OXFAM AMERICA
Evaluation Report

RENEWABLE ENERGY ACCESS AND SOCIO-ECONOMIC DEVELOPMENT: THE CASE OF SMALLHOLDER FARMERS IN MCHINJI AND RUMPHI DISTRICTS IN MALAWI

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America

This report explores the role and extent to which renewable energy access can contribute to the social and economic development of smallholder farmers in Malawi with reference to *"Improved livelihoods for 3,000 poor farmers and their families in rural Malawi"* project as a case study. The project has been operating in Malawi since 2015 and was funded by the Scottish Government. This study focusses on the access to renewable energy aspects of the project and covers the work undertaken between April 2015 and September 2018.

The major evaluation activities took place between 5th and 26th November 2018. The evaluation was carried out by *A*gro-Ind Serve through a competitive process and reflects the findings as reported by them as validated with stakeholders. The evaluation was managed by Emma Fawcett, Evaluation, Learning and Effectiveness Advisor from Oxfam America and Hyton Lefu and Temwanani Mulitswa of Oxfam in Malawi and commissioned by Late Lawson-Lartego, Director of the Food Systems theme.

For additional information regarding the evaluation Terms of Reference, please refer to the report appendices.

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PREFACE

In October 2018, Oxfam in Malawi with support from Oxfam America, contracted *A*gro-Ind Serve to undertake an impact evaluation of the access to renewable energy on social and economic development of smallholder farmers in Malawi. Oxfam used the project titled *"Improved Livelihoods for 3,000 poor farmers and their families in rural Malawi,"* which was implemented by Oxfam in Malawi in partnership with Church Action in Relief and Development (CARD) and Catholic Development Commission (CADECOM) with support from the Scottish Government as a case study. Renewable energy technologies were introduced through this project in 3 districts, namely, Lilongwe and Mchinji in Central Malawi and Rumphi in Northern Malawi between April 2015 and September 2018 for small-scale irrigation, value addition, and small enterprises.

This report explores the role and extent to which renewable energy access can contribute to social and economic development of smallholder farmers in two of the three districts in which the *"Improved livelihoods for 3,000 poor farmers and their families in rural Malawi"* project was implemented. The two focus districts were Mchinji and Rumphi.

This report presents the findings of the assessment of the role that access to renewable energy plays among smallholder farmers as well as recommendations for Oxfam in Malawi and the Oxfam family as a whole in as far as the promotion of renewable energy is concerned as a tool for poverty reduction amongst poor smallholder farmers in rural areas.

The *A*gro-Ind Serve team would like to express its gratitude to Oxfam in Malawi and Oxfam America for availing it the opportunity to contribute towards the promotion of renewable energy in Malawi, particularly in general and solar energy. Specifically, *A*gro-Ind Serve wishes to acknowledge the technical guidance and support provided by Hyton Lefu, Steve Kuliyazi, and Temwanani Mulitswa from Oxfam in Malawi and Dr. Emma Fawcett from Oxfam America.

*A*gro-Ind Serve would also like to acknowledge the technical and logistic support of staff from Oxfam partners, namely CADECOM and CARD. In this regard, special mention goes to Mr. Chimwemwe Phiri, the National Coordinator of CADECOM, Mr. Wanangwa Msowoya of CADECOM Mzuzu, Henry Simukonda of CADECOM Rumphi, Mr. Melton Luhanga, the Executive Director of CARD, Mr. Boniface Mbundungu, the Value Chain Specialist at CARD, and Mr. Vitumbiko Jere of CARD in Mchinji.

We would also like to sincerely thank all stakeholders from both the public and private sectors and the NGO sector, which interacted with our team in this study. Last but not least, we are grateful to all the farmers and members of irrigation schemes, value addition groups, and enterprise groups who have provided us with

insightful information regarding the access to renewable energy aspects of the *"Improved Livelihoods for 3,000 poor farmers and their families in rural Malawi"* project. This study would not be possible without them and others who gave their time.. It is our sincere hope that this study will contribute to the emergence of the renewable energy sector as a key contributor to poor people's livelihoods, industrialization, and the reduction of energy poverty in Malawi.

LIST OF ABBREVIATIONS AND ACRONYMS

BIF	Business Innovation Facility
BOQ	Bill of Quantities
CADECOM	Catholic Development Commission
CARD	Churches Action for Relief and Development
CONREMA	Cooperation Network for Renewable Energy in Malawi
CSO	Civil Society Organization
DFID	Department for International Development
EU	European Union
FGD	Focus Group Discussions
FINCORP	Financial Cooperative
FISD	Foundation for Irrigation and Sustainable Development
ha	Hectare
IFC	International Finance Corporation
MBS	Malawi Bureau of Standards
MERA	Malawi Energy Regulatory Authority
MGDS	Malawi Growth and Development Strategy
MK	Malawi Kwacha
MREA	Malawi Renewable Energy Agency
MREPG	Malawi Renewable Energy Partnership Group
MRES	Malawi Renewable Energy Strategy
NGO	Non-governmental Organization
NSO	National Statistical Office
PAYG	Pay as You Go
PSP	Pico-Solar Products
PV	Photovoltaic

REIAMA	Renewable Energy Industries Association of Malawi
RET	Renewable Energy Technology
SE4ALL	Sustainable Energy for All
SHS	Solar Home Systems
SPSS	Statistical Package for Social Sciences
TEVETA	Technical Vocational and Entrepreneurial Training Authority
TV	Television
UNDP	United Nations Development Programme
USD	United Stated Dollar
VAT	Value Added Tax
VSL	Village Savings and Loans
WEE	Women Economic Empowerment

GLOSSARY OF TECHINICAL TERMINOLOGY

Gender Relations

Gender relations are a specific subset of social relations uniting women and men as social groups in a particular community, including how power – and access to/control over resources – is distributed between the sexes.

Grey Market

A 'grey market" is one in which, renewable energy products that do not meet national or international quality standards are sold.

Pico-Solar Products (PSPs)

PSPs are defined as low-cost solar products that provide basic lighting, mobile phone charging, and communication service.

Renewable energy

Sources of energy that arise from natural processes in the interaction between the sun and the earth's surface and are regularly replenished. These include the sun as the primary renewable energy resource and the secondary renewable energy resources that derive from the sun, such as wind, hydro, ocean thermal, ocean wave, and ocean tidal energy, as well as electricity from photo-voltaic effects, biomass and geothermal energy.

Village Savings and Loan Group/Association

A Village Savings and Loan Group or Association (VSLA) is a group of people who save together and take small loans from those savings. The activities of the group run in cycles of one year, after which the accumulated savings and the loan profits are distributed back to members. The purpose of a VSLA is to provide simple savings and loan facilities in a community that does not have easy access to formal financial services.

Women Economic Empowerment

Oxfam defines the state of effective economic empowerment for women as occurring when women enjoy their rights to control and benefit from resources, assets, income and their own time. Also, when they have the ability to manage risk and improve their economic status and wellbeing. However, for this to become a reality, women must also have the autonomy and self-belief to make changes in their own lives, which includes having the power to organize and influence decision making while enjoying equal rights to men and freedom from violence. Women's economic empowerment (WEE) programmes focus on women's ability to gain access to and control over productive resources and to be recognized as fully participating economic actors.

1. EXECUTIVE SUMMARY

INTRODUCTION

This is a report of the study to assess the impact of access to renewable energy on the socio-economic status of poor rural smallholder farmers in Malawi using the *"The Improved livelihoods for 3,000 poor farmers and their families in rural Malawi"* project that was implemented by Oxfam in Malawi with the support of the Scottish Government between 2015 and 2018 as a case study. While the project was implemented in the districts of Lilongwe, Mchinji in central Malawi, and Rumphi in the North, this study is limited to the Mchinji and Rumphi districts.

PURPOSE OF THE EVALUATION

The evaluation aimed at assessing the impact of access to renewable energy on smallholder farmers using "*The Improved livelihoods for 3,000 poor farmers and their families in rural Malawi"* project as a case study. The study also aimed to assess the marketing and policy environment to identify enabling factors and barriers to the promotion of renewable energy in Malawi. The findings from the study are expected to help improve the effectiveness of Oxfam interventions and expand knowledge on renewable energy within Oxfam in Malawi and in the confederation as a whole.

SCOPE OF THE EVALUATION

This evaluation assessed the impact by comparing beneficiary groups to a comparison group so as to allow attribution of the impact directly to access to renewable energy. It also involved interviewing other stakeholders in order to understand the issues that private sector suppliers face when they are dealing with smallholder farmers and to understand how policies and regulations help or hinder them. It also considered how access to renewable energy could be facilitated and accelerated at the national level. In addition, the evaluation aimed to identify advocacy issues that Oxfam in Malawi and other stakeholders could pursue in order to make the policy and marketing environment for renewable energy more conducive to uptake at both the national and global levels.

EVALUATION METHODOLOGY

The study employed a combination of data collection techniques and collected both quantitative and qualitative data. This included: a review of literature relevant to the study, administration of a structured questionnaire, focus group discussions and interviews with relevant government departments and organizations, non-governmental organizations, business groups, and individual private sector companies working on solar energy and renewable energy in general, and systematic observations. The use of a combination of data collection techniques made triangulation of data and information collected during the evaluation possible.

KEY FINDINGS

- Access to renewable energy, solar energy in particular, can have a positive impact on poor rural households in terms of their livelihoods, income, food security, and women's empowerment and gender relations.

- Access to solar irrigation, value addition, and business enterprises provided the participating households new sources of income. Mean household incomes were generally higher amongst beneficiary households than in control groups. Almost 71% of households belonging to solar enterprise groups, 49% in value addition groups, and 35% in irrigation groups had experienced an increase in household income over the duration of the project.

- Participation in solar-based interventions has contributed to improved food security among the participating households. More people were having three meals a day than before the start of the interventions. About 44% of the households in the control groups had experienced a hungry season compared to 34% amongst solar-based irrigation groups, 31% amongst value addition groups and 22% amongst enterprise groups

- On average, more households from the beneficiary sample owned each type of asset than households from the control group except for ownership of beds and mobile phones. However, most of the assets were bought before the interventions started. Therefore access to renewable energy has not had an impact on asset ownership, at least not as yet.

