	41.4	35.6	45.0	35.7	41.4
	Jointly	60.6	59.6	64.6	56.2	62.6	55.0	62.6	57.1
	Both	1.1	1.8	1.1	2.4	0.9	0.0	1.0	1.5
Total sample	Solely	34.9	36.3	29.3	37.5	33.0	41.1	32.3	38.1
	Jointly	63.8	62.2	68.7	60.6	65.5	58.9	66.1	60.7
	Both	1.1	1.5	1.2	1.8	0.8	0.0	1.0	1.2

Note: Percentages add up to more than 100 because of multiple responses.

3.3.1.2 Ownership of large livestock

There was an increase in those owning small livestock and a decline in the proportion of male and female household members owning large livestock across the treatments (Figure 7). There was a slight increase (less than 3 percentage points) in the proportion of women who owned large livestock in both the Gender Light and EKATA groups, while there was a decline in the Control group. This points to changing trends, where more women own large livestock , which traditionally has been the domain of men.

Figure 7: Percent of male and female members owning large livestock



The actual number of livestock owned by the households was generally low, and the mean numbers of large animals owned solely or jointly by male and female household members did not change (only one large livestock by women at both end-line and baseline), except in EKATA, where the average number of large livestock owned solely remained the same while those jointly owned increased from two to three for men, while remaining constant for women.

3.3.1.3 Ownership of household equipment

Non-mechanized farm equipment was one of the assets that were owned by a large proportion of the respondents, followed by small consumer durables (Table 15). The equipment is important in complementing other inputs to increase agricultural productivity. At baseline survey, nearly equal proportions of men and women, especially in Control and EKATA treatments, owned non-mechanized equipment. Ownership of non-mechanized farm equipment declined by more than 50%, regardless of the treatment and sex of the respondent. There also was a decline of ownership of all other assets except non-mechanized equipment and cellphones. There was no clear explanation for the decline in ownership of these assets.

Ownership of non-mechanized business equipment went up for both men and women, with the largest increase for women being in the EKATA groups, where women's ownership went up 17%, compared with 15% in Gender Light. Women's ownership of cellphones went up by close to 10% in both EKATA and Control groups.

Table 15: Ownership of assets by sex of respondent and treatment

	Treatment	Male		Female		Total Sample	
		Baseline	End-line	Baseline	End-line	Baseline	End-line
Non-mechanized farm equipment	Control	82.4	30.8	87.5	38.0	85.7	36.5
	EKATA	83.8	42.4	83.3	35.1	83.5	36.6
	Gender Light	74.7	26.7	82.9	26.9	79.7	26.8
Non-farm business equipment	Control	13.5	20.0	13.2	30.1	13.3	27.8
	EKATA	16.2	44.0	13.3	41.0	14.4	41.7
	Gender Light	15.9	36.0	14.1	28.9	14.8	30.6
House or building	Control	39.3	33.7	38.1	38.2	38.5	37.3
	EKATA	42.8	37.9	39.8	34.1	41	34.9
	Gender Light	50.2	28.4	47.6	27.7	48.6	27.9
Small consumer durables	Control	52.0	29.8	56.7	38.8	55	36.9
	EKATA	50.7	42.4	47.7	33.7	48.9	35.5
	Gender Light	44.4	27.8	47.1	27.6	46.1	27.6
Cellphone	Control	32.4	30.6	20.9	31.1	25.0	30.9
	EKATA	35.6	45.5	31.7	39.0	33.2	40.6
	Gender Light	41.5	24.0	30.7	30.0	34.9	28.5

Unlike at baseline, at end-line, the narrowest gap between men and women was in the ownership of a cellphone. While 36.7% of male respondents indicated they owned a cellphone, only 27.7% of the female respondents owned one (Figure 8). The proportion of men owning cellphone in EKATA increased by 28%, while the proportion of female members owning cellphone increased by 23%. There was more disparity in ownership of cellphone in the Control group. There was still an increase in the proportion of women who owned cellphones, with an increase of 49%.

Figure 8: Proportion of respondents who reported owning equipment solely or jointly

Figure 8a: Baseline

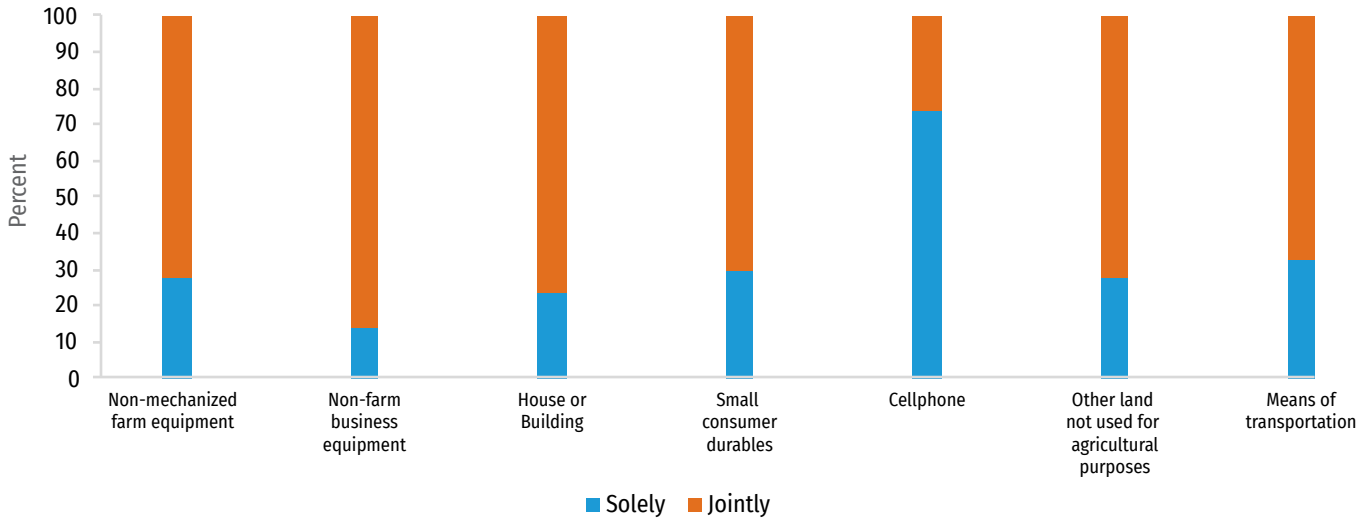
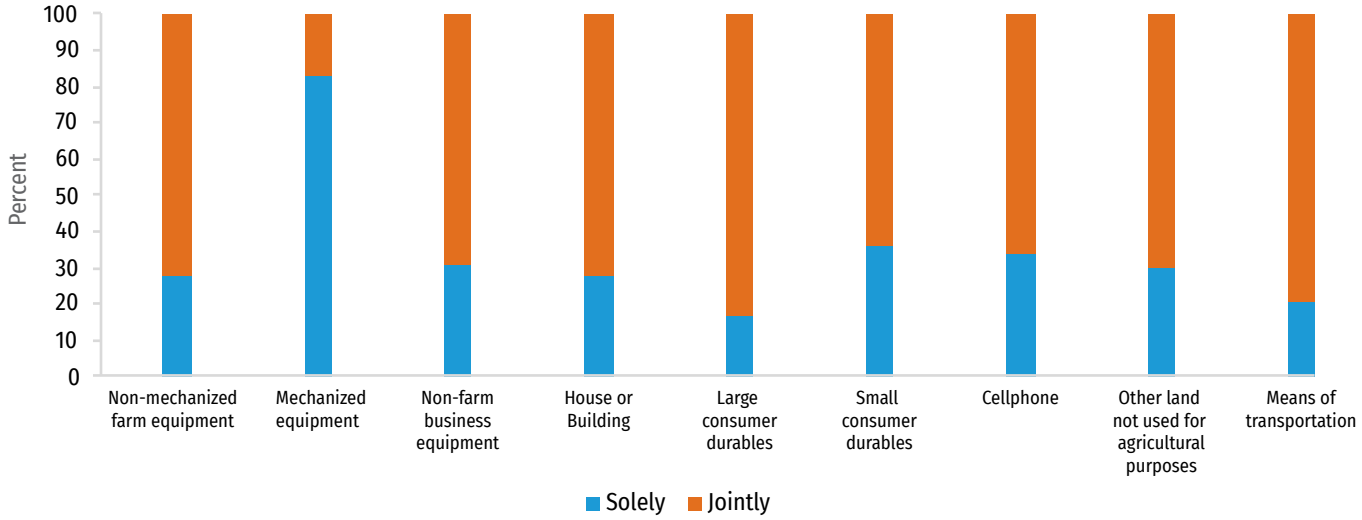


Figure 8b: End-line



There were no significant differences in the actual numbers of assets owned across treatments (Table 16).

Table 16: Number of assets owned by male and female respondents

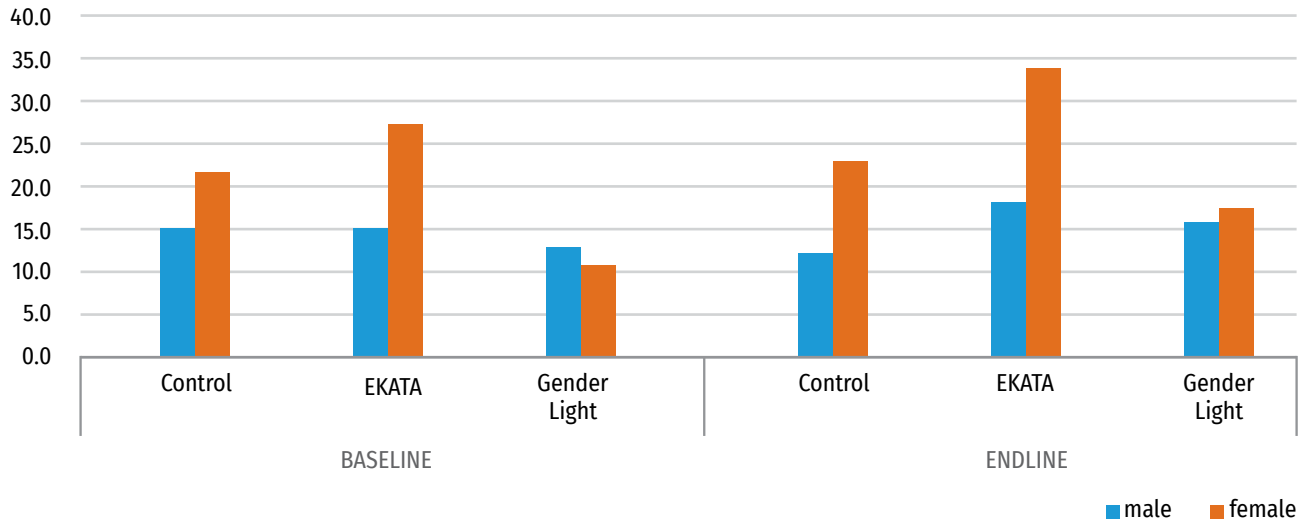
	Male				Female			
Asset	**Solely**		**Jointly**		**Solely**		**Jointly**	
	Baseline	End-line	Baseline	End-line	Baseline	End-line	Baseline	End-line
Non-mechanized farm equipment	2.7	2.2	2.4	2.8	2.3	2.1	2.3	2.3
Non-farm business equipment	1.1	1.3	1.1	1.0	1.1	1.2	1.1	1.0
House or building	1.0	1.0	3.5	1.0	1.0	1.0	1.1	1.0
Small consumer durables	2.0	1.2	3.0	1.3	2.3	1.6	2.9	1.6
Cellphone	1.0	1.0	1.1	1.0	1.1	1.0	1.1	1.0
Other land not used for agricultural purposes	1.4	1.0	1.3	1.0	1.3	1.0	1.1	3.5
Means of transportation	1.0	1.0	1.1	1.1	1.1	1.0	1.1	1.0

3.3.2 Decisions on income

3.3.2.1 Decision-making on crop income

The was an increase in decision-making by women on crop income from baseline to end-line, with the largest increase in the EKATA groups, although the proportion of women making decisions on income remained under 50%. At baseline, 25.7% of women made decisions on crop income, and this proportion increased to 34.5% at end-line. In the Gender Light groups, only 16.5% of women made decisions on control of income, while in the Control groups, 23% did.