- The project achieved its objective of targeting at least 60% women beneficiaries. The project has also managed to get more women in leadership positions although the situation was the same among the control groups. However, being in positions of leadership does not seem to have enhanced women's participation in the decision-making processes as demonstrated during FGDs when men dominated the discussions.

- Women were participating in the control of household resources as well as in the decision-making in households. They did this as female household heads, sole decision makers, or jointly with their spouses. However, it is not possible to attribute this directly to the project considering that in most areas the interventions started in the second or third year of the project.

- The positive effects of the interventions are yet to exceed the cost of provision of renewable energy technologies as these effects take time to be realized. However, there are signs that this could happen in the future. However, their achievement is being jeopardized by a number of challenges faced by the beneficiaries, including non-functional equipment and limited markets.

- As far as continuity of activities beyond the project, the findings show great commitment and interest to do so among the beneficiaries. However, the financing model which anticipated the VSL to provide a safety net for repairs and maintenance has not worked so far except in one case.

- The policy environment is being made more conducive to the promotion of renewable energy in Malawi. A new Energy Policy has been developed as well as a strategy specifically focused on renewable energy, the Malawi Renewable Energy Strategy of 2017. However, there are still a number of gender issues to be considered when promoting renewable energy in Malawi. These are access, control of resources, decision-making, and gender analysis. The market environment could also be better than it is currently. The proliferation of substandard and counterfeit products, especially, PSPs poses a threat to customer confidence on renewable energy products. In addition,

the continued levying of duty and VAT on renewable energy products and components poses the risk of keeping renewable energy technologies out of reach of the majority of the people who should benefit from them. It is pleasant to note, though, that government is willing to consider waiving such taxes if provided evidence on the fiscal impact of such a policy. Fortunately, another study that shows the positive impacts of a policy shift toward duty and tax exemption has begun.

CONCLUSIONS

There are indications that access to renewable energy and solar energy, in particular, can have a positive impact on households in terms of their livelihoods, income, and food security. However, the benefits from access to renewable energy in this project have been limited by a variety of challenges during its implementation.

Nevertheless, the project has provided a learning ground that can inform future interventions in the area of renewable energy in general, and solar energy, in particular. A number of areas for advocacy or lobbying and support to renewable energy industry have also been identified.

RECOMMENDATIONS

- Oxfam and its partners should consider providing support to communities to address the systemic challenges they face in regards to the solar energy technologies introduced. These challenges include the inability of the irrigation systems to provide adequate water to the farmers for irrigation and broken down pieces of equipment amongst value addition groups. If these problems are not sorted out quickly, the sustainability of the interventions will be unlikely.

- Similar projects in the future should provide for adequate funding in the project budgets that enable implementing partners to procure solar energy technologies of the appropriate capacity.

- Oxfam, in collaboration with other stakeholders, should advocate for the review and adoption of the proposed duties of the district energy officers and lobby for their recruitment and deployment to districts. The University of Strathclyde has developed a proposal on the roles and responsibilities of the District Energy Officers.

- Oxfam, in partnership with other key stakeholders, should closely monitor the implementation of the MRES to ensure that the actions spelt out there are implemented.

- Oxfam and other key stakeholders should continue to advocate and lobby for the drafting and eventual enactment of a renewable energy Act.

- Oxfam, in collaboration with other key stakeholders, should follow up with the government on the adaptation and adoption of the Lighting Global Standards developed by the World Bank and the IFC in order to curtail the proliferation of counterfeit and substandard solar energy products on the Malawi market.

- Similar projects should in the future be based on proper and detailed feasibility studies and be implemented based on the recommendations of such studies.

2.0 INTRODUCTION

2.1 OVERVIEW OF THE RENEWABLE ENERGY PROJECT

Oxfam in Malawi with financial support from the Scottish Government implemented a project titled *"The Improved livelihoods for 3,000 poor farmers and their families in rural Malawi"*. The project was implemented in 3 districts, namely; Lilongwe and Mchinji in Central Malawi and Rumphi in Northern Malawi. The project started in April 2015 and came to an end on 30th September 2018. Oxfam implemented the project with two major implementing partners. In Rumphi and Lilongwe, the project was implemented with the Catholic Development Commission (CADECOM), while in Mchinji, it was implemented in partnership with Churches Action in Relief and Development (CARD).

2.2 OVERVIEW OF THE INTERVENTION GOALS

The overall objective of the project was to build the resilience of rural farmers through the use of renewable energy in irrigation farming, enterprise development, and value addition. Specifically, the project aimed to address the interrelated challenges of economic insecurity and access to energy, to reduce levels of poverty for a target group of 3,000 rural poor households (of which 1,800 are headed by women) based in the districts mentioned above. In total, the project aimed at improving the lives of more than 13,800 people (8,280 are women and girls).

2.3 PURPOSE OF THE EVALUATION

The aim of this evaluation was two-fold.

- First, a deep impact assessment of access to renewable energy on small holder farmers in the context of the project "Improving livelihoods for smallholder producers in Rumphi, Lilongwe, and Mchinji".
- Second, to look beyond the project to assess more broadly the marketing environment and the policy environment – and identify the enabling factors and the barriers.

Strategically, this evaluation is expected to help improve the effectiveness of Oxfam interventions and expand knowledge on renewable energy within Oxfam in Malawi and in the confederation as a whole. The project funded by the Scottish Government is only used for reference only.

2.4 SCOPE OF THE EVALUATION

The scope of this impact evaluation was as follows:

- **A more robust impact evaluation:** This evaluation compared program participants with a comparison group, to allow for attribution of the impacts directly accessing renewable energy.
- **Different scope**: This evaluation looked beyond the beneficiaries and interviewed other stakeholders to understand the issues that private sector suppliers face while engaging with smallholder farmers, and to understand how policies and regulations help or hinder them. This evaluation also considered how access to renewable energy could be facilitated and accelerated at a national level.
- **Different purpose:** This evaluation was more advocacy-focused and targeted the kinds of evidence and arguments that would be useful in Oxfam's lobby at the national level and on the global stage. It built upon a comprehensive study on the policy and regulatory environment (and gaps) governing renewable energy in Malawi that was produced at the beginning of the project by contributing lessons and learnings from the project itself, and drawing out recommendations that are evidenced by real-life experience.

2.5 KEY STAKEHOLDERS AND PRIMARY CHANGE AGENTS

The key stakeholders for this evaluation are Oxfam in Malawi, Oxfam America, the confederation as a whole, the smallholder farmers, the project implementing partners, namely CADECOM and CARD, Government of Malawi, international and local non-governmental organizations and private sector players in the renewable energy industry.

2.6 BRIEF DESCRIPTION OF PROGRAM'S THEORY OF CHANGE

The project's theory of change is that if access by poor male and female smallholder farmers in Malawi to renewable energy is improved in the form of solar energy for irrigation, value addition and enterprise development, then there will be progress in their incomes, livelihoods, and food security as well as women's empowerment and gender relations. In addition, if evidence based advocacy on renewable energy issues is undertaken in collaboration with key stakeholders, then the policy, regulatory, and market environment is likely to become more conducive for the promotion and adoption of renewable energy technologies.

3.0 EVALUATION DESIGN

3.1 KEY EVALUATION QUESTIONS

The impact evaluation aimed at addressing the following key questions:

a. **Assess the impacts of access to energy, as provided by** *"The Improved livelihoods for 3,000 poor farmers and their families in rural Malawi"* **on men and women's income, livelihoods, food security, and women's empowerment and gender relations.** As some of the larger renewable energy equipment was provided for free to communities, the evaluation sought to establish whether any positive effects of access were worth more than the costs of provision. Also, the evaluation was cognisant of research suggesting that while some impacts are quick; others such as on labour markets or education can often take up to a decade to manifest.

b. **How far are these effects sustainable?** This involved examining the business model behind the project such as the financing models for maintenance of the equipment. Were these financing models working effectively? Is the private sector supplying after-sales service? Are people using their increased incomes on more energy or on other things?

c. **Identify enabling conditions.** In general**,** focusing on the policy environment, marketing environment, and any other factors for effective adoption of renewable energy in Malawi.

d. **What are the gender issues that need to be considered when promoting renewable energy access?**

3.2 EVALUATION TEAM

The evaluation team from *A*gro-Ind Serve was led by Munday S. Makoko, an Agricultural Engineer and expert in socio-economic studies and Patrick Chimutu, an Agricultural Economist and expert in monitoring and evaluation. The team was assisted by a group of 6 research assistants who were thoroughly trained before embarking on the study.

3.3 EVALUATION METHODOLOGY

The study employed a combination of data collection techniques and collected both quantitative and qualitative data. There was a review of literature relevant to the study, administration of a structured questionnaire, focus group discussions and interviews with relevant government departments and organizations, non-governmental organizations, business groups, and individual

private sector companies working on solar energy and renewable energy in general and systematic observations. The use of a combination of data collection techniques allowed us to triangulate data and information collected during the evaluation.

One of the questions addressed in this evaluation was whether access to solar energy affected the incomes, livelihoods, food security and women's empowerment and gender relations of men and women in the project sites. In order to be able to attribute any positive or negative changes in these, the evaluation went beyond looking at the before and after situation of the beneficiary communities and compared the beneficiary communities to non-beneficiary communities.

Data collection was done through checklists to guide focus group discussions and interviews with key stakeholders and the administration of structured questionnaires to samples of smallholder farmers from beneficiary and non-beneficiary (control) communities.

Beneficiary households were defined as those households that have accessed renewable energy for irrigation, value addition, and small scale enterprise development in the past three and a half years through Oxfam interventions while non-beneficiary communities were those in which no similar interventions had been implemented.