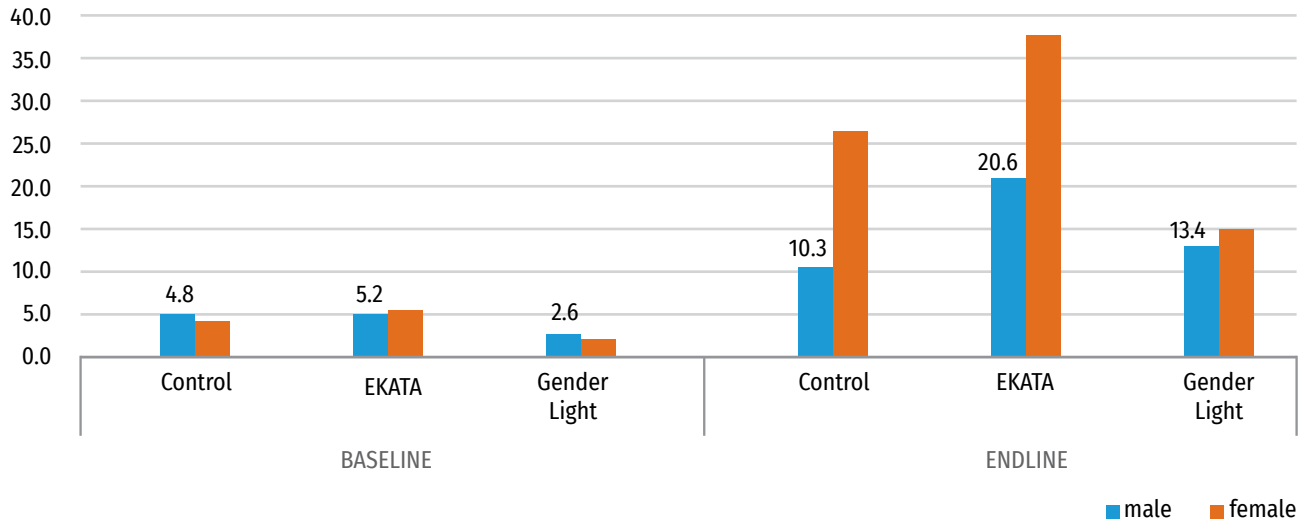
Figure 9: Proportion of men and women who made decisions on crop income



3.3.2.2 Decision-making on livestock income

The highest proportion of women making decisions on livestock income at end-line were from the EKATA groups, where 37.7% were involved, compared with 14.8 for Gender Light and 26.2% for Control.

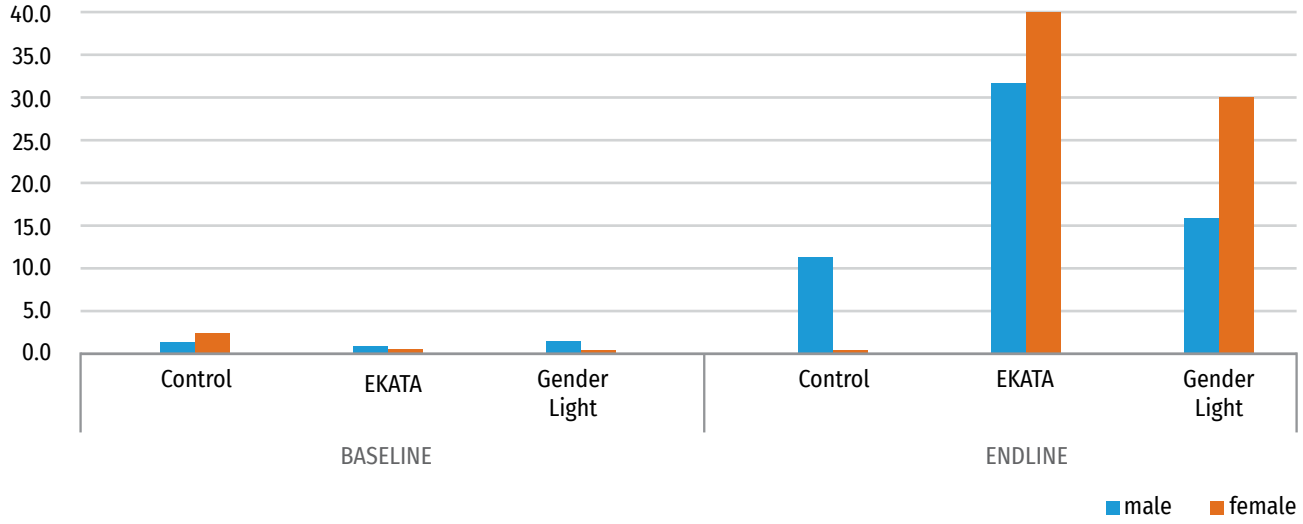
Figure 10: Proportion of women and men making decisions on livestock income



3.3.2.3 Decision-making on livestock product income

The greatest change in decision-making for women was in livestock product income, where before interventions, women barely made any decisions. In the EKATA groups, the proportion of women making decisions on livestock income increased from 0.5% to 40%, while in Gender Light, the proportion increased from 0.3% to 30%.

Figure 11: Proportion of women and men making decisions on livestock product income

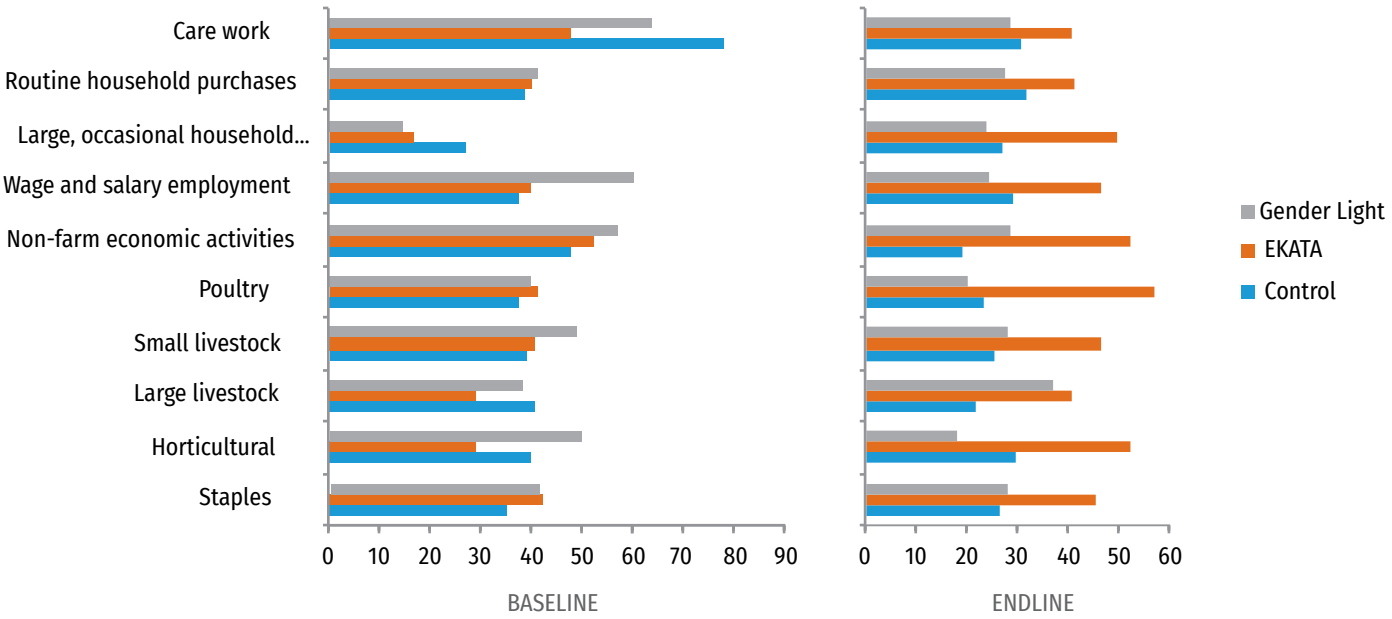


3.3.3 Decision-making on productive activities

At end-line, a higher proportion of women in the EKATA groups were making decisions on fish, small livestock, large livestock and staples, compared with other treatments (Figure 13). For example, 48% of women in EKATA made decisions on staples compared with 33% of the women in Gender Light and 18% in the Control group. Likewise, 38.7% of the women in the EKATA groups made decisions

on large livestock, compared with 33.5% of the women in Gender Light groups and 27.8% of the women in Control. For some decisions, like on non-farm activities, more women in Gender Light made decisions than in EKATA and Control groups.

Figure 12: Proportion of women making input into most or all decisions for different activities at baseline and end-line



3.3.4 Access to Credit

The results show a mixed pattern of ability of female respondents from male-headed households (MHHs) and female-headed households (FHHs) to access credit from different sources (Table 17). The largest percentage increase in access to credit from NGOs, formal lenders and informal credit was in the EKATA groups. For example, between baseline and end-line, the proportion of women accessing credit from NGOs rose from 31.8% to 40% in the EKATA groups, while it declined for both Gender Light and Control. The same pattern was observed for formal lenders, with the proportion of women in EKATA groups accessing credit from this source increasing while it declined for women in the other treatment groups.

The main sources of credit for women in the Control groups was informal lenders and group-based microfinance.

Table 17: % of female respondents who accessed credit

Source of Credit	Treatment	Male-headed Households		Female-headed Households		Total Sample	
		Baseline	End-line	Baseline	End-line	Baseline	End-line
NGO	Control	31.1	29.7	32.6	32.1	31.3	30.4
	EKATA	29.5	43.6	41.9	32.1	31.8	40.0
	Gender Light	39.4	26.7	25.6	35.9	36.9	29.6
Formal lenders	Control	33.2	29.4	29.5	32.3	32.7	30.2
	EKATA	33.5	42.5	52.5	33.9	36.3	40.0
	Gender Light	33.2	28.1	18.0	33.9	31.0	29.8

Informal lenders	Control	39.6	43.8	36.5	30.4	39.1	40.2
	EKATA	30.2	32.8	30.2	34.8	30.2	33.3
	Gender Light	30.2	23.4	33.3	34.8	30.8	26.4
Friends or relatives	Control	37.0	30.7	35.8	40.9	36.8	33.5
	EKATA	32.6	41.5	37.7	39.4	33.5	40.9
	Gender Light	30.3	27.8	26.4	19.7	29.7	25.6
Group-based microfinance	Control	31.9	33.6	33.8	41.3	32.2	35.6
	EKATA	32.6	36.1	39.2	34.0	33.9	35.6
	Gender Light	35.5	30.3	27.1	24.7	33.9	28.9
Informal credit	Control	37.0	32.3	34.3	36.0	36.4	33.3
	EKATA	33.6	47.7	32.9	48.0	33.4	47.8
	Gender Light	29.4	20.0	32.9	16.0	30.2	18.9

Note: Percentages add up to more than 100 because loans may have been issued from more than one source.