The project targeted a total of 3,000 households across the three districts of Lilongwe, Mchinji, and Rumphi, with each district contributing 1,000 households. Due to financial resource limitations, the impact evaluation was conducted in two of the three target districts, namely Mchinji and Rumphi. Lilongwe district was used for pre-testing the study tools. Therefore, the total target beneficiary population in the selected two districts of Mchinji and Rumphi was 2,000. Using standard sample size formulae the statistically representative sample for a target population of 2,000 beneficiary households, taking a confidence limit of 95% and 5% margin of error, was calculated to be 322 households. The household sample was equally distributed between the districts and among irrigation schemes, value addition, and enterprise groups in each district. The irrigation schemes, value addition groups, and enterprise groups were selected using simple random selection.

During implementation of the evaluation, however, a total of 212 households were interviewed mainly because there had been dropouts from the various groups. Of the 212 respondents interviewed, 133 were from Mchinji and 79 were from Rumphi. From the FGDs it was explained that people were dropping out of the groups because their own expectations were taking long to be met. A minor reason given was migration out of the area in search of jobs or as a result of marriage.

Non-beneficiary households were sampled from communities that did not benefit from any of the three interventions of solar irrigation, value addition, and enterprise development. A sample of 60 households was agreed upon with Oxfam as being adequate for the purposes of this evaluation, taking into consideration financial and time limitations. However, a total of 66 were interviewed, 33 from each district.

To ensure that each question was asked with the same meaning and in the same way, the questionnaires were translated from English to Chichewa which is most commonly spoken across

the country. Enumerators with previous experience and knowledge of beneficiary surveys using electronic data collection instruments were recruited and thoroughly trained in the impact evaluation and the conduct of beneficiary surveys, including research ethics.

The questionnaire was programmed onto data-enabled tablets to enable electronic data capture using CSPRO version 7.1. At the end of the field work, the data was cleaned and analysed using the Statistical Package for Social Sciences (SPSS) software. Qualitative data obtained through stakeholder interviews and FGDs was analysed using thematic and trend analysis.

In addition to the 212 beneficiaries and 66 non-beneficiaries interviewed using the questionnaire, we also consulted a total of 36 people as key informants and 52 through Focus Group Discussions (FGD). Of these, about 67% were female.

The research team adhered to standard ethical practices. Each respondent was informed about the objectives of the impact evaluation and were informed that their participation was voluntary and that all their responses would be kept confidential. Respondents were also free not to answer any questions and also to stop the interview at any point. Only respondents who gave their consent to participate in the evaluation were interviewed.

3.4 EVALUATION LIMITATIONS

The sample size for the evaluation was based on a beneficiary population of 2,000, equally distributed amongst the two districts of Mchinji and Rumphi. However, during the beneficiary survey it was discovered that some members of the groups using solar energy had dropped out. This reduced the number of beneficiaries available for consultations. This was more prominent in Rumphi and particularly so for the sampled enterprise groups where only 4 out of a planned 50 respondents were available. During FGDs, it was reported that some members had gotten married and moved out of the community while others had trekked to South Africa as well as in nearby towns of Rumphi and Mzuzu in search of jobs. Others were said to have just dropped out of the groups because they were not benefitting from the interventions. As reported earlier, one enterprise group in Luvili which initially had 10 members was a three member operation as at the time of this evaluation. Another group at Chikwawa, still in Rumphi, which initially had 10 members, was now a one person enterprise. Two barbershops in the Luvili area, one of which was in our sample, were now one person shows. Attempts were made to trace and interview those that were no longer active but these were unsuccessful as none were available at the time of the survey for one reason or another.

Comparison with control groups was a major factor differentiating this impact evaluation from the end of project evaluation which was also under way at the time of this impact evaluation. Our research team relied on the staff of Oxfam's implementing partners for the identification of an ideal control community. The control community was to be a community that did not have similar interventions being implemented or having been implemented by either the implementing partner of other organizations. However, in Rumphi district, the identified community had CADECOM interventions that included irrigation and other agricultural interventions, although the irrigation

intervention was based on a diesel pumping system. This meant that this particular community could not be considered as a true non-beneficiary community since the interventions by CADECOM influenced the socio-economic status of the smallholder farmers.

Some of the questions in this study required participant recall, especially those on incomes and food security. Faulty memories may, therefore, affect our findings in these aspects of the study.

Some of the private sector companies contacted opted not to participate in the study while others did not respond to emailed questionnaires, despite that the companies themselves had requested for an emailed questionnaire. As a result out of a selected 10 companies, the study received responses from 4.

4.0 EVALUATION FINDINGS

4.1 DEMOGRAPHICS OF RESPONDENTS

4.1.1 Sex of Respondent

Table 1 presents the composition of the sample by sex of respondent in the beneficiary communities. As shown in the table, female respondents made up the majority of the sample in both districts and across the three groups of solar power users. Out of the 212 respondents that were interviewed from among the beneficiary communities, 70% were female, while 30% were male. These findings are consistent with the project's aim of targeting more women than men.

Table 1: Beneficiary sample composition by sex of respondent

District	Irrigation				Value Addition				Enterprise				Survey Total			
	Male		Female		Male		Female		Male		Female		Male		Female	
	No.	%	No.	%	No.	%	No.	%	No.	%	No	%	No.	%	No	%
Mchinji	23	44 %	29	56 %	9	29 %	22	71 %	8	16 %	42	84 %	40	30 %	93	70 %
Rumphi	17	39 %	27	61 %	5	17 %	25	83 %	1	20 %	4	80 %	23	29 %	56	71 %
Total	**40**	**42 %**	**56**	**58 %**	**14**	**23 %**	**47**	**77 %**	**9**	**16 %**	**46**	**84 %**	**63**	**30 %**	**149**	**70 %**

Source: Impact evaluation (2018)

Similarly, the majority of respondents in the control communities were female. Overall, about 59% of the respondents were female compared to approximately 41% who were male. Females made up the majority of the sample in both districts (Table 2). This perhaps reflects the national population statistics which show that there are more females than males.

Table 2: Control group composition by sex of respondent

District		Sex of Respondent		Total
		Male	Female	
Mchinji	Number	15	18	33
	%	45.5%	54.5%	100.0%
Rumphi	Number	12	21	33
	%	36.4%	63.6%	100.0%
Survey Total	Number	27	39	66
	%	40.9%	59.1%	100.0%

Source: Impact evaluation (2018)

4.1.2 Sex of Household Head

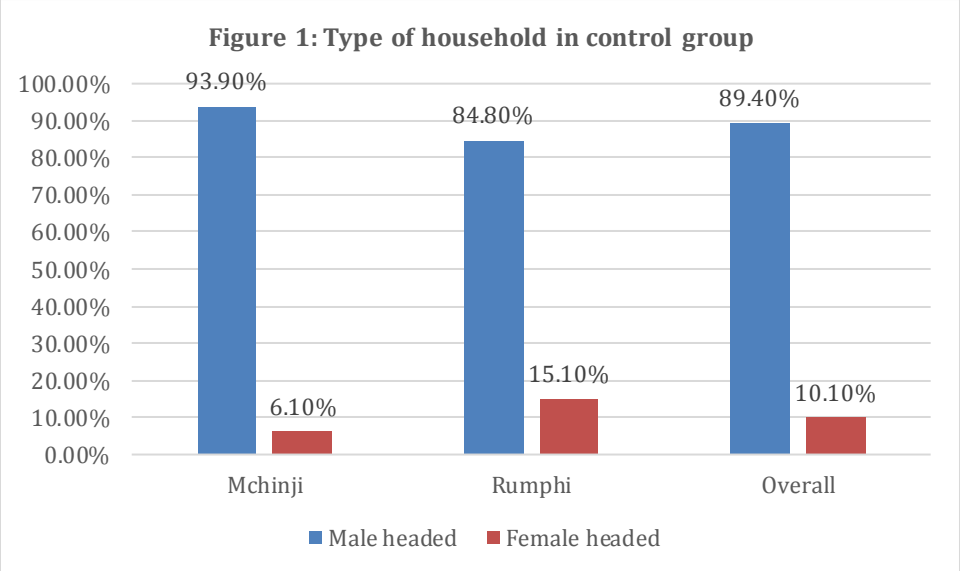
As shown in Table 3, eighty-six percent (86%) of the households in the beneficiary sample were male headed while 14% were female headed. In both districts, there were more male headed households than female headed households. Similarly, there were more male headed households in each of the three solar power user groups.

Table 3: Composition beneficiary sample by sex of household head

District		Irrigation			Value Addition			Enterprise			Survey Overall		
		Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Mchinji	No	45	7	52	30	1	31	47	3	50	122	11	133
	%	87%	13%	100 %	97%	3%	100 %	94%	6%	100 %	92%	8%	100 %
Rumphi	No.	33	11	44	23	7	30	5	0	5	61	18	79
	%	75%	25%		77%	23%	100 %	100 %	0%	100 %	77%	23%	100 %
Total	**No.**	**78**	**18**	**96**	**53**	**8**	**61**	**52**	**3**	**56**	**183**	**29**	**212**
	%	**81%**	**19%**	**100 %**	**87%**	**13%**	**100 %**	**95%**	**5%**	**100 %**	**86%**	**14%**	**100 %**

Source: Impact evaluation (2018)

Just like in the beneficiary sample, 89.4% of the households in the control sample were male headed compared to 10.1% that were female headed (Figure 1) Male headed households dominated the sample in both Mchinji and Rumphi. The findings in both the beneficiary and control samples are consistent with national population statistics. According to the Integrated Household Survey of 2016-2017 (NSO, 2017), 78% of households in Rumphi were headed by males compared to 22%, headed by females. In Mchinji, 74.1% of households were headed by males, while 25.9% were headed by females confirming the predominance of male headed households.



4.1.3 Marital Status of Household Head

Table 4 presents the marital status of the household head in the beneficiary sample. Ninety percent (90%) of the household heads among the sample beneficiary households were married, while 1% was single, 4% divorced, and 5% widowed. Amongst the three groups of beneficiaries of solar power, the majority of the household heads were married.