3.3.5 Women's time use and work balance

Analysis of the use of time by men and women shows that women spent more time than men in all domestic activities other than caring for adults, shopping and weaving (Figure 13). At baseline, women spent on average five hours a day on unpaid care work (5.1 hours in Control, 5.0 hours in EKATA and 5.1 hours in Gender Light). On the other hand, men in the Control groups spent 0.8 hours per day on unpaid care work, while those in EKATA spent 1.4 hours, and those in Gender Light spent 0.8 hours per day.

Figure 13: Women's time spent on unpaid care work at baseline

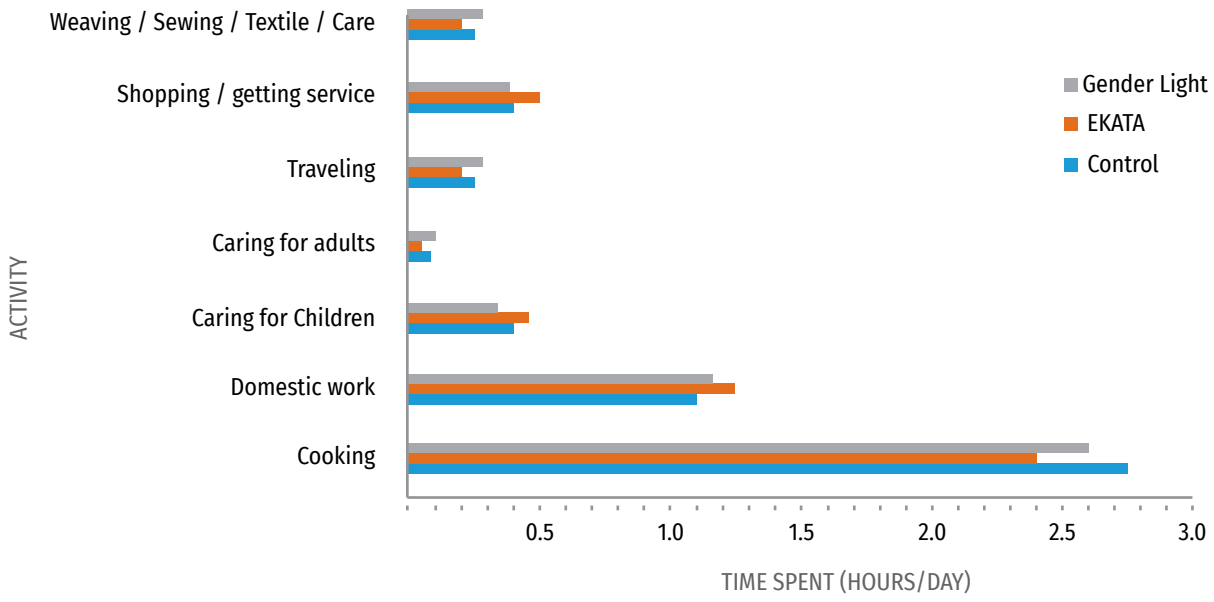


Figure 14: Women's time spent on unpaid care work at end-line

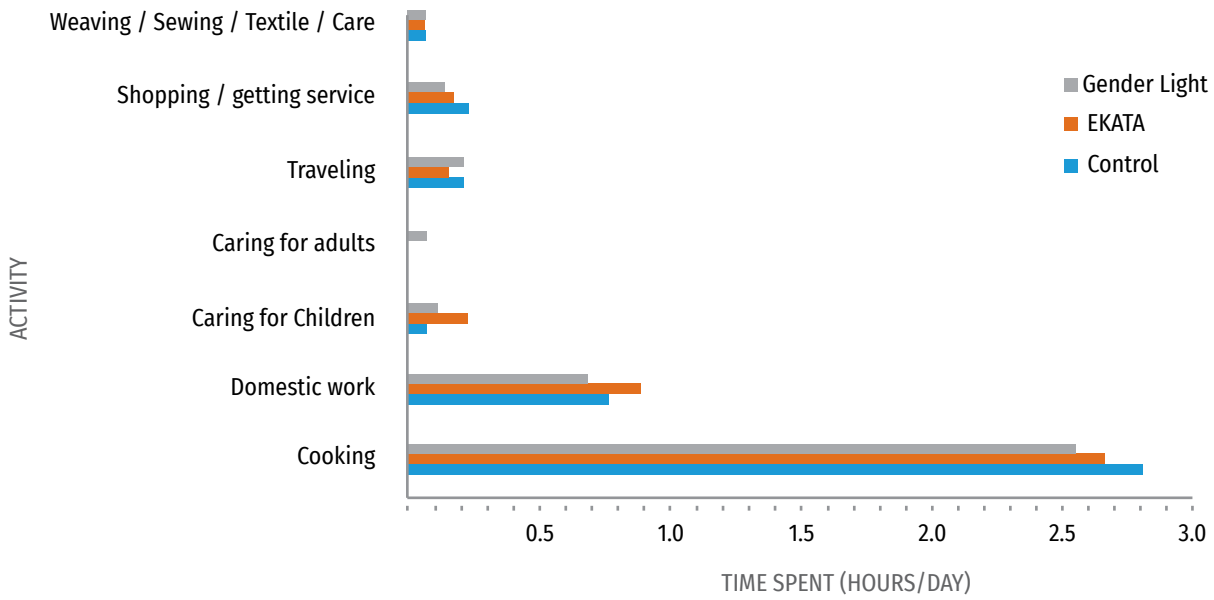


Figure 15: Men's time spent on unpaid care work at baseline

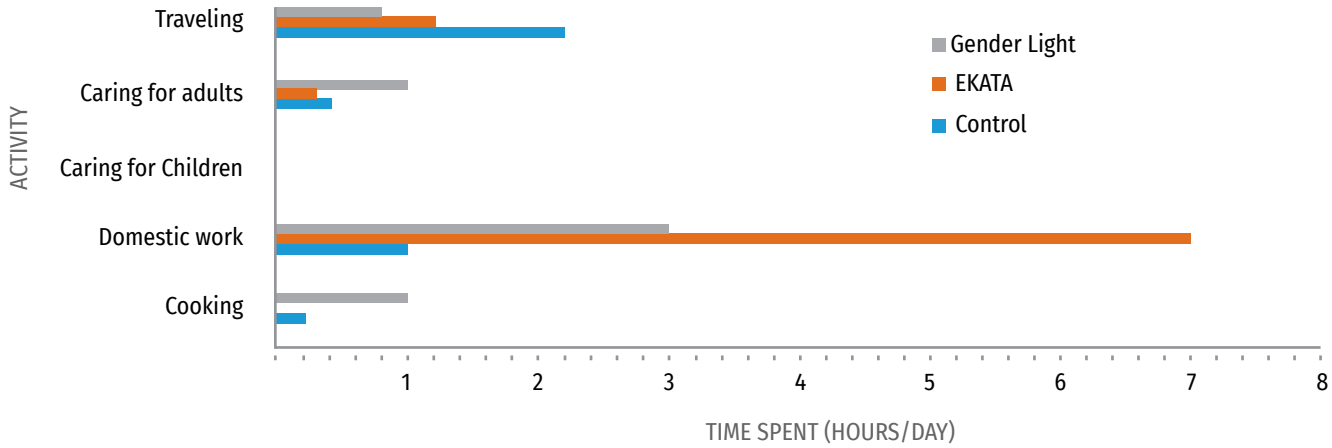
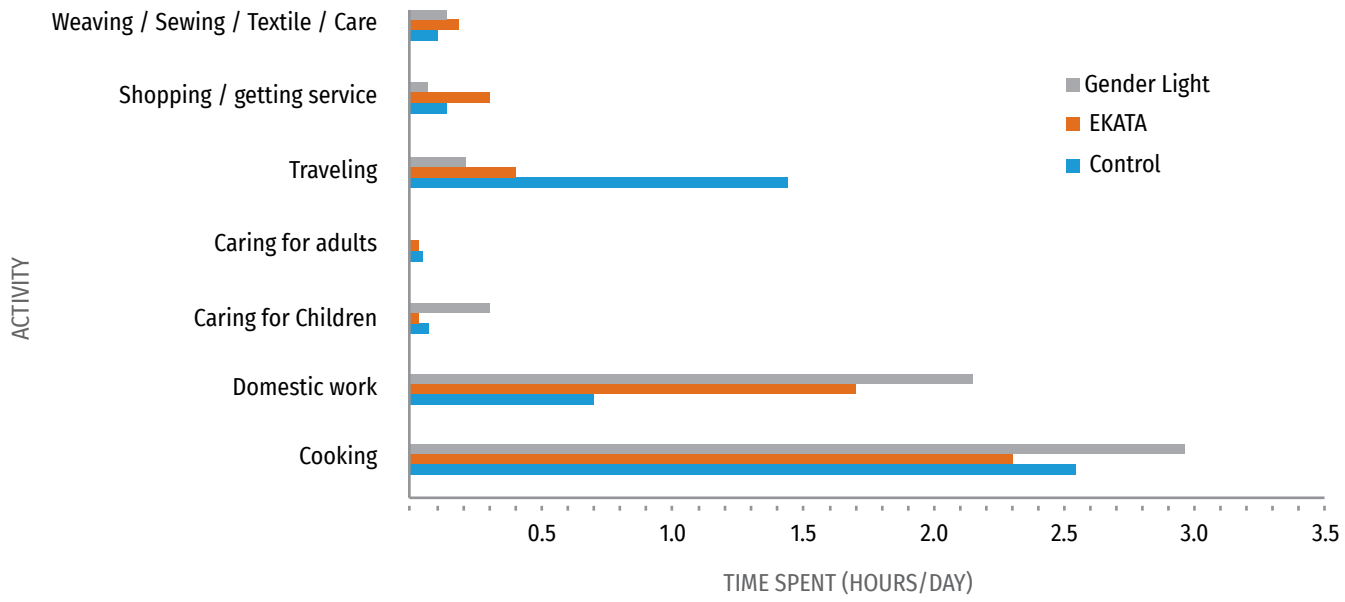


Figure 16: Men's time spent on unpaid care work at end-line



At end-line, there was a reduction in time spent on unpaid care work by women in the Control and EKATA groups, as they spent 4.1 hours, while those in Gender Light spent 3.8 hours. For men, there was an increase in the amount of time spent on unpaid care work across all groups. For example, while there were no men cooking in the EKATA groups at baseline, at end-line, men spent 2.3 hours cooking. Overall, the largest change in men's participation in unpaid care work was in the Gender Light groups.

3.3.6 Group membership

There was a general decline in group membership across the treatments between baseline and end-line surveys, whereby the proportion of men belonging to groups declined by almost half whilst that of women slightly decreased. The exception was in EKATA where membership by men increased by 9.8% in agricultural groups and in Control where men membership in Mutual help or insurance groups increased by 35% (Table 18). Only the religious groups recorded increased membership by women across the treatments. The membership in civic or charitable groups, however, increased; highest in EKATA by 96.4% followed by Gender Light (77.2%).

Table 18: Group membership by respondents in male- and female-headed households

Group type		Baseline	End-line		Baseline	End-line	
	Treatment	Male	Male	% diff.	Female	Female	% diff.
Agricultural / livestock/ fisheries	Control	56.1	22.9	-59.2	57.6	53.3	-7.5
	EKATA	51.1	56.1	9.8	56.6	54.5	-3.7
	Gender Light	67.5	58.2	-13.8	65.6	47.8	-27.1
Credit or microfinance group	Control	93.9	58.2	-38.0	97.3	82.9	-14.8
	EKATA	91.4	87.9	-3.8	97.7	89.9	-8.0
	Gender Light	92.8	85	-8.4	97.7	91.9	-5.9

Mutual help or insurance group	Control	34.0	46.0	35.3	32.7	15.6	-52.3
	EKATA	24.5	22.5	-8.2	23.5	26.4	12.3
	Gender Light	38.6	7.8	-79.8	36.5	20	-45.2
Civic group	Control	3.7	3.4	-8.1	8.2	8.2	0.0
	EKATA	4	5.2	30.0	8.4	16.5	96.4
	Gender Light	5.1	6.1	19.6	9.2	16.3	77.2
Religious group	Control	18.4	11.5	-37.5	23.8	29	21.8
	EKATA	29.1	21.9	-24.7	29.6	34.5	16.6
	Gender Light	19.1	16.9	-11.5	22.4	33.9	51.3

3.3.7 Extent of influence in groups

The ability to influence group decisions varied between men and women and across types of groups. A higher proportion of women felt they could influence decisions of the credit/microfinance groups and the civic/charitable groups compared with men (Table 19).

Table 19: Proportion of male and female respondents who felt they had high level of influence on groups

		Baseline	End-line		Baseline	End-line	
Type of group	**Treatment**	**Male**	**Male**	**% diff.**	**Female**	**Female**	**% diff.**
Agricultural / livestock/ fisheries	Control	28.8	17.2	-40.3	35.4	26.5	-25.1
	EKATA	36.5	58.6	60.5	26.2	43.4	65.6
	Gender Light	34.6	24.1	-30.3	38.5	30.1	-21.8
Credit or microfinance	Control	35	13.2	-62.3	36.2	30.7	-15.2
	EKATA	33.1	54.4	64.4	28.3	39.2	38.5
	Gender Light	31.9	32.4	1.6	35.4	30.1	-15.0
Mutual help or insurance	Control	18.8	14.3	-23.9	32.5	23.8	-26.8
	EKATA	56.3	42.9	-23.8	37.5	52.4	39.7
	Gender Light	25	42.9	71.6	30	23.8	-20.7
Civic or charitable group	Control	16.7	8.3	-50.3	50	15	-70.0
	EKATA	50	41.7	-16.6	12.5	60	380.0
	Gender Light	33.3	50	50.2	37.5	25	-33.3
Religious group	Control	20	20.9	4.5	35.3	30.1	-14.7
	EKATA	53.3	41.9	-21.4	41.2	36.1	-12.4
	Gender Light	26.7	37.2	39.3	23.5	33.7	43.4

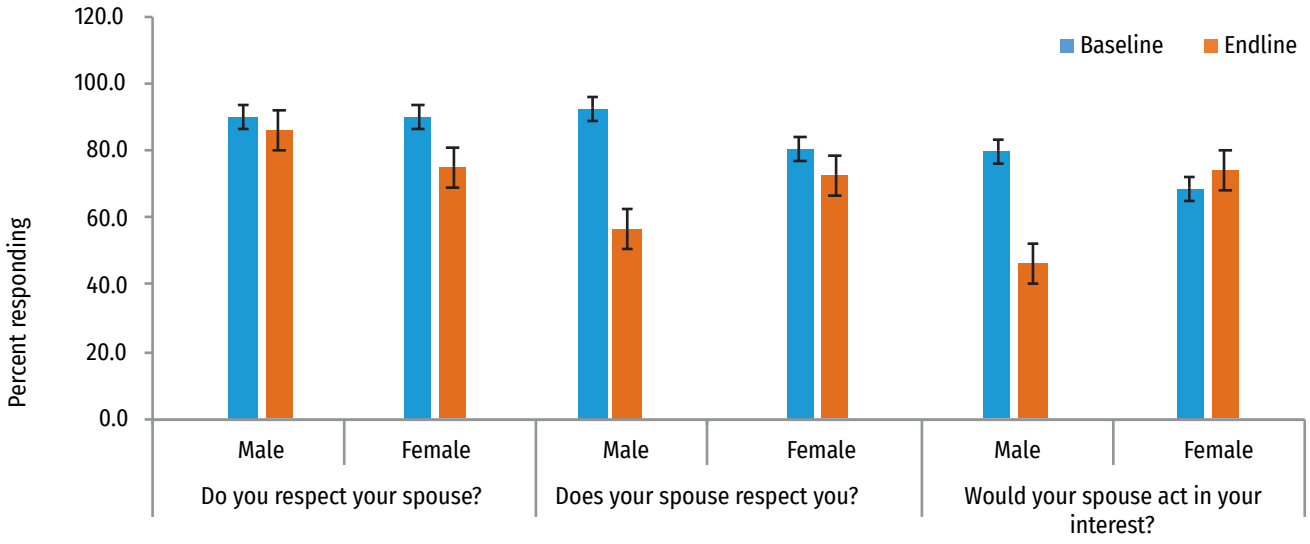
The proportion of women in EKATA who had influence in groups was higher than in the Gender Light and Control groups. For example, 43.4% of women in EKATA groups had high levels of influence in agriculture groups, compared with only 30.1% in Gender Light and 28.5% in Control groups. In credit and microfinance groups, 39.2% of women from th EKATA groups had high influence compared with 30% of women in both Gender Light and Control groups. And for civic groups, women from EKATA again had more influence than those in the Control and Gender Light, and more influence than the men in all the other treatments. For these types of groups, 60% of the women reported having a high level of influence

There was a huge change for EKATA group members in their influence on groups from baseline to end-line. For example, for agriculture/ livestock groups, there was a 65.5% increase in the proportion of women who had high influence, while there was a decrease for both Control and Gender Light. The same pattern was observed for credit and microfinance groups, where there was a 38.5% increase in EKATA group members' influence and a decline for Gender Light and Control.

3.3.8 Respect within the household

Over 80% of men felt that they respected their wives, with no significant differences between baseline and end-line. However, women felt they respected their spouses more at baseline than at end-line ($p<0.05$). This may be interpreted several ways. It could mean that women may have interpreted "respect" as fearing their husbands, rather than respect in its true sense; thus, once they felt empowered, this may have reduced their fear. On the other hand, the proportion of men who felt respected was significantly higher at baseline than end-line ($p<0.05$). This could mean that men interpreted empowerment in the same way, as women fearing them, and the growing voice of women could have made them fell less respected. The proportion of men who felt their wives would do things that were in their best interest was significantly higher at baseline than end-line ($p<0.05$). In contrast, there was no significant difference in the percentage of women who felt that their husbands would act in their best interest between baseline and end-line.

Figure 17: Changes in perceptions of respect by spouses



3.3.9 Attitudes toward gender-based violence

The change in perceptions toward gender-based violence was greater in men than in women. Men's rejection of domestic GBV more than doubled (101%) between baseline and end-line (Table 19). The largest differences for men were in attitudes toward GBV if a woman neglects the children (-49.1%), if she comes home late at night (-34.7%), if she goes out without telling him (-34.7%), and if she refuses to have sex with him (-30.5%). For women, the greatest shift was on if she comes home late at night (-21.3%), if she goes out without telling him (-16.6%) and if she neglects her children (-13.9%).

There was, however, reinforcement of some harmful attitudes toward GBV. There were more men at end-line compared with baseline who believed it was justified to beat a woman if she argued with him. More women believed at end-line that it was justified for a man to beat a woman if she argued with him (+22.6%), if she burns food (+32.5%), and if she takes out a loan without his knowledge (+3.6%).

Table 20: Responses to questions on situations where it is justified for a man to beat his wife

	Female			Male			
Situation	**Baseline**	**End-line**	**% diff.**	**Baseline**	**End-line**	**% diff.**	**DiD**
If she goes out without telling him	42.2	35.2	-16.6	25.9	16.9	-34.7	-18.2
If she neglects the children	30.9	26.6	-13.9	16.1	8.2	-49.1	-35.2
If she argues with him	16.8	20.6	22.6	10.1	11.2	10.9	-11.7
If she refuses to have sex with him	37.6	35.4	-5.9	17.4	11.9	-31.6	-25.8
If she burns the food	12.3	16.3	32.5	6.3	5.8	-7.9	-40.5
NEVER justified to beat wife (proWEAI)	61.8	60.1	-2.8	38.1	76.7	101	82
If she comes home late at night	63.4	49.9	-21.3	40.3	26.3	-34.7	-13.4
If she spends money without asking him	39.5	34.8	-11.9	24.3	16.9	-30.5	-18.6
If she takes credit without his knowledge	33.6	34.8	3.6	18.9	17.7	-6.3	-9.9
If a friend was beating his wife, I would advise him to stop.	97.4	98.4	1.0	97.4	97.5	0.1	-0.9
If I knew a woman experiencing violence at home, I would advise her to seek help.	96.2	96.7	0.5	96.1	95.5	-0.6	-1.1
When I see others speaking up about violence in the community, I want to joint them.	64.7	70.0	8.2	67.5	73.7	9.2	1.0
In the last 12 months, I have gotten involved with others who are promoting relationships between men and women that are free of violence.	53.7	71.0	32.2	58.4	75.3	28.9	-3.3

Note: DiD — Difference in differences

Disaggregating by treatments, the proportion of men in the Control group who felt that a man was justified to beat a woman increased across all questions, and in the Gender Light group where there was an increase for three out of the eight statements (Table 21).

Similarly, there was an increase in the proportion of women and men in the EKATA groups who indicated that if their friend or neighbor engaged in gender-based violence, they would tell them to stop, and if someone was a victim, they would tell them to report. This shows EKATA not only changed individual perceptions about violence between spouses, but also toward other community members.