Table 4: Marital Status of household head in beneficiary sample

	Marital Status			
	Single	**Married**	**Divorced**	**Widowed**
Irrigation	0%	88%	4%	8%
Value Addition	2%	93%	3%	3%
Enterprise	2%	93%	4%	2%
Mchinji	1%	92%	5%	3%
Rumphi	1%	87%	3%	9%
Overall	1%	90%	4%	5%

Source: Impact evaluation (2018)

The marital status of household heads in the control sample was similar to that in the beneficiary sample. Approximately 91% were married while 3% were divorced and 6% were widowed.

4.1.4 Literacy Level of Household Head

Literacy in this evaluation was measured on the basis of one's ability to read only. Seventy-five percent (75%) of those interviewed amongst beneficiaries were able to read easily while 6% were able to read with difficulty, and 19% were not able to read (Table 5). Amongst the beneficiary groups heads of households participating in value addition were more literate than those in the other two groups, with 90% who could read easily compared to those in irrigation and enterprise groups. Rumphi had more literate household heads than Mchinji.

Table 5: Literacy level of household head of beneficiary groups

Intervention	Easily	With difficulty	Can't read
Irrigation	74%	6%	20%
Value Addition	90%	2%	8%
Enterprise	61%	9%	31%
Mchinji	65%	6%	29%
Rumphi	91%	5%	4%
Overall	75%	6%	19%

Source: Impact evaluation (2018)

Literacy in the control groups was almost the same as in the beneficiary group. Almost 77% were able to read easily while 8% could read but with difficulty and 14% cannot read.

4.1.5 Household Size

Table 6 presents the household sizes in each of the sample groups. As can be noted the size of a household in both beneficiary and control groups is at 5 members and ranges from 1- 11 among irrigation groups, 1-10 in value addition groups, 2-9 in enterprise groups and 1-13 in the control groups. The size of the households in this study is consistent with the findings of the 2018 Population and Housing Census[1], which put the household size for Mchinji at 4.5 and that for Rumphi at 4.9, both of which can be rounded up to 5.

Table 6: Household size

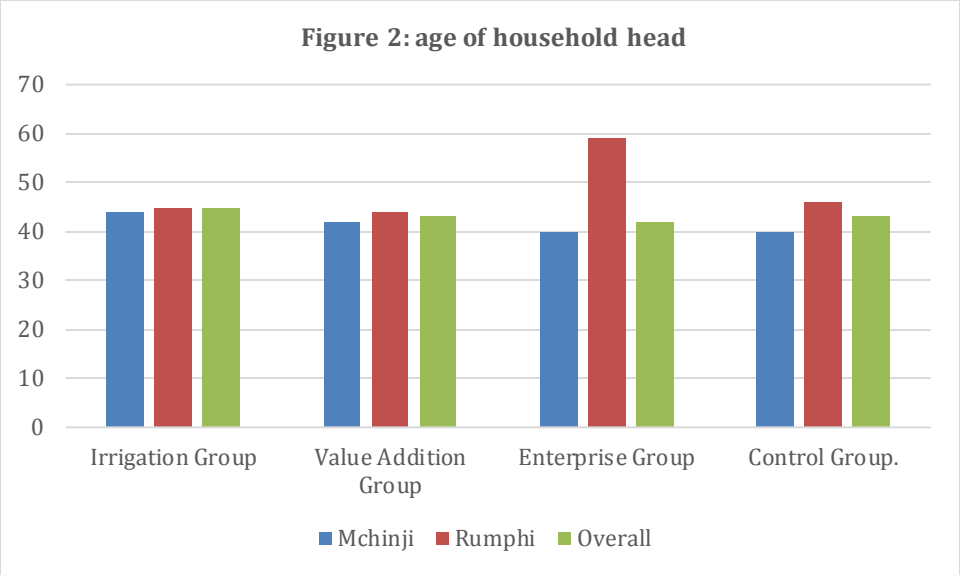
District	Number of household members per household											
	Irrigation Group			Value Addition Group			Enterprise Group			Control		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Mchinji	5	1	11	5	1	9	5	2	9	6	1	10
Rumphi	5	1	9	5	1	10	5	2	7	5	2	13
Overall	5	1	11	5	1	10	5	2	9	5	1	13

Source: Impact evaluation (2018)

4.1.7 Age of household head

The average age of the household head in each of the sample groups is presented in Figure 2. As can be noted the average age of household heads in the beneficiary sample is almost the same as that in the control group. On average household heads are in their early to mid-forties.

[1] NSO (2018) Malawi Housing and Population Census: Preliminary Report



4.2 IMPACT ASSESSMENT

4.2.1 Impact on Incomes and Livelihoods

4.2.1.1 Sources of Income

Each respondent of the household survey was asked to indicate the sources of their household income and provide an estimate of the amount of income they earned as individuals from each source in a year. The findings are presented in Table 6. As can been noted from Table 6, sales from rainfed crops was the most important source of household income for all solar-based groups and the control group in both districts seconded by Village Savings and Loans (VSL) groups. The mean annual total household income from sales of crops produced under rainfed conditions ranged from MK155,995[2] amongst beneficiaries in irrigation schemes to MK277,136 among those in value addition groups compared to MK194,560 in the control group. Incomes from VSLs ranged from MK45,131 among irrigation groups to MK74,028 among enterprise groups compared to MK31,891 in the control group. The End of Project Evaluation reported annual MK76,000 per household across the project and MK92, 000 for Rumphi and MK135,000 for Mchinji. Note that the income earned from irrigation crop sales by irrigation groups, enterprise groups and value addition groups in the current study was from crops produced under solar irrigation. The income earned by the control groups from irrigation crops sales was from motorised pump irrigation.

The findings in Table 7 also show that there were instances where a household belonged to more than one solar-based intervention group. For example, value addition and enterprise groups also

[2] MK736 = USD1:00 as of February 15th 2019

earned income from solar irrigation, while solar irrigation groups also earned income from value addition and enterprise interventions.

Table 7: Mean annual household incomes by source and beneficiary group

Source of income	Mean Annual Household Incomes (Malawi Kwacha)[3]			
	Irrigation Groups	Enterprise Groups	Value Addition Groups	Control Group
Ganyu (Casual labour)	28,347	15,703	25,441	20,432
Salary	0	6,000	0	19,862
Remittances	1,316	0	1,695	2,758
Sale Forest products	2,210	1,886	0	6,276
Livestock sales	19,468	20,962	25,593	23,612
Irrigation crop sales	16,773	11,935	23,695	98,983
Rainfed crop sales	155,995	200,287	277,136	194,560
Solar power enterprises	979	7,159	1,966	1,206
Value Addition	2,863	8,370	35,983	0
VSL	45,131	74,028	64,274	31,891

Source: Impact evaluation (2018) it is pleasing to note, however, that households that are participating in solar-based irrigation, value addition, and enterprises are earning incomes from these activities. The fact that solar irrigation, value addition, and enterprises were now additional sources of household income was also noted at the mid-term review where an average MK19, 109 was recorded as having come from solar enterprises. This was confirmed through FGDs and key informant interviews. For example, it was reported during an FGD that Tikondwe Business Club, which is engaged in a barber shop and cell phone charging in Mchinji, reported earnings ranging from MK1,200 to MK1,500 per day from phone charging and MK900 per day from the barbershop translating into a total of MK374,400 – MK468,000 and MK280,000 gross per annum from phone charging and the barbershop, respectively or a combined annual gross group income of MK655,200 –MK748,800 or MK43,680 – MK49,920 per member per annum for the 15 member group, just from the solar enterprise.

It was also noted from FGDs that the beneficiaries of the solar interventions invested the earnings from the activities into the VLSs. For example, Kadammanja enterprise group in Mchinji, which operates a barber shop and phone charging unit and also sells solar lamps, put all its earnings amounting to MK180,000 into their VSL from which they would borrow for other activities such as buying farm inputs. Members of Malabada irrigation scheme, also in Mchinji, indicated that they planned to put any profits they may make from the irrigation scheme into their VSL. Other groups such as the Kasekese Cooperative in Mchinji District, which is involved in peanut butter production use incomes earned from the value addition activity to buy more shares in the cooperative.

[3] Mean annual incomes are calculated as an average of all recorded individual incomes per source of income using SPSS

4.2.1.2 Annual Incomes

Table 8 presents the findings on mean total household income earned per annum by the four sample groups calculated as the average of the sum of incomes earned from all sources of income reported by the household. The mean incomes are generally higher among the irrigation, value addition and enterprise groups than in control groups except in Rumphi. The higher incomes recorded in the control group in Rumphi could result from the interventions implemented in the community by CADECOM, which included diesel pump irrigation and promotion of good agricultural practices.

Table 8: Total annual average household income

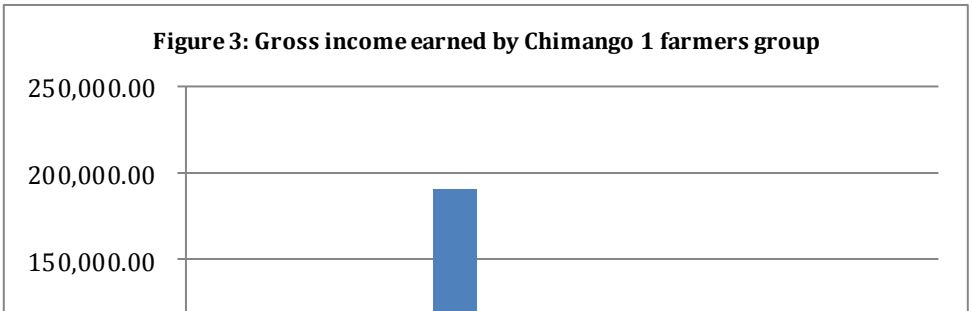
District	Average Total Annual household Income (Malawi Kwacha)			
	Enterprise Group	Irrigation Group	Value Addition Group	Control Group
Mchinji	381,083.00	171,049.00	422,367.00	219,715.00
Rumphi	331,000.00	391,844.00	490,352.00	546,361.00
Overall	377,373.00	273,312.00	455,783.00	399,934.00

Source: Impact evaluation (2018)

The household incomes recorded in Table 8 above are almost 10 times higher than those recorded at both the baseline (MK12,000) and the mid-term review (MK39,257). FGDs and key informant interviews confirm that incomes are higher than before. As stated earlier, members of Tikondwe Business Club in Mchinji, for example, earn MK43,680 – MK49,920 per annum each just from the solar enterprise, which is higher than both the incomes reported at the baseline and the mid-term review.