Table 21: Attitudes toward gender-based violence

Situation		Baseline	End-line		Baseline	End-line		
	Treatment	**Male**	**Male**	**% diff.**	**Female**	**Female**	**% diff.**	**DiD**
If she goes out without telling him	Control	29.5	48.8	65.5	35.0	43.4	24	-42
	EKATA	34.3	24.4	-28.9	29.2	23.2	-21	8
	Gender Light	36.2	26.8	-26.0	35.7	33.4	-6	19
If she neglects the children	Control	27.9	50.0	79.2	34.1	42.0	23	-56
	EKATA	31.0	25.0	-19.4	31.6	24.1	-24	-4
	Gender Light	41.1	25.0	-39.2	34.3	33.9	-1	38

If she argues with him	Control	22.2	48.1	116.7	34.5	46.7	35	-81
	EKATA	37.0	18.5	-50.0	30.5	17.5	-43	7
	Gender Light	40.7	33.3	-18.2	35.0	35.8	2	21
If she refuses to have sex with him	Control	27.3	41.4	51.4	36.2	46.3	28	-24
	EKATA	35.3	20.7	-41.3	30.0	20.8	-31	11
	Gender Light	37.4	37.9	1.4	33.8	33.0	-2	-4
If she burns the food	Control	28.0	57.1	104.1	34.8	48.8	40	-64
	EKATA	30.0	7.1	-76.2	28.0	16.1	-43	34
	Gender Light	42.0	35.7	-15.0	37.3	35.1	-6	
If she comes home late at night	Control	32.6	39.1	19.8	35.1	45.4	29	10
	EKATA	32.9	21.9	-33.5	29.9	22.6	-24	9
	Gender Light	34.5	39.1	13.3	35.0	32.0	-9	-22
If she spends money without asking him	Control	27.8	48.8	75.2	31.4	45.5	45	-30
	EKATA	33.5	17.1	-49.0	33.9	22.1	-35	14
	Gender Light	38.7	34.1	-11.7	34.7	32.4	-7	5
If she takes credit without his knowledge	Control	30.5	41.9	37.4	33.8	44.7	32	-5
	EKATA	30.5	11.6	-61.8	33.8	20.7	-39	23
	Gender Light	39.1	46.5	19.0	32.4	34.6	7	-12
If a friend was beating his wife, I would advise him to stop.	Control	30.5	29.5	-3.0	33.5	36.4	9	12
	EKATA	35.3	41.8	18.2	33.8	35.0	3	-15
	Gender Light	34.2	28.7	-16.1	32.7	28.6	-12	4
If I knew a woman experiencing violence at home, I would advise her to seek help.	Control	30.9	29.3	-5.0	33.4	36.0	8	13
	EKATA	35.3	42.2	19.7	34.1	35.4	4	-16
	Gender Light	33.9	28.4	-16.0	32.5	28.6	-12	4
When I see others speaking up about violence in the community, I want to joint them.	Control	30.2	26.8	-11.3	32.4	32.1	-1	11
	EKATA	34.7	46.9	35.3	34.2	40.7	19	-16
	Gender Light	35.1	26.3	-25.1	33.4	27.1	-19	6
I have gotten involved with others who are promoting relationships between men and women that are free of violence.	Control	29.1	29.0	-0.6	34.3	31.8	-7	-7
	EKATA	37.9	43.7	15.3	35.1	40.4	15	0
	Gender Light	33.0	27.3	-17.1	30.6	27.7	-9	8

Further analysis regarding domestic gender violence found key differences between treatments. From baseline to end-line, the EKATA groups reported the highest change – more than double (110%) in men and 16.9% in women reporting that domestic violence is never justified (Table 22). While the percentage change for women in EKATA was low, those groups still had the highest proportion of women at end-line that indicated NEVER for domestic gender-based violence. In the Gender Light arm, there was a 62% increase in men and a 46% increase in women who felt it was not justified to beat a woman under any circumstances. This was much higher than in the Control groups, where there was only a 38% increase in men and 55% increase in women who felt it was never justified for a man to beat a woman.

Table 22: Proportion of male and female respondents reporting domestic violence is NEVER justified

	Baseline	End-line		Baseline	End-line	
Treatment	**Male**	**Male**	**% diff.**	**Female**	**Female**	**% diff.**
Control	34.8	48.1	38.2	40.2	62.5	55
EKATA	40.8	85.6	110	65.1	76.0	16.9
Gender Light	38.3	62.1	62.1	43.3	63.4	46

3.3.10 General self- and collective efficacy

Only the women in EKATA reported increased self-efficacy, and the increase in some cases was marginal. In the EKATA groups, 20.8% of women "strongly agreed" or "agreed" that they can overcome any challenges, and 10.3% thought that they can obtain outcomes that are important to them.

Table 23: Proportion of women and men who strongly agreed or agreed with general self-efficacy statements

General self-efficacy statements		Baseline	End-line		Base	End-line	
		Male	**Male**	**% diff.**	**Female**	**Female**	**% diff.**
I will be able to achieve most of the goals that I have set for myself.	Control	30.8	28.8	-71.2	35.1	36	0.6
	EKATA	35.1	45.5	-54.5	34.6	36.4	0.2
	Gender Light	34.1	25.6	-74.4	30.3	27.6	8.9
When facing difficult tasks, I am certain that I will accomplish them.	Control	32.2	32.7	-67.3	36.2	35.4	2.2
	EKATA	34.3	40.6	-59.4	34.1	37.6	0.3
	Gender Light	33.5	26.7	-73.3	29.7	27	9.1
In general, I think that I can obtain outcomes that are important to me.	Control	32.8	32.3	-67.7	34.9	35.9	0.9
	EKATA	32.2	41.4	-58.6	33.6	38.2	3.7
	Gender Light	35	26.3	-73.7	31.5	25.8	18.1
I believe I can succeed at most any endeavor to which I set my mind.	Control	32.9	29.1	-70.9	35.2	34.4	2.3
	EKATA	33.1	43	-57	33.6	38.3	4.0
	Gender Light	34	27.9	-72.1	31.2	27.4	12.2
I will be able to successfully overcome many challenges.	Control	33	32.1	-67.9	37.6	32.7	13.0
	EKATA	31.9	40.5	-59.5	33.1	40	0.8
	Gender Light	35.1	27.5	-72.5	29.3	27.3	6.8
I am confident that I can perform effectively on many different tasks.	Control	32.8	30.6	-69.4	34.4	35.8	0.1
	EKATA	34.1	42.8	-57.2	35.1	36.8	0.8
	Gender Light	33.1	26.7	-73.3	30.5	27.4	10.2
Compared to other people, I can do most tasks very well.	Control	32.4	28.7	-71.3	36	35.2	2.2
	EKATA	34.1	44.4	-55.6	34.2	36.4	0.4
	Gender Light	33.4	27	-73	29.7	28.4	4.4
Even when things are tough, I can perform quite well.	Control	32.3	30.3	-69.7	35.6	35.9	0.8
	EKATA	34.5	42.1	-57.9	34.2	36	0.3
	Gender Light	33.2	27.7	-72.3	30.2	28.2	6.6

In terms of collective efficacy, EKATA had the greatest change among men (12%) and women (17.8%) who indicated they were either "sure" or "completely sure" that women would protect each other against GBV. Also, the proportion of EKATA women who felt they could improve how women are treated at health facilities increased by 10.5%, followed by Gender Light at 8.3%. Regarding obtaining government services and entitlements, there were nearly equal increases among members of EKATA and Gender Light. The largest increment among men was a 12% increase in EKATA groups who claimed they could prevent each other from being beaten or injured by family members.

Table 24: Men and women's perceptions of collective efficacy

		Baseline	End-line	% diff.	Baseline	End-line	% diff.
Prevent each other from being beaten or injured by family members?		**Male**	**Male**		**Female**	**Female**	
	Control	84	78.9	-6.1	84	87	3.5
	EKATA	82	91.9	12.1	80	93.8	17.8
	Gender Light	86	83.8	-2.4	82	87.5	6.2
Improve how women are treated at the health facility?	Control	89	82.9	-7.2	91	91	0.0
	EKATA	90	88.9	-1.6	86	95.5	10.5
	Gender Light	84	86.8	3.6	87	94.2	8.3
Obtain government services and entitlements?	Control	88	82.9	-5.9	85	89	4.0
	EKATA	86	91.9	7.4	86	95	10.0
	Gender Light	85	85.3	0.1	84	93.2	11.5
Improve the health and well-being of women and children in the community?	Control	88	85.7	-2.7	86	90.8	6.0
	EKATA	84	86.6	2.9	87	97.2	12.2
	Gender Light	85	82.9	-1.9	83	92.2	11.2

3.3.11 Couples communication

An analysis revealed differences in how men and women communicated with each other. At baseline, men indicated that they had more say than their partners on important decisions that affected their relationships, but less so at end-line. Disaggregation of the results by treatment shows that women from EKATA claimed that "most of the time" or "sometimes" they had more say than their partners in important decisions that affect their relationship, rising from 37.9% at baseline to 71.4% at end-line (101% increase). However, this proportion declined by 5% among the men in EKATA.

There was an 88.5% increase among women in EKATA who were able to tell their partners "most of the time" or "sometimes" when they disagreed with them, but only 5.1% of the men had done that. In contrast, nearly half (47.7%) of women in Gender Light had been able to tell their partner when they disagreed with them; and there was only a 27.5% increase in the proportion of women who had more say than their partners in important decisions that affect their relationships. In the Control groups, there was a decline among men in all studied aspects between baseline and end-line, the least being a decline of 4% on being able to tell their partner when they disagreed and the highest being a decline of 40% with regard to their partner having made most of the decisions that affect their health.

Table 25: Experiences with couples communications by male and female respondents

	Control			EKATA			Gender Light		
Male respondents	**Baseline**	**End-line**	**% diff.**	**Baseline**	**End-line**	**% diff.**	**Baseline**	**End-line**	**% diff.**
I have been able to tell my partner when I disagree with him/her.	72.1	69.3	-3.9	68	71.4	5.0	76.2	60.3	-21
I have had more say than my partner in important decisions that affect our relationship.	79.5	73.7	-7.3	74.5	70.4	-5.5	80.5	70.6	-12.3
When my partner and I have an argument, my partner has gotten his/her way most of the time.	48.8	40	-18.0	44.2	60.8	37.6	55.2	50.7	-8.2
My partner and I have discussed most of our expenses before making them.	92.6	78.9	-14.8	90.3	90.7	0.4	93.5	86.8	-7.2
My partner has made most of the decisions that affect my health.	53.7	55.3	3.0	52.9	70.1	32.5	53.4	60.3	12.9
Female respondents	**Baseline**	**End-line**	**% diff.**	**Baseline**	**End-line**	**% diff.**	**Baseline**	**End-line**	**% diff.**
I have been able to tell my partner when I disagree with him/her.	34.5	49.4	43.2	37.9	71.4	88.4	42.6	62.9	47.7
I have had more say than my partner in important decisions that affect our relationship.	29.7	41.7	40.4	31.3	63.0	101.3	35.6	45.5	27.8
When my partner and I have an argument, my partner has gotten his/her way most of the time.	55.6	67.3	21.0	57.6	61.2	6.3	63.2	67.6	7.0
My partner and I have discussed most of our expenses before making them.	62.4	72.8	16.7	61.5	89.4	45.4	70.4	82.8	17.6
My partner has made most of the decisions that affect my health.	45.6	72	57.9	46.5	70.9	52.5	47.5	62.2	30.9

3.3.12 Gender equality and empowerment based on Pro-WEAI

3.3.12.1 Pro-WEAI and GPI scores

The aggregate pro-WEAI scores by treatments were almost similar at baseline at 0.41 for Control, 0.39 for Gender Light, and 0.34 for EKATA (Table 26).

The largest increase in the Pro-WEAI score was among EKATA groups, where it increased to 0.65, an increase of 84%. This was followed by Gender light, where the score increased to 0.52, a 31% increase.

The proportion of women who were "empowered" also increased from baseline – 27% for Control, 34% for Gender Light, and 22% for EKATA – to 34%, 53% and 68%, respectively, at end-line. The EKATA group had the greatest increase, from 22% at baseline to 68% at end-line.