Records examined during the study confirm that households are earning income from the three interventions. A sample of business records is presented in Appendix 2. Records from Kasekese Cooperative, which has 65 members (52 women), for example, showed that the group produces 2,450 bottles of 250g each per year and sells each bottle at MK500, resulting in an annual group revenue of MK1,225,500 or MK19,000 per member. The Kadammanja enterprise group which runs a barber shop, phone charging services and sale of solar lamps in Mchinji, made a total of MK180,000 last year, meaning that each member of the group of 18 (11 women) got an income of MK10,000 per annum from the enterprise. Figure 3 shows the gross monthly income earned by Chimango 1, a peanut butter value addition group in Luvili in Rumphi. Over the 7 month period in which records were examined, the group grossed around MK712,000. As mentioned before, incomes realised from these interventions are invested into either the VSLs for on-lending or into cooperatives in the form of additional shares.

Figure 3: Gross income earned by Chimango 1 farmers group



4.5.1.3 Changes in Incomes and Livelihoods

To establish if improved access to renewable energy has had an impact on the incomes and livelihoods of the beneficiaries of the project, respondents were asked whether they had experienced any increase in their incomes since they started participating in solar-based irrigation, value addition groups, and enterprise groups. They did so by comparing their incomes before they participated in the solar activity to the incomes they were earning at the time. The largest proportion of respondents that experienced an increase in incomes since the start of the interventions belonged to the enterprise groups, with 71% reporting the increase (Table 9). These were followed in second place by the value addition groups at 49% followed by irrigation groups at 35%. The control group had the largest proportion of respondents that had actually experienced a reduction in their incomes with 41% reporting a decline compared to 27% for irrigation groups, 14% among value addition groups, and 15% among enterprise groups.

Table 9: Proportion of households that have experienced increase in income by intervention

Current status of income			
Sample group	**Same as at start of intervention**	**Less than before intervention**	**More than before intervention**
Solar Irrigation	38%	27%	35%
Value addition	37%	14%	49%
Enterprise group	15%	15%	71%
Control group	22%	41%	37%

Source: Impact evaluation (2018)

Analysed at the district level, Table 10 shows that more households had experienced an increase in income in Rumphi than was the case in Mchinji amongst both beneficiary and control groups. About 43%, 62%, and 80% of the irrigation, value addition, and enterprise groups respectively, had experienced an increase in income amongst the beneficiary communities while 43% experienced an increase among the control groups. The high proportions amongst the beneficiary community in Rumphi could be, to some extent, a reflection of the lower respondent sample size than that of Mchinji. The fact that few respondents from the irrigation groups reported increases

in income largely reflects the condition irrigation schemes were in at the time of this study. Some schemes were not functional while others were not servicing as many people as had been planned due to insufficient water and pressure to supply the entire scheme.

Table 10 Proportion of households that had experienced increase in incomes by district

Group	Current status of Income					
	Mchinji			Rumphi		
	Same as before	Less than before	More than before	Same as before	Less than before	More than before
Irrigation	37%	35%	28%	39%	18%	43%
Value addition	43%	20%	37%	31%	7%	62%
Enterprise group	16%	14%	70%	0%	20%	80%
Control group	37%	35%	28%	39%	18%	43%

Source: Impact evaluation (2018)

In order to establish whether the reported increase in income was as a result of the participation in solar-based irrigation, value addition or enterprises, respondents were asked to state the reason for the changes in their incomes. As shown in Table 11, VSL was the main reason for increased incomes amongst beneficiaries who participated in solar-based value addition and solar enterprises as well as for the control group. Eighty-four percent (84%) of the respondents in value addition groups who had experienced an increase in their income, 78% of those in enterprise groups and 48% of the control group stated participation in VSL as the main reason their incomes had increased, respectively. As already reported in this study, some groups invested the income earned from the solar interventions into the VSLs from which they were able to borrow for other developmental activities and this explains why the VSL was singled out as the main reason for the improved incomes.

The afore-going notwithstanding, it is important to note that there were participants who reported their participation in the solar-based interventions as the reason for the increase in their incomes. In fact, amongst irrigation groups, 24% considered their participation in solar irrigation as the main reason why their incomes had increased over the past three years compared to 21% who gave VSL as the reason. Amongst value addition groups, 74% thought their participation in the group was the reason for the increase in their incomes while 39 % of enterprise group members considered the enterprise as the reason. This demonstrates the potential that solar-based economic activities can have on poor people's incomes, especially considering that the interventions have been on the ground mostly for less than three years in most areas.

Table 11: Reasons for increase in household incomes

Group	Reason for increased income							
	Participation in Solar Irrigation	Participation in Solar enterprise	Participation in solar-based Value Addition activity	VSL	Increased Ganyu(casual labour) earnings	Increase in Salary	Increase in Livestock sales	Increase in Remittances
Solar Irrigation	24%	0%	4%	21%	2%	0%	3%	0%
Value Addition	10%	16%	74%	84%	0%	0%	8%	3%

Solar Enterprise	5%	39%	0%	78%	5%	0%	8%	0%
Control	0%	0%	0%	48%	7%	0%	3%	0%

Source: Impact evaluation (2018)

4.5.1.4 Household use of additional income

We also wanted to establish if the additional income earned was being used in the purchase of other solar technologies as a way of measuring if access to renewable energy was leading to increased uptake of such technologies in the communities. As illustrated by Table 12 only 3% of the households in enterprise groups and value addition groups and 6% of the irrigation households were using the additional income to purchase solar-based technologies. The majority of the households were using additional income to buy food, clothes and school uniforms and paying school fees. Thus, the spillover effects to other types of solar gadgets are yet to be realised. This could be because of lack of awareness amongst the beneficiaries of the existence and benefits of the other types of solar technologies, which indicates that the promotion of the solar technologies for irrigation, value addition, and enterprises should be accompanied by awareness campaigns on a range of solar technologies that beneficiaries could benefit from. Having said this, it is important to note that in Mchinji, one of the enterprise groups linked up with Sunny Money, a private sector company dealing in solar lighting products, and was selling lighting products to members of their community[4].

Table 12: Uses of extra income

	Sample Group			
Use	**Irrigation**	**Value Addition**	**Enterprises**	**Control**
Buying clothes	23%	71%	60%	46%
Paying school fees	23%	68%	40%	46%
School uniforms	17%	61%	48%	25%
Building better houses	7%	13%	3%	29%
Buying food	23%	84%	68%	50%
Paying medical bills	5%	26%	10%	0%
Buying livestock	14%	36%	35%	25%
Solar technologies (e.g. lamps, SHS, etc.)	6%	3%	3%	0%
Other	3%	19%	35%	11%

Source: Impact evaluation (2018)

It is important to note, however, that the main source of income for all three intervention groups was sales from rainfed crops just as was the case at the mid-term evaluation. Sales of rainfed crops was the main source of income for almost 67% of beneficiaries of irrigation schemes, 80%

[4] Verbal communication from CARD

of those participating in value addition groups and 64% of those in solar-based enterprises. The situation was the same amongst control groups where almost 68% reported sales from rainfed crops as the main source of income. This suggests that although there have been contributions to increased household income by the three solar-based interventions; their impact is yet to surpass that of sales from rainfed crops. Once again, this is not surprising considering that in most areas; the three interventions have been operational for less than three years.

4.2.2 Impact on Food Security

The impact of the project on household food security was measured in three ways. The first was the number of meals the household is currently taking per day compared to the situation before the household started participating in any of the solar-based interventions and then compared against the control group. The second was the proportion of households reporting a hunger season during the 12 months prior to the evaluation. The third measure was the proportion of respondent households reporting increased availability of food at the household level. These three elements measure only one aspect of food security, namely food availability. The other aspects of food security, namely access and utilization were not considered in this study. Food availability was used as a proxy measure of food security because of the ease of measurement.

In addition, the study had intended to examine the changes in total production and yields of crops grown under solar irrigation as an indicator of improved food security. However, that data proved to be unusable largely because of faulty memories and inadequate appreciation of weights and measures amongst the respondents. For example, an analysis of data on the hectarage put to solar irrigation among the solar irrigation groups shows that on average, farmers in Mchinji allocated 2.98 acres (1.3ha) while those in Rumphi allocated 2 acres (0.9ha) to solar irrigation. However, FGDs revealed that farmers were actually allocated 0.25 acres or 0.11ha. These figures were confirmed through systematic observations and in fact in some cases, the actual amount of land being cropped was much less. This was the case in the Kalonde scheme in Rumphi, for example, where each farmer had only grown two ridges of beans, each approximately 50 metres long.

4.2.2.1 Crops grown

Table 13 presents the types of crops grown under irrigation by solar irrigation groups and those grown by farmers from the control communities. As can be noted, farmers in the control community in Rumphi were also practicing irrigation. The control group in Mchinji was not practicing any irrigation, hence the zero proportion of farmers shown in the table. Maize was the predominant crop in both the beneficiary sample and the control group in Rumphi with 79% of the households in the beneficiary sample reporting growing maize under irrigation and 85% in the control sample. Beans was the next most grown crop. FGDs and systematic observations confirmed the predominance of maize in the irrigation schemes.

Table 13: Proportion of farmers growing crops under irrigation by type of crop

District	Name of crop											
	Maize		Beans		Leafy Vegetables		Cabbages		Onions		Tomatoes	
	Irrigation Groups	Control	Irrigation Groups	Control	Irrigation groups	Control	Irrigation groups	Control	Irrigation Groups	Control	Irrigation Groups	Control
Mchinji	92%	0%	29%	0%	29%	0%	2%	0%	10%	0%	33%	0%
Rumphi	64%	85%	89%	49%	9%	12%	0%	12%	0%	6%	5%	0%
Overall	79%	42%	56%	24%	20%	6%	1%	6%	5%	3%	20%	0%

Source: Impact evaluation (2018)

4.2.2.2 Number of meals taken per day

Table 14 shows that participation in the solar-based interventions had a positive impact on the number of meals taken per day only for value addition and enterprise groups. The proportion of respondents taking three meals per day as at the time of the impact evaluation had increased to 68% from 54% at the start of the project for value addition groups and from 27% to 54% for enterprise groups. Amongst the control group, the proportion of households taking three meals per day also increased from 53% to 56%. It is therefore difficult to clearly attribute the increase in proportions of households taking more meals per day entirely to the households' participation in the solar-based interventions.

Table 14: Number of meals taken per day

Number of meals per day	Sample group							
	Irrigation		Value Addition		Enterprise		Control	
	Before	Now	Before	Now	Before	Now	Before	Now
One	3%	5%	0%	2%	9%	4%	5%	3%
Two	44%	43%	46%	31%	60%	43%	41%	39%
Three	53%	51%	54%	68%	27%	54%	53%	56%
Four	0%	1%	0%	0%	4%	0%	2%	2%

Source: Impact evaluation (2018)

4.2.2.3 Number of households experiencing hungry season.

With respect to the proportion of households that experienced a hungry season during the 12 month period prior to the evaluation, 44% of the respondent households in the control groups had experienced a hungry season compared to 34% amongst solar-based irrigation groups, 31% amongst value addition groups and 22% amongst enterprise groups (Table15). It can therefore be concluded beyond reasonable doubt that participation in solar-based interventions promoted under this project improved a household's food security as measured in terms occurrence of hungry seasons. For the purposes of this evaluation, a hungry period was defined as a period of one or more months a household did not have enough food because their own stores were depleted and they did not have money to buy food5.

Table 15: Households that experienced a hungry season

Group	Experienced hungry season during past 12 months?	
	Yes	No
Irrigation groups	34%	66%
Value Addition groups	31%	70%
Enterprise groups	22%	76%
Control groups	44%	56%

Source: Impact evaluation (2018)

As illustrated in Table 16, a higher proportion of the households participating in solar-based value addition and business enterprises were more food secure in terms of food availability, compared

[5] Note that both the baseline and mid-term evaluation of the project did not collect data on this indicator of food security. Hence it is not possible to compare these findings with the two previous studies.

to irrigation scheme participants where only one third considered themselves as having more food now than before the interventions, just like those in the control groups. All intervention groups are more food secure now than they were at baseline. At baseline, 28% of the households were food secure (Jana and Mkandawire, 2015). The households participating in solar-based value addition and enterprises were more food secure now than at mid-term evaluation where 38.7% of the households in the project were food secure with respect to food availability.

Table16: Households with increased food security

Group	Households with more food than at the start of the intervention?	
	Yes	No
Irrigation	33%	67%
Value Addition	54%	46%
Enterprise	64%	36%
Control	34%	66%

Source: Impact evaluation (2018)

For each intervention group, the main reason for the increased food availability was the household's participation in the solar-based intervention. For example, 61% of households participating in irrigation stated that they were more food secure as a result of increased production through solar-based irrigation while 46% of value addition households attributed it to increased purchases from increased incomes from the solar-based value addition activities.

Households participating in solar irrigation which reported having less food than before the project started cited poor water availability as the main reason for this (Table17). Almost 64% of these households reported poor water availability as the reason. It should be noted that the problem of poor water availability was related to problems associated with the irrigation technology installed not being able to supply enough water for the irrigation command area.

Table 17: Reasons for low food availability amongst irrigation scheme members

Irrigation Scheme		H6: If No why do you have less food?				Total
		Poor water availability	Pests and diseases	System malfunctionality	Other	
Kalonde	Number	11	1	0	8	20
	%	55.0%	5.0%	0.0%	40.0%	100.0%
Kayembe	Number	13	0	5	0	18
	%	72.2%	0.0%	27.8%	0.0%	100.0%
Malabada	Number	10	3	1	4	18
	%	55.6%	16.7%	5.6%	22.2%	100.0%
Timbaninyanja	Number	6	0	0	1	7
	%	85.7%	0.0%	0.0%	14.3%	100.0%
Total	**Number**	**40**	**4**	**6**	**13**	**63**
	%	**63.5%**	**6.3%**	**9.5%**	**20.6%**	**100.0%**

Source: Impact evaluation (2018)

Table 18 presents the reasons why the households were less food secure than before they began participating in the solar-based enterprises. For households in Mchinji, the main reason was non-functional technology which was reported by 66% of those who considered their households as being less food secure than at the start of the enterprise. In Rumphi, the main reason cited was access to finance which was reported by 60% followed by a lack of spare parts for the solar-based technologies they were using.

Table 18: Reasons for being less food secure amongst enterprise groups

Reason	District	
	Mchinji	Rumphi
Access to finance	10%	60%
Non-functional technology	66%	20%
Lack of after sales services	6%	20%
Lack of spare parts	24%	40%
Too much competition	0%	0%
Group is too large	2%	20%

Source : Impact evaluation (2018)

Non-functional technology was given as the main reason for being food insecure by those respondents in solar-based value addition groups in both districts (Table 19). Forty-eight percent (48%) of those who considered themselves less food secure than before they started participating in the value addition groups in Mchinji and 37% in Rumphi gave this as the cause.

Table 19: Reasons for being less food secure among value addition groups

Reasons	Value addition	
	Mchinji	Rumphi
Lack of access to finance	26%	20%
Non-functional equipment	48%	37%
Lack of after-sales service	3%	7%
Lack of spare parts	26%	17%
High costs of R&M	10%	13%
Group too large & benefits too little	0%	10%

4.2.2.4 Overall Impact

Based on the afore-going analysis, participation in solar-based irrigation, solar-based enterprises and solar-based value addition has contributed to improved food security among the participating households. More people were having three meals a day than before the start of the interventions and fewer households experienced a hungry season during the 12 month period prior to the study than in control communities. However, it is important to note that one of the reasons given by those households who considered themselves as being less food secure than at the start of the intervention was non-functionality of equipment. This points to the need to ensure care in the selection of the technology introduced and ensuring that there are skills available either within the community or amongst the participants or indeed in both to ensure that technologies down time is minimised.

4.2.3 Impact on Household Assets

An assessment of the type of household assets owned by a household are a proxy of the wealth status of that household. The more valuable assets owned by a household, the wealthier that household is considered to be. And if the assets have been acquired during the period of the project's implementation, they are reasonably assumed to have been acquired as a result of increased income from the household's participation in the project activities assuming all other factors constant.

In this impact evaluation, we asked beneficiary and control groups what assets they owned and when they acquired them to establish their wealth status and whether access to renewable energy contributed to it. The hypothesis was that if more beneficiary households owned valuable household assets than those in the control group and if these household items were acquired during the duration of the project, then the project had an impact on the economic status of the beneficiaries. As illustrated in Table 20, on average, more households from the beneficiary sample owned each type of asset than households from the control group except for ownership of beds and mobile phones. For example, 72% of beneficiary households owned bicycles compared to 66% amongst control groups and 45% owned solar torches compared to 30% of the control group.

Table 20: Proportion of households owning household asset

	Percent households				
Household asset	Irrigation	Value Addition	Enterprise	Average of beneficiary groups	Control
Bicycle	61%	80%	75%	72%	66%
Bed	43%	71%	29%	48%	58%
Dining table	38%	68%	39%	48%	39%
Chairs	42%	64%	37%	47%	42%
Cell phone	56%	81%	56%	65%	67%
Solar torches	30%	44%	60%	45%	30%
Solar phone chargers	12%	14%	23%	16%	14%
Radio	37%	54%	42%	44%	42%
Goats	40%	56%	56%	51%	42%

Source: Impact evaluation (2018)

However, as shown in Tables 21 and 22, in the majority of the cases these assets were acquired before the project started. And as illustrated in Table 23, even when the assets were acquired during the project period, it was not as a result of participation in the project.

Table 21: Period when asset was acquired among beneficiary

Asset	Period when asset acquired											
	Irrigation					Value Addition						
	This year	2017	2016	2015	before2015	2018	2017	2016	2015	Before 2015	2018	
Bicycle	4%	5%	12%	12%	67%	9%	15%	13%	13%	51%	5%	
Bed	5%	13%	0%	13%	70%	3%	8%	11%	3%	76%	0%	
Dining table	6%	11%	6%	8%	69%	13%	27%	13%	21%	27%	21%	
Cell phone	8%	25%	26%	17%	25%	0%	25%	38%	25%	13%	8%	
Radio	9%	21%	18%	9%	44%	9%	22%	6%	13%	50%	18%	
Goats	11%	14%	16%	5%	54%	3%	24%	12%	15%	46%	14%	

Source: Impact evaluation (2018)

Table 22: Period when asset acquired amongst control group

	Period when purchased				
	2018	2017	2016	2015	Before 2015
Bicycle	10%	13%	8%	10%	60%
Bed	5%	23%	0%	5%	68%
Dining table	4%	17%	0%	4%	75%
Cell phone	6%	24%	24%	24%	24%
Radio	0%	20%	10%	20%	50%
Goats	0%	50%	0%	50%	0%

Source: Impact evaluation (2018)

Table 23: Whether asset was bought because of participation

Asset	% households that purchased because of participation		
	Irrigation	Value addition	Enterprises
Bicycle	9%	6%	10%
Bed	8%	8%	16%
Dining table	6%	15%	21%
Cell phone	12%	25%	17%
Radio	15%	0%	0%
Goats	5%	21%	0%

Source: Impact evaluation (2018)

Based on the findings, it could be concluded that the project has not had an impact on asset ownership, at least not yet. However, it has been reported by CARD that some members of Kayembe Irrigation Scheme in Mchinji were able to purchase goats from the income generated from solar irrigation. As shown in Table 23 above, 50% of those who bought goats acquired them in 2017. It is also important to note that some of the assets were actually acquired during the project period and using incomes earned as a result of participation in the solar interventions, even though the proportions of beneficiaries doing so is small. The small proportions could result from the fact that most of the interventions have been on the ground for a very short period of time, ranging mainly from one to two years. Such benefits may accrue to more people later with the continuity and successful implementation of the interventions.