Another important parameter is Gender Parity Index (GPI), which also improved – by 51% in EKATA, 6% in Gender Light, and 7% in Control. Women achieving gender parity increased by 94% in EKATA, 51% in Gender Light, and 21% in Control. The GPI is very important in measuring gender equality. Although Pro-WEAI analysis puts greater emphasis (90%) on the 3DE, which represents the achievements of women in the sample across the 12 indicators of empowerment in pro-WEAI, it still recognizes the importance of gender equality as an aspect of empowerment. Thus, improvements in either the 3DE or GPI (measure of gender equality) will increase the Pro-WEAI score. The average empowerment gap between women who did not achieve gender parity with the men in their households decreased by 55% in EKATA, 21% in Control and 15%in Gender light

Table 26: Pro-WEAI results by treatments

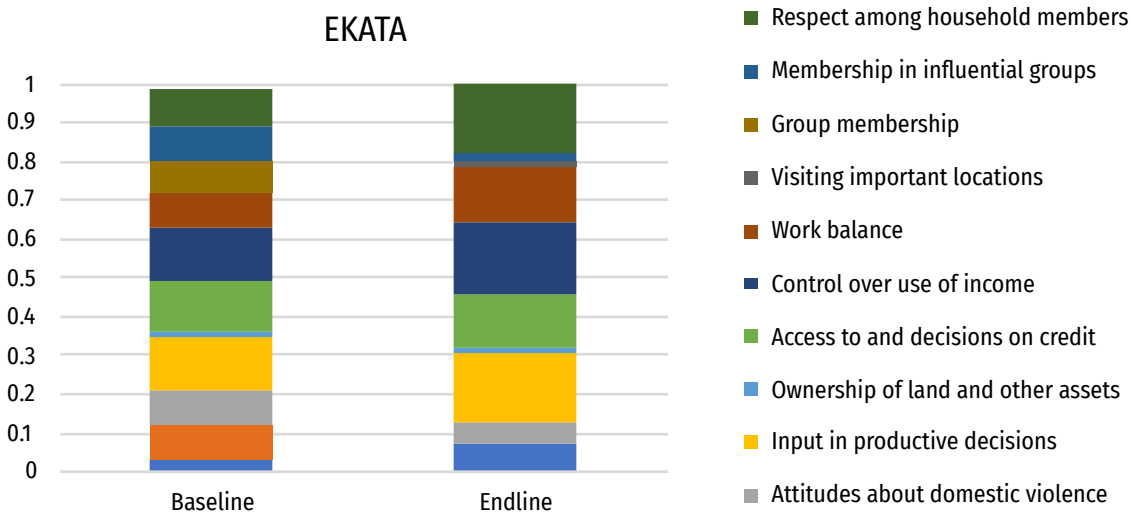
Indicator	Control		Gender Light		EKATA	
BASELINE	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**
Pro-WEAI 3DE score	0.41	0.55	0.39	0.54	0.34	0.58
% Disempowerment score (1-3DE)	0.59	0.45	0.61	0.46	0.66	0.42
% achieving empowerment	0.27	0.48	0.34	0.37	0.22	0.33
% not achieving empowerment	0.73	0.52	0.66	0.63	0.78	0.67
Mean adequacy score for un-empowered (3DE_unemp)	0.41	0.55	0.39	0.54	0.34	0.58
Mean adequacy score for not yet empowered (mean_disemp)	0.59	0.45	0.61	0.46	0.66	0.42
Dual households n=819						
Gender Parity Index	0.45		0.49		0.47	
% achieving gender parity	0.27		0.37		0.32	
% not achieving gender parity	0.73		0.63		0.68	
Average empowerment gap	0.58		0.63		0.71	
Pro-WEAI score(0.9*3DE+0.1*GPI)	0.41		0.40		0.35	
END-LINE	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**
Pro-WEAI 3DE score	0.43	0.64	0.52	0.58	0.65	0.73
% Disempowerment (1-3DE)	0.57	0.36	0.48	0.42	0.35	0.27
% achieving empowerment	0.34	0.37	0.53	0.58	0.68	0.56
% not achieving empowerment	0.66	0.63	0.47	0.42	0.32	0.44
Mean adequacy score for un-empowered (3DE_unemp)	0.52	0.57	0.64		0.59	0.48
Mean adequacy score for not yet empowered (mean_disemp)	0.58	0.43	0.56		0.61	0.52
Dual households n=819						
Gender Parity Index	0.48		0.52		0.71	
% achieving gender parity	0.33		0.56		0.62	
% not achieving gender parity	0.67		0.44		0.38	
Average empowerment gap	0.46		0.54		0.32	
Pro-WEAI score(0.9*3DE+0.1*GPI)	0.44		0.52		0.65	
% change in Pro_WEAI from baseline to end-line	5.7		31.1		83.8	

% change in average gender gap (at end-line)	-20.7		-14.6		-54.9	
% change in gender parity index	6.6		6.1		51.1	
% change in those achieving gender parity index	21.0		51.4		93.8	
Average empowerment gap	-20.7		-14.6		-54.9	

3.3.12.2 Contributions of different indicators to disempowerment

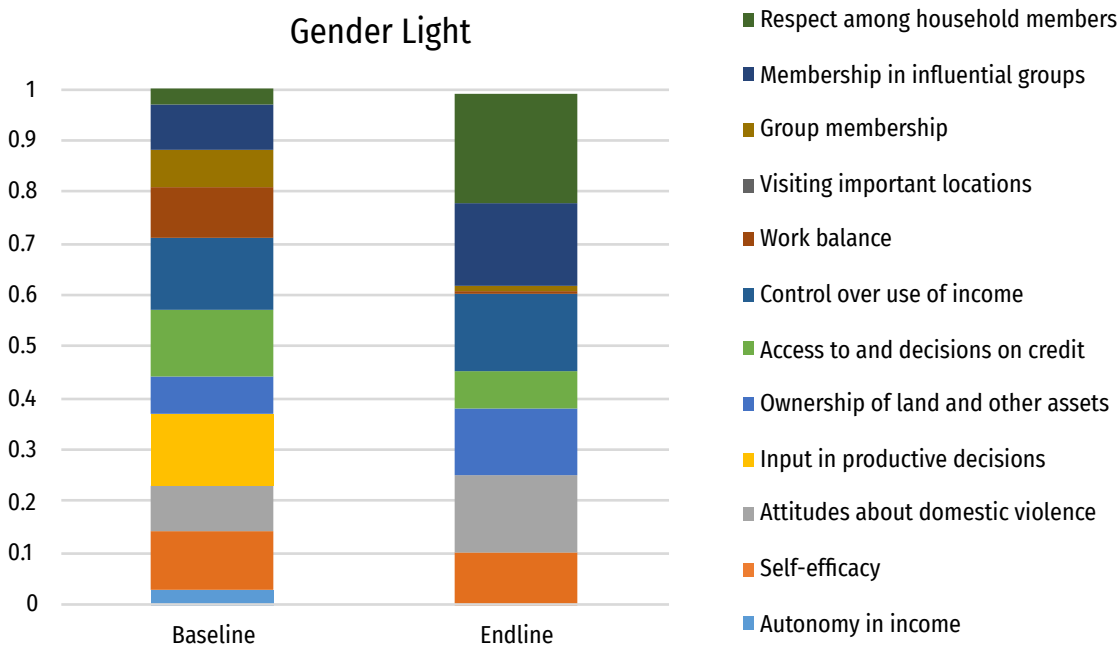
In EKATA groups, the three top indicators contributing to disempowerment at baseline were: Input to productive decisions, access to and decisions on credit, and control over the use of income. At end-line, the top three contributors to disempowerment were: respect among household members, control over the use of income, and input in productive decisions. The contribution of self-efficacy to disempowerment declined by 100%, while attitudes toward domestic violence also declined by 35% for men and 36% for women.

Figure 18: Contributors to women's disempowerment in EKATA groups



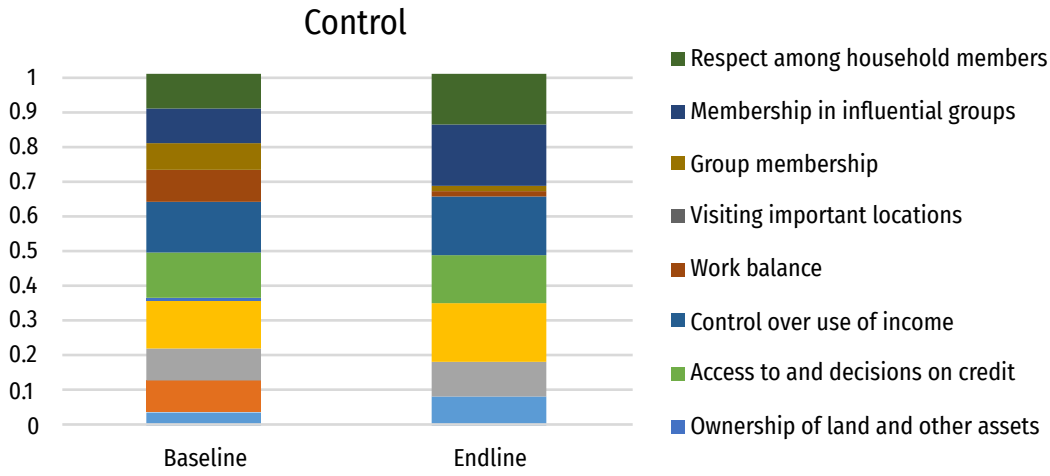
In the Gender Light groups, the largest contributors to disempowerment for women were: respect among household members, membership in influence groups, control over use of income, and attitudes toward gender-based violence. Three indicators that were contributors to disempowerment at baseline reduced by 100%. These were: autonomy in income, visiting important places, and input in productive decisions (Figure 18).

Figure 19: Contributors to women's disempowerment in Gender Light groups



In the Control groups, most indicators contributing to empowerment did not change significantly from baseline to end-line. The top three contributors to disempowerment were: input in productive decisions, access to and decisions on credit, and control over the use of income. These were still critical at end-line, and some – such as input in productive decisions – grew in prominence, others such as membership in influential groups and respect among household members were large contributors to disempowerment (Figure 19).

Figure 20: Contributors to women's disempowerment in Control groups



3.4 Cost-Benefit Analysis

3.4.1 Allocation of project budget by treatments

Table 27: Distribution of project budget by treatments (USD)

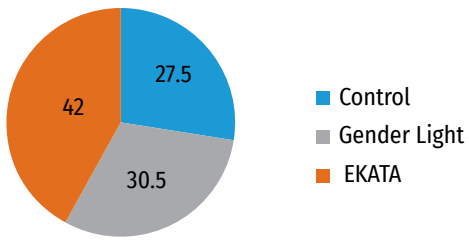
Cost item	Control	Gender Light	EKATA	Total
Program administration and staff costs	$338,984	$373,108	$477,680	$1,189,772
Capital equipment	20,946	20,946	20,946	62,838
Targeting costs	153,572	169,814	248,135	571,521
Participant training	29,051	36,270	73,456	138,777
Implementation and program material costs	219,503	243,376	342,857	805,736
Total from project	762,056	843,514	1,163,074	2,768,644
Beneficiary contribution	8,500	9,150	12,850	30,500
Total cost	770,556	852,664	1,175,924	2,799,144
Total # of participating farmers	2,925	3,149	3,837	9,911
Cost per farmer	263	271	306	282

Note: 1. Cost distribution by treatment (USD) 1 BIF = 0.0005 USD.
2. Total project expenses exceed the budget allocated to the project because of addition of the opportunity cost of time and labor by the beneficiaries, valued at market rate.