4.2.4 Impact on Housing

By Malawi standards, the best dwelling house should have a wall made of burnt bricks or blocks, a cement floor and a roof made of iron sheets. Table 24 shows that more beneficiary households of value addition activities had better housing than those in solar irrigation, solar enterprises, and the control groups. About 48% had cement floors, 94% had walls made of burnt bricks/blocks, and 70% had roofs made of iron sheets. The differences between beneficiary households and the control group are not that pronounced with regards to the type of wall. This is not surprising because it does not require a lot of investment to make burnt bricks and most households make these on their own, while one has to have financial resources in order to have an iron sheet roof. It should also be noted that most of the houses were constructed before the project period.

As shown in Table 24, more beneficiary households had iron sheet roofs than control groups. Amongst value addition groups, 70% of the households had iron sheet roofs, while 43% of solar irrigation beneficiary households and 47% of enterprise groups, had iron sheet roofs compared to 33% of households in the control group. This is most likely due to the fact that beneficiary households had higher incomes than control households, most of which came from sale from rainfed crops and VSLs. It is unlikely though that the incomes earned from participation in the solar-based interventions were directly invested in construction of dwelling units. However, it is the practice of participating groups to invest the earnings from solar-based interventions into VSLs from which they borrow for other development activities, which could include purchase or iron sheets for their dwelling units.

Table 24: Type of dwelling houses

	Floor type		Wall type			Roof type	
Group	Mud	Cement	Mud	Unburnt bricks/blocks	Burnt bricks/blocks	Grass thatch	Iron sheets
Irrigation	79%	22%	1%	10%	89%	57%	43%
Value addition	53%	48%	2%	4%	94%	31%	70%
Enterprise	87%	13%	2%	11%	85%	53%	47%
Control	88%	12%	0%	14%	86%	67%	33%

Source: Impact evaluation (2018)

4.2.5 Women Empowerment and Gender Relations

Effective economic empowerment for women occurs when women enjoy the right to control and benefit from resources, assets, income and their own time, and when they have the ability to manage risk and improve their economic status and wellbeing. However, for this to occur, women must also have the autonomy and self-belief to make changes in their own lives, including to have the power to organize and influence decision-making while enjoying equal rights to men and freedom from violence. Women's economic empowerment (WEE) programmes focus on women's ability to gain access and control over productive resources and to be recognized as fully participating economic actors[6].

[6] https://policy-practice.oxfam.org.uk/publications/oxfams-conceptual-framework-on-womens-economic-empowerment-620269

Gender relations are a specific subset of social relations uniting women and men as social groups in a particular community, including how power – and access to/control over resources – is distributed between the sexes[7].

In this evaluation, we measured the extent of women's empowerment and gender relations by looking at participation in decision making processes through belonging to decision making structures as well as holding positions of influence in such structures. In this project, the main structures were the committees set up to provide leadership under each solar-based intervention. We also looked at access and control over resources at the household level. Access to resources (human, financial, material, political, social etc.) means the ability to use and benefit from the specific resources while maintaining control over resources refers to being able to make decisions over the use of that resource (human, financial, material, political, social etc.). Access and control over resources is considered a key element of women's empowerment and the achievement of gender equality.

4.2.5.1 Participation in project activities

By design, at least 60% of the target beneficiaries were to be female. This deliberate targeting of more female participants was an affirmative action aimed at achieving women empowerment. According to Oxfam, almost 62% of the participants in the project on average were women. The fact that the majority of the respondents in this study were women confirms this. Information obtained from Oxfam partners, FGDs and key informant interviews also confirms that the majority of the participants, especially in the value addition and enterprise groups were women and youth. For example, Timbaninyanja irrigation scheme in Rumphi has 50 members of whom 35 or 70% were female. Titemwane Shop, which is also in Luvili, Rumphi had 3 members, all of whom were girls. Kasekese Cooperative in Mchinji has 65 members, of which 52 or 80% were women while Kadammanja enterprise group also in Mchinji had a membership of 18, of which 11 or 61% of whom were female. Thus, the project achieved its objective of promoting women empowerment through a deliberate targeting strategy.

4.2.5.2 Women in Decision Making Positions

Respondents in the quantitative survey were asked to state if they belonged to a committee of their solar-based activity and also to state what position they held in the committee. The data was analysed using crosstabulation of the response to the questions and the sex of the respondent in each solar-based intervention group. Table 25 presents the percentage of women who are members of committees under each solar-based intervention. Each committee had female representation. In fact, females dominated the composition of committees in value addition and enterprise groups. Seventy percent (70%) and 86%, respectively, of the respondents were females who belonged to committees of the solar-based value addition groups and enterprise groups, respectively were female. Females also outnumbered males in committees in the control

[7] UN Women Gender Equality Glossary – https://training centre.unwomen.org/mod/glossary/view/php?id=36

groups. This should not be surprising, especially in Rumphi, since the control group was a beneficiary of interventions by CADECOM who may have used the same targeting strategy as the one used in the renewable energy interventions.

Table 25: Composition of membership of Committees

Sex of respondent	Percent of respondents who are members of a committee			
	Irrigation	Value addition	Enterprise	Control
Male	58%	30%	14%	41%
Female	42%	70%	86%	59%

Source: Impact evaluation (2018)

The low female participation in committees under irrigation interventions, however, could not be confirmed through FGDs and key informant interview as these showed higher levels of participation. For example, at Luvili Irrigation scheme, 6 of the 10 members of the scheme committee were female. At Kayembe irrigation scheme in Mchinji, the membership of the scheme committee was 50% females. The low levels recorded during the quantitative survey could merely be reflective of the sample that participated since the question was asking if the individual respondent was a committee member. On the other hand, levels of participation of women in committees of enterprise and value addition groups were confirmed during the FGDs and key informant interviews. For example, of the 13 executive committee members of the Kasese Cooperative in Mchinji, 8 or 62% were females. Similarly, Kadammanja enterprise group had an executive membership of 5, of which 3 or 60% were female.

An examination of the type of position held by females in the committees showed that females held key positions in the committees. Those who held the positions of chairperson, vice chairperson, and treasurer were female in the majority of the committees under all three interventions (Table 26). Traditionally, women would be given the roles of secretary but as shown in Table 26, this position was held mostly by males.

Table 26: Position held in committee by females

Position in Committee	Percent holding position							
	Irrigation		Value addition		Enterprise		Control	
	Male	Female	Male	Female	Male	Female	Male	Female
Chairperson	75%	25%	40%	60%	33%	67%	43%	57%
Vice chairperson	0%	100%	33%	67%	0%	100%	50%	50%
Secretary	100%	0%	33%	67%	20%	80%	75%	25%
Vice Secretary	67%	33%	67%	33%	0%	100%	0%	0%
Treasurer	67%	33%	50%	50%	0%	100%	0%	100%
Ordinary member	56%	47%	16%	84%	13%	87%	38%	63%

Source: Impact evaluation (2018)

While holding decision-making positions is a good starting point for empowering women, it does not mean that women are empowered. Discussions with Oxfam, partner institutions, and key informants showed that while the majority of women hold “non-traditional” positions in the project committees, the majority are still not active participants during deliberations that lead to decisions that shape their lives. During FGDs it was noted that men dominated the discussions unless women participants were specifically asked to respond. This included some women who held the

positions of chairperson or vice chairperson. This suggested that during committee and other group discussions, the decision-making process is still dominated by men. This, however, should not come as a surprise considering that some of the interventions have been in place for one to two years and the process of empowerment is ongoing. This is also in agreement with the assessment Oxfam and other stakeholders conducted that found that there are only a few active and vocal women in groups, and they tend to be the women who have participated for at least three years.

4.2.5.3 Control over Income

Participants in the survey were asked to indicate who earned the income through a particular source which they had indicated as one of the sources of income for their household. The findings are presented in Table 27 the results show that women are earners of household income in almost all sources of household income and amongst all three solar-based interventions. Women earn the income either as household heads, spouses or jointly with the household head[8]. About 64% of respondents among irrigation scheme members reported that income from solar-based enterprises was earned mainly by the spouse while 26% stated that the household head was the main earner compared to 7% who said both the spouse and household head jointly earned the income from this source. Almost 62% of the same group stated that the main earners of income from solar-based value addition activities were spouses. Responses also indicated that women were also the main income earners from the value addition groups. As shown in Table 27, 75% of the respondents reported that income from sales of forest products was earned by the household head and spouse while 54% stated that income from sale of irrigated crops was jointly earned. Similar findings can be noted amongst respondents from the solar-based enterprises. Compared to the control group, incomes among participants in the solar-based interventions are more likely to be jointly earned.

[8] 14% of the households in this survey are female headed.

Table 27: Household income earners by sample group

Income source	Percent earning income															
	Irrigation				Value addition				Enterprises				Control			
	HHH	Spouse	Both HHH & spouse	Whole family	HHH	Spouse	Both HHH & spouse	Whole family	HHH	Spouse	Both HHH & spouse	Whole family	HHH	Spouse	Both HHH & spouse	Whole family
Ganyu (casual labour)	75%	25%	0%	0%	23%	18%	36%	23%	14%	10%	48%	10%	48%	17%	35%	0%
Salary	67%	33%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Remittances	24%	7%	59%	10%	0%	0%	0%	0%	0%	0%	0%	0%	67%	33%	0%	0%
Sale of Forest products	23%	14%	46%	16%	13%	4%	75%	8%	0%	100%	0%	0%	80%	20%	0%	0%
Livestock sales	21%	2%	55%	22%	18%	14%	36%	32%	33%	5%	52%	10%	42%	5%	53%	0%
Sale of irrigated crops	50%	0%	50%	0%	19%	0%	54%	26%	11%	22%	28%	39%	19%	7%	68%	7%
Sale of rain-fed crops	40%	40%	20%	0%	100%	0%	0%	0%	16%	4%	55%	25%	27%	2%	64%	7%
Solar powered enterprise group	26%	64%	7%	2%	41%	36%	18%	5%	20%	60%	13%	7%	0%	0%	0%	0%
Solar – based Value Addition products.	31%	62%	3%	3%	20%	53%	26%	2%	0%	67%	33%	0%	26%	44%	30%	0%

Source: Impact evaluation (2018)

Table 28 presents the findings to the question of who controlled the household income at the time of the study. As can be noted the main controllers of household income were household heads. Considering that 14% of the household heads in this study were female, it can be concluded that women do control household incomes in their capacity as household heads. The data also shows that women have control over the household income jointly with their spouses. Total control over incomes by spouses alone, the majority of whom are women in the study sample, is minimal.