The results show that EKATA was allocated the highest amount of the budget: $1,175,924, compared with $770,556 allocated to Control (See Appendix 2 for details). This implies that implementations of EKATA are relatively expensive compared with Gender Light and control.

As expected, the highest proportion of the project budget was expended on the EKATA arm in terms of training and materials for implementation of the program. This was mainly due to higher intensity of additional gender equality and women empowerment activities that were conducted in EKATA. On average, the EKATA arm had the highest average cost of $306 per participating farmer, compared with $271 for Gender Light and $263 for Control. Approximately 42% of the budget was applied on EKATA, 31% on Gender Light, and 28% on Control (Figure 21).

Figure 21: Proportion distribution of project budget by treatment arms



3.4.2 Comparison of costs and benefits of treatments

Measuring change requires analyzing the "counterfactual," the economic term to describe what would have happened without our intervention. This means that when assessing the benefits of the project interventions, comparisons are made against an alternative situation without the intervention (the Control).

The value of benefits created by the project was highest in EKATA, at $3,275,088, which was about twice the value of Gender Light ($1,611,658) and almost 8.5 times more than Control ($382,996). Analysis of benefit-cost ratio (BCR) found that EKATA had a ratio of 5:1, which was the highest, compared with 3:1 and 2:1 for Gender Light and Control, respectively. The criteria for a project or an intervention to be considered profitable is for the net present value to be greater than zero (>0) and the BCR to be greater than one (>1). The BCR tells how many dollars are generated by the intervention for each dollar invested. In this case, for example, the results indicate that for each dollar spent on EKATA, $5 of benefits are generated across the life of the project.

Evaluating return on the investment, EKATA came in at 410%, compared with 270% in Gender Light and 30% in Control. However, when comparing two or more projects, the project with the highest NPV, BCR and ROI is selected. Therefore, it is clear from the findings of this study that EKATA was the most profitable intervention, based on the three evaluation criteria.

Table 28: Benefits and costs (US$) by treatments

Costs and Benefits	Year				
	2016	2017	2018	2019	Total
CONTROL					
Present value of benefits (NPV)	-	354,526	308,284	268,073	930,883
Present value of costs (PV)	162,888	157,567	100,504	126,928	547,887
Net present value (NPV)	-162,888	196,959	207,780	141,145	382,996
Benefit-cost ratio					1.7
Return on investment (NPV/PV costs)					69.9
GENDER LIGHT					
Present value of benefits (NPV)	246,616	740,141	653,943	568,646	2,209,346
Present value of costs (PV)	138,176	189,708	127,190	142,614	597,688
Net present value (NPV)	108,439	550,433	526,753	426,032	1,611,658
Benefit-cost ratio					2.6
Return on investment (NPV/PV costs)					270
EKATA					
Present value of benefits (NPV)	763,043	1,261,292	1,096,775	953,718	4,074,828
Present value of costs (PV)	98,386	259,896	232,521	208,936	799,740
Net present value (NPV):	664,657	1,001,396	864,254	744,781	3,275,088
Benefit-cost ratio					5.1
Return on investment (NPV/PV costs)					410

The main factors that influence differences in benefits and costs of the treatment arms were the number of beneficiaries per treatment and the level of gains per beneficiary attributed to the project. It is important to mention that the Control in this project was not a real control, as it had interventions. Since the objective of the project was to test the added value of the EKATA gender-transformative model compared with a typical gender integration model, the Control was an agricultural intervention in which there was no gender integration. This type of design is appropriate for development projects, as it has no "real" control. The Control and treatments have incremental interventions, and the design was, therefore, appropriate from an ethical perspective.

3.4.3 Valuation of non-marketable project benefits

As expected, the project activities induced a flow of benefits associated with externalities to the communities, such as improved participation of women and men in other community activities, resolving GBV in non-project households, and improvements in feeder roads through collective construction by direct beneficiaries of the project and other community members, improved political and social capital. Informal discussion showed that, on average, individual farmers were willing to pay US$600 in EKATA per year ($50 per month) and $384 per year ($32 per month) in Gender Light. This was mainly associated with improved sharing of some household tasks and having input in productive decisions. In this study, the analysis of labor and employment as social externalities were not performed, because most of the farmers used their own labor.

3.4.4 Measuring empowerment and externalities

In the past, studies (Ackerman and Heinzerling, 2002) note that the inability to account for externalities in CBA can result in findings that are not objective. For example, empowerment of women may generate positive social and political benefits, thereby enabling improvement of knowledge, technology diffusion, crop productivity and nutrition. It is, therefore, important to consider the value of externalities associated with implemented interventions when computing CBA. Such an approach is important, because our aim is to promote gender equality and women's empowerment that yield desirable outcomes both on the farm and in communities. In addition, such an analysis can move valuation beyond financial aspects only (Chaudhury et al., 2016). Nevertheless, the valuation of nonmarket benefits is contentious, because they are not traded in the market (Scrieciu et al., 2011).

In this study, we valued externalities for inclusion in discussions with stakeholders in the broader intervention process to identify externalities associated with the selected activities of the project. The changes in externalities and values were assessed through key informant interviews with experts and farmers. The values associated with externalities of empowerment were computed by considering a value derived from the key experts and farmers. On average, all EKATA and Gender Light treatments had positive values. In both communities, collective actions such as construction of rural access roads and resolving community GBV were frequently mentioned. Externality benefits associated with social and political capital were high for those in EKATA groups. Moreover, the resulting higher social capital due to EKATA intervention could be due to increased interactions between farmers and development agencies.

3.4.5 Limitations of the Cost-Benefit Analysis

It is widely recognized that assisting research managers in making decisions about how to allocate resources among possible research projects is a complex exercise. Identification and measurement of benefits from a specific research project is commonly a complex exercise. Literature on CBA notes a number of concerns related to methodological issues such as data quality, uncertainty, discount rate, valuation and equity (UNFCC, 2011). In this study, the uncertainty relating to data was addressed through triangulation of information from farmers, community leaders, extension staff and project implementers through focus group discussions and individual in-depth interviews. Farmers were asked what would have happened in their communities in the absence of the project, but most did not conceptualize it well and had little understanding. The farmers used the "without intervention" situation as the baseline when estimating the non-marketable costs and benefits associated with the project activities. However, during the analysis, comparisons were made between treatments and Control.

The choice of discount rate is another important gap. Due to the sensitivity associated with the choice of discount rates, we applied the average interest rate charged by commercial banks in Burundi over the project life as the discount rate, which was 15%. Prices

over the period of analysis were assumed to be constant; this is a limitation that can be addressed with an in-depth study focused on market dynamics. The CBA results in this study were validated with project implementers as a step toward including CBA in the broader participatory process for making decisions based on the new evidence produced in this report.

Despite consensus on the utility of cost-benefit estimates, it is rare to see cost data publicly available, whether in peer-reviewed research publications, project completion reports or process evaluations (World Bank, 2019). The major challenge is the limited accessible guidance on cost capture. This includes collection of sufficiently detailed financial and programmatic data to use in CBA. In order to get cost data that is sufficiently disaggregated and project-specific, it should be captured in real time – that is, throughout project implementation, not after the intervention is completed.

Incorporating less tangible benefits into a CBA is very challenging, because there are no straightforward indicators allowing these qualitative changes to be translated in quantitative terms, which is a requirement if one wants to include these in a CBA. Due to these factors, adoption of BCA has been hampered by the perception that it provides unreliable information. It is important that analysts and decision-makers are aware of the limitations of the process to avoid unreasonable expectations that lead to disappointment. This limitation of imperfect data is not a case for discrediting BCA, but rather for using it properly.

4. CONCLUSIONS AND RECOMMENDATIONS

This study of the impacts of two gender models – EKATA and Gender Light – used in CARE's Win-Win project shows that **the gender-transformative approach performed much better in improving food security, creating wealth, gender equality and the empowerment of women**. While rice production and productivity declined in the Control groups, it increased in both Gender Light and EKATA groups. The amount of rice sold and consumed by households was also highest in the EKATA groups. EKATA households increased their use of improved technologies, including use of hybrid seed, fertilizers and manure, although the rates of adoption remained relatively low across all the farmers.

The results also show that EKATA groups reported the highest changes from baseline to end-line in both the household dietary diversity score and the women's dietary diversity score, although the increase was not significant. Further, EKATA had the highest proportion of households falling within the acceptable food consumption scores (FCS) and had the highest improvement of FCS (from 37 to 41), followed by Gender Light, which improved by 2 points from baseline to end-line.

Due to floods and animal disease experienced during the year of the study, all households reported a decline in both crop and livestock income. This decline was highest in the Control groups, although the difference between this and the EKATA and Gender Light groups was not significant. It would seem the interventions did not cushion any of the households from climatic changes and incidences of diseases.

While there was a decline in proportions of male and female household members owning large livestock, there was an increase in those owning small livestock and other assets, including cell phones and non-mechanized equipment. This led to increases in the wealth index of households. The largest increase in wealth was recorded in the EKATA groups, with 13% of households improving their wealth status to the first quintile, much higher than the Gender Light and Control households.

In terms of gender equality and women's empowerment, analysis showed that EKATA group members achieved the highest Pro-WEAI score of 0.65, with an 84% increase from baseline to end-line, followed by Gender Light and Control. And while the proportion of women in the Control group who were empowered at baseline was nearly the same at end-line (increasing from 27% to 34%), the proportion of women in the EKATA groups that were empowered rose to 68%, and those in Gender Light rose to 53%. The Gender Parity Index (GPI) improved by 51% in EKATA, but by less than 10% in the other groups. The average empowerment gap between women who did not achieve gender parity with the men in their households reduced by 55% in EKATA as well, while it only decreased by 21% in Control groups and 15% in Gender Light.

In EKATA groups, there were significant changes in perceptions of gender-based violence, with more men and women in these groups reporting it was NEVER acceptable, not just in their households but in their communities as well. Women in EKATA also had higher self- and group efficacy, and were able to communicate with their spouses when they did not agree with them. These changes were not as evident for men in these groups.

Evidence obtained from this analysis shows that there is a business case for scaling the EKATA approach. Although EKATA cost more to implement – US$1,175,924, compared with $770,556 for Control – it also generated more benefits. About 42% of the project budget was spent on EKATA, compared with 31% on Gender Light and 28% on Control. Similarly, EKATA had the highest average cost of $306 per participating beneficiary farmer, compared with $263 per farmer in Control and $271 for Gender Light.

The value of benefits (NPV) created by the project was highest in EKATA treatment. The NPV for EKATA was $3,275,088, compared with $1,611,658 for Gender Light and $382,996 for Control, which means EKATA NPV was twice the value of Gender Light and almost 8.5 times more than Control. The benefit-cost ratio for EKATA was 5:1, compared with 3:1 for Gender Light and 2:1 for Control. Likewise, EKATA had the highest return on investment – 410%, compared with 270% in Gender Light and 30% in Control. Based on the three criteria – NPV, BCR and ROI – EKATA clearly was the most profitable treatment.

The key externalities generated from the implementation of EKATA included: improved participation of women and men in other

community activities; resolving GBV in non-project households; improvements in feeder roads through collective construction by project members; and improved political and social capital. On average, individual farmers were willing to pay $600 per year in EKATA ($50 per month) and $384 per year ($32 per month) in Gender Light to gain gender equality and empowerment from the project. There were some differences in willingness to pay between men and women. Overall, men in both treatment arms were willing to pay less than women for empowerment, hence their relatively low valuation of empowerment. Women, on average, were willing to pay $54 per month, compared with $48 for men. For Gender Light, women were willing to pay$35 per month, while men were willing to pay $29.

Based on the study findings, CARE's hypothesis that a gender-transformative approach is a win-win for food and nutrition security, livelihoods and gender equality holds true. As such, EKATA could be successfully scaled up, using analysis of the findings and lessons learned during project implementation to adapt the approach to specific contexts.

One of the key challenges in implementing the EKATA approach was the lack of integration of capacity to adapt to climate change, which threatens any gains in farm productivity and food security.

The partnerships fostered in the Win-Win project – between CARE, government agencies and local organizations –provide a key opportunity to mainstream the EKATA program into the government's implementation strategies for the transformation of the agriculture sector. This, however, requires a full cost-benefit analysis (covered in separate report) to ensure that investments in the approach lead to benefits for smallholder farmers.

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APPENDIX 1: PERCENT CONTRIBUTION OF PRO-WEAI INDICATORS TO DISEMPOWERMENT (%)

Indicator	EKATA						Gender Light						Control					
	Baseline	**End-line**		**Baseline**	**End-line**		**Baseline**	**End-line**		**Baseline**	**End-line**		**Baseline**	**End-line**		**Baseline**	**End-line**	
	Male	Male	% diff.	Female	Female	% diff.	Male	Male	% diff.	Female	Female	% diff.	Male	Male	% diff.	Female	Female	% diff.
Autonomy in income	0.04	0.06	58	0.03	0.07	104	0.0	0.00	-100	0.03	0.00	-100	0.04	0.12	194.0	0.04	0.08	127.73
Self-efficacy	0.11	0.00	-100	0.09	0.00	-100	0.1	0.02	-81	0.11	0.10	-3	0.11	0.00	-100.0	0.09	0.00	-100.00
Attitudes about domestic violence	0.07	0.05	-32	0.09	0.06	-36	0.1	0.14	130	0.09	0.15	64	0.07	0.04	-41.2	0.09	0.10	13.31
Input in productive decisions	0.18	0.18	-4	0.14	0.18	27	0.2	0.01	-96	0.14	0.00	-97	0.18	0.18	-2.0	0.14	0.17	17.34
Ownership of land and other assets	0.01	0.00	-100	0.01	0.01	46	0.0	0.08	930	0.07	0.13	91	0.01	0.01	71.5	0.01	0.00	-54.14
Access to and decisions on credit	0.16	0.13	-21	0.13	0.14	3	0.2	0.17	3	0.13	0.07	-46	0.17	0.07	-58.1	0.13	0.14	1.33
Control over use of income	0.18	0.18	0	0.14	0.18	33	0.2	0.06	-69	0.14	0.15	6	0.19	0.18	-3.0	0.14	0.17	20.65
Work balance	0.04	0.07	80	0.09	0.15	64	0.0	0.03	-31	0.10	0.01	-88	0.03	0.01	-51.0	0.09	0.01	-89.52
Visiting important locations	0.05	0.03	-35	0.00	0.01	192	0.0	0.08	84	0.00	0.00	-100	0.06	0.06	3.9	0.00	0.00	-8.28
Group membership	0.01	0.01	10	0.08	0.00	-95	0.0	0.09	355	0.07	0.01	-90	0.01	0.08	781.4	0.08	0.02	-79.94
Membership in influential groups	0.05	0.06	32	0.09	0.02	-79	0.0	0.17	351	0.09	0.16	87	0.05	0.16	210.5	0.10	0.17	71.84
Respect among household members	0.10	0.18	84	0.10	0.18	86	0.1	0.14	41	0.10	0.21	110	0.09	0.15	64.6	0.10	0.15	49.38
	1.0		**-100**	**1**	**1**	**0**	**1**	**1.00**	**0**	**1**	**1.00**	**0**	**1.00**	**1.00**		**1.00**	**1.00**	

APPENDIX 2: PROJECT COST STRUCTURE AND CALCULATIONS OF COSTS AND BENEFITS

1. CONTROL	Year 1	Year 2	Year 3	Year 4	
	2016	2017	2018	2019	Total
Program administration and staff costs					
Personnel costs	37,877	42,823	49,825	59,447	189,972
Monitoring and evaluation	2,090	2,090	2,090	2,090	8,360
Consultancies		10,929	28,232	45,195	84,356
Travel	9,417	8,462	7,853	30,564	56,297
Capital equipment	10,053	10,893			20,946
Targeting costs					
Sensitization and targeting	6,800				6,800
Staff training	34,993	54,993	14,993	34,993	139,972
Participant training					
Training of farmers	11,621	8,715	5,810	2,905	29,051
Implementation and program material costs					
Cost of materials and distribution costs	2,085	4,170		2,085	8,340
Support to farmer groups (sub-award)	69,886	63,307	42,050	42,719	217,963
Beneficiary costs					
Beneficiary contribution of labor and time	2,500	2,000	2,000	2,000	8,500
Total (USD)	**187,322**	**208,383**	**152,853**	**221,998**	**770,556**
Present value of costs	162,888	157,567	100,504	126,928	547,887
BENEFITS					
1. Yield (kg/acre)		2,269	2,269	2,269	6,807
2. Price per kg of rice		1,210	1,210	1,210	3,630
3. Revenue/acre (1*2)		2,745,490	2,745,490	2,745,490	8,236,470
4. Total area under rice (acre)		341.55	341.55	341.55	1,025
5. # beneficiaries		2,925	2,925	2,925	2,925
7. # beneficiaries who adopted varieties 51.9%		1,518	1,518	1,518	1,518
6. Revenue/beneficiary (4*5)					1,853,206
8. Total monetary revenue (3*4*7)		937,722,109.50	937,722,109.50	937,722,109.50	2,813,305,319
9. Other benefit (empowerment)					
10. Value of benefits (USD): 1 BIF = 0.0005 USD		468,861	468,861	468,861	1,406,653
11. Present value of benefits		354,526.32	308,283.75	268,072.83	930,882.90
12. Net present value	(162,888.43)	196,959.13	207,780.11	141,144.85	382,995.65
13. Benefit-cost ratio					1.70

Notes: 1. Mean WTP for empowerment was $600 per person per year in EKATA and $384 per person per year for Gender Light; and none was estimated for Control.
2. Agricultural benefits started in the second year, and only empowerment benefits were reported in first year.
3. For the first year of the project, the empowerment was only obtained in the last six months of the year.
4. Yield was assumed to be constant from Year 2 to Year 4.
5. Discount rate is the mean interest rate of 15% as per Bank of Burundi during the study period.

2. GENDER LIGHT	Year 1	Year 2	Year 3	Year 4	
	2016	2017	2018	2019	Subtotal
Program administration and staff costs					
Personnel costs	32,085	57,582	55,361	66,052	211,080
Monitoring and evaluation	3,001	3,001	3,001	3,001	12,003
Consultancies		12,143	31,369	50,217	93,729
Travel	9,417	8,462	7,853	30,564	56,297
Capital equipment	10,053	10,893			
Targeting costs					
Sensitization and targeting	7,145				14,290
Staff training	38,881	38,881	38,881	38,881	155,524
Participant Training					
Training of farmers	9,068	12,068	6,068	9,068	
Implementation and program material costs					
Cost of materials and distribution costs	2,085	2,085	2,085	2,085	8,340
Support to farmer groups (subaward)	44,318	103,675	46,723	47,465	197,863
Beneficiary costs					
Beneficiary contribution of labor and time	2,850	2,100	2,100	2,100	9,150
Total costs (USD)	158,903	250,889	193,440	249,433	852,664
Present value of costs	138,176.38	189,707.82	127,189.84	142,613.85	597,687.89
BENEFITS					
1. Yield (kg/acre)	1,880	1,880	1,880	1,880	
2. Price per kg of rice		1,210	1,210	1,210	1,210.00
3. Revenue/acre (1*2)		2,274,800	2,274,800	2,274,800	
4. Total area under rice (acre)	361.90	361.90	361.90	361.90	341.55
5. # beneficiaries	2,925	2,925	2,925		2,925
7. # beneficiaries who adopted varieties 50.5%	1,477	1,477	1,518	1,518	
6. Revenue/beneficiary (4*5)					
8. Total monetary revenue (3*4*7)		823,240,167.75	823,250,120.00	823,250,120.00	
9. Other benefit (empowerment)	567,216,000	1,134,432,000	1,165,881,600	1,165,881,600	
Total benefits (BIF)	567,216,000	1,957,672,168	1,989,131,720	1,989,131,720	
Total benefits (USD): 1 BIF = 0.0005 USD	283,608.00	978,836.08	994,565.86	994,565.86	3,251,575.80
Present value of benefits (USD)	246,615.65	740,140.71	653,943.20	568,646.26	2,209,345.81
NET Present Value (NPV) (USD)	108,439.28	550,432.88	526,753.36	426,032.41	1,611,657.93
Benefit-cost ratio					2.59

3. EKATA	Year 1	Year 2	Year 3	Year 4	
COSTS	**2016**	**2017**	**2018**	**2019**	**Total**
Program administration and staff costs					
Personnel costs	40,322	68,200	99,350	94,675	302,548
Monitoring and evaluation	3,764	3,764	3,764	3,764	15,056
Consultancies		17,405	44,963	71,977	134,344
Travel		9,417	8,462	7,853	25,732
Capital equipment	5,053	10,893	5,000		
Targeting costs					
Sensitization and targeting	6,304	6,304			25,217
Staff training	25,729	55,729	85,729	55,729	222,918
Participant Training					
Training of farmers	3,364	18,364	33,364	18,364	
Implementation and program material costs					
Cost of materials and distribution costs	1,085	2,085	3,085	2,085	8,340
Support to farmer groups (subaward)	23,523	148,601	66,969	108,033	347,126
Beneficiary contribution of labor and time	4,000	2,950	2,950	2,950	12,850
Total costs (USD)	**113,144**	**343,712**	**353,636**	**365,431**	**1,175,924**
Present total costs (USD)	**98,386**	**259,896**	**232,522**	**208,936**	**799,740**
BENEFITS (BIF)					
1. Yield (kg/acre)		2,306	2,306	2,306	2,306
2. Unit price	1,210	1,210	1,210	1,210	1,210
3. Revenue/acre (1*2)		2,790,260	2,790,260	2,790,260	2,790,260
4. Average rice area/household (acre)	0.475	0.475	0.225	0.225	0.225
5. Revenue/beneficiary (4*5)		627,809	627,809	627,809	627,809
6. # beneficiaries	2,925	2,925	2,925	2,925	2,925
7. # beneficiaries growing rice at 62.4%		1,825	1,825	1,825	1,825
8. Total monetary revenue (5*7)		1,145,876,074.20	1,145,876,074.20	1,145,876,074.20	
9. OTHER BENEFITS	1,755,000,000	2,190,240,000	2,190,240,000	2,190,240,000	
Total benefits (BIF)	1,755,000,000	3,336,116,074	3,336,116,074	3,336,116,074	
Total benefits (USD): 1 BIF = 0.0005 USD	877,500	1,668,058	1,668,058	1,668,058	5,881,674
Present value of benefits (USD)	763,043	1,261,292	1,096,775	953,718	4,074,828
NET Present Value (NPV) (USD)	664,657	1,001,396	864,254	744,781	3,275,088
Benefit-cost ratio					5.1