Table 28: Control of household income as at end of project

Sample group	Controller of Income		
	Household head	Spouse	Both household head and spouse
Solar Irrigation	63%	4%	32%
Solar-based Value addition	51%	7%	41%
Solar-based Enterprise	78%	7%	15%
Control	69%	7%	24%

Source: Impact evaluation (2018)

As a way of establishing whether there had been any changes regarding the extent of women's involvement in the control of household income in the absence of baseline and mid-term review data, respondents were asked if the same person who was controlling the income at the beginning of the solar-based interventions still controlled the income. The aim was to see if the changes could be attributed to participation in the solar-based interventions. As can be noted from Table 29, the majority reported that the person in control of the income as at the time of the study was the same person who controlled the income at the beginning of the interventions. Five percent of the respondents in irrigation schemes, 14% amongst solar-based value addition groups and 13% of those in solar-based enterprises indicated that there had been a change in who controlled the income. Unfortunately the study did not establish if this change was a result of the solar-based interventions. Therefore, it is not possible to attribute this change directly to access to renewable energy.

Table 29: Control of household income at beginning of project

Sample group	Is this the same person who controlled income before the project?	
	Yes	No
Solar Irrigation	95%	5%
Solar-based Value addition	86%	14%
Solar-based Enterprises	87%	13%
Control	93%	7%

Source: Impact evaluation (2018)

4.2.5.4 Household level decision making

As a way of establishing whether women are involved in decision making at the household level, the study assessed whether women were part of the decision over household purchases, what to grow in the solar irrigation schemes, and whether to join the enterprise or value addition group. Table 30 presents the extent of women involvement in decision-making over what to buy with the household incomes. Women are involved in deciding what is purchased by the household as household heads, sole decision makers and jointly with the husbands. Approximately 9-10% make decisions by themselves, while 32%-46% are making the decisions jointly with their spouses. Almost 14% of the 44%-59% of the households in which the decision is made by household heads are female household heads. This translates to women being involved in deciding what the household purchases in approximately 56% of the households in the beneficiary sample compared to almost 52% in the control sample.

Table 30: Decision making over household purchases

Sample group	Decision maker on household purchases		
	Household head	Spouse	Both Household head & spouse
Solar Irrigation	52%	9%	40%
Solar-based Value addition	44%	10%	46%
Solar-based Enterprise	59%	9%	32%
Control	53%	9%	38%

Source: Impact evaluation (2018)

In 85.5% of the households participating in the project, the situation with respect to decision making on household purchases has not changed over the project period as shown in Table 31 meaning that change has occurred in 14.5% of the households. It is not possible from the available data to establish whether this change means more women are participating now than at the beginning of the project as well as attribute that change to activities under the three solar-based interventions.

Table 31: Changes in decision maker on household purchases in solar irrigation groups

District		Is this the same person who made the decisions before you joined the solar irrigation scheme?	
		Yes	No
Mchinji	Number	43	7
	%	86.0%	14.0%
Rumphi	Number	4	1
	%	80.0%	20.0%
Total	Number	47	8
	%	85.5%	14.5%

Source: Impact evaluation (2018)

In 52% of the households of the participants in irrigation schemes, the decision on what crops to grow in the scheme is made by the household head compared to 14% in which the decision is made solely by the spouse and 33.3% where both the household head and spouse make the decision (Table 32). Taking into consideration that women female headed households formed 14% of the sample, it can be concluded that women were involved in deciding what to grow in the irrigation schemes in approximately 54% of the households.

Table 32: Decision maker on what crops to grow under irrigation

District		Decision maker on what crops you grow on the irrigation scheme?			Total
		Household head	Spouse	Both household head and spouse	
Mchinji	Number	29	7	14	50
	%	58.0%	14.0%	28.0%	100.0%
Rumphi	Number	19	6	17	43
	%	44.2%	14.0%	39.5%	100.0%
Total	Number	48	13	31	93
	%	51.6%	14.0%	33.3%	100.0%

Source: Impact evaluation (2018)

In the case of enterprise groups, the decision to join the enterprise group was made by the household head in 40% of the households compared to 43.6% of the households in which the spouse made the decision even though at least 60% of the members were expected to be female. In almost 52% of the households participating in solar irrigation, the decision to join the scheme was made by the household head compared to only 14% where the decision was made by the spouse and 33% where it was made by both the household head and spouse. Household heads also dominate the decision-making process for joining value addition groups. The decision was made by household heads in almost 41% of the households compared to 32.2% in which, the spouse made the decision and 25%, where the decision was made by both the household head and spouse.

The above findings show that women are involved in decision-making at the household level. They make such decisions as household heads in female headed households, sole decision makers in their households or jointly with their spouses. However, it is not possible to attribute this to the solar-based interventions. And considering the short duration of the project, it is unlikely that this could be as a result of the project interventions.

4.2.6 Effects of Access versus cost of provision

In this project, all solar equipment and accessory equipment such as that required for value addition and enterprises such as oil presses, mills or grinders, and refrigerators were provided to the communities for free. The project also met all related installation costs. The participating members of the groups were normally asked to make in-kind contributions such as provision of land, bricks and other materials required in the installation of the equipment and labour. For the business enterprise groups, part of their contribution was in the form of premises for the enterprise. According to CARD, the contribution from the community was estimated at around 30%.

The findings of this study show that access to solar-based technologies has had positive effects on the beneficiary communities. Participating communities were more food secure than at the beginning of the project. They were also more food secure than their control counterparts. Beneficiary households have new sources of income in the form of solar-based irrigation, value addition and enterprises. Access to renewable energy has also contributed to increase in household incomes. The project has also contributed to increased access of solar-based technology by women. There are also indications of contribution to gender relations although this study has not been able to directly attribute this to access to solar-based technologies.

The research question at hand is whether the positive effects that have been experienced exceed the cost of providing the renewable energy equipment. At the time of the study, the majority of the groups had been operational for one to two years. In Mchinji, for example, only 4 out 17 groups started in year 1 of the project and 6 started in the final year of the project (Table 33).

Table 33: Year when interventions started in Mchinji

Intervention	Name of Group	Traditional Authority	Group Village Headman	Year Started
Irrigation	Kayembe Solar powered irrigation scheme	Dambe	Kayembe	Year 1
	Tipindule solar powered irrigation scheme	Kapondo	Kalulu	Year 2
	Malabada solar powered irrigation scheme	Simphasi	Mphanga	Year 3
Value Addition	Kasekese Cooperative	Dambe	Gandali	Year 1
	Mthirasembe Cooperative	Simphasi	Mphanga	Year 2
	Tiyanjane Association	Kapondo	Chipumi	Year 2
	Mtapo	Dambe	Kavuta	Year 3
Business enterprises	Kadammanja	Dambe	Gandali	Year 1
	Chisomo	Dambe	Diti	Year 1
	Tiyanjane	Kapondo	Kalulu	Year 2
	Kakoma	Kapondo	Nkhwazi	Year 2
	Chiyanjano	Kapondo	Kalulu	Year 2
	Mvulathona	Kapondo	Gwirani	Year 2

	Tikondwe	Simphasi	Mphanga	Year 3
	Mthirasembe	Simphasi	Mphanga	Year 3
	Tigwirizane	Simphasi	Mphanga	Year 3
	Ludzi 1	Simphasi	Mphanga	Year 3

Source: Information from CARD provided to study team by Oxfam 2018.

Feasibility studies of productive use of solar PV systems in rural areas of Malawi conducted by Eales et al in 2017 showed that solar-based irrigation and barbershop and phone charging enterprises were viable. The study by Eales et al assessed the economic feasibility of solar irrigation and phone charging and barber shop businesses and other businesses under three scenarios, namely strong, stable and weak cashflows. The study concluded that solar irrigation had a payback period of 2 years under strong scenario, 3 years under the stable scenario and 5 years under weak scenario. The payback period for barber shop and phone charging enterprise was 2 years for both the strong and stable scenarios and more than 10 years for the weak scenario. The payback period is the time it takes to recover the investment costs. This therefore indicates that it takes time for the positive effects of access to exceed the cost of provision. Considering that incomes in rural areas are generally low, that the interventions have mostly been implemented for one or two years and that they had experienced a number of challenges[9], the applicable business scenario in this study can be taken to be the weak scenario. This then means that it will take time for the positive effects observed in this study to exceed the cost of provision. This also means that for such projects to have effects that exceed the costs of provision, their duration should be longer than the 3 years that was planned for in this project.

5.0 GENDER ISSUES TO CONSIDER

The solar technologies used in this project were mostly gender friendly. By design, they are very easy to use and not labour intensive. The only problem relates to the use of hose pipes for irrigating crops, which can be labour intensive. Thus, apart from this element, gender sensitivity of the technologies is generally not an issue that needs to be considered when promoting these technologies. There are, however, other issues that must be considered when promoting renewable energy in Malawi, which arediscussed below.

5.1 ACCESS

This project achieved its target of at least 60% female participants in the solar interventions. As has already been reported, 70% of the respondents from the

[9] See section on challenges for more details

beneficiary sample were female. The composition of various groups consulted in the study also confirmed that women made up the majority of participants in the solar interventions. The strategy therefore ensured that more women have access to solar energy technologies for irrigation, value addition, and enterprises. Although specific data was not collected in this study with respect to women's access to renewable energy in Malawi, it is generally accepted that access to renewable energy is still very low, especially among women, considering that renewable energy is still a new phenomenon.

Access to renewable energy by women should go beyond access as consumers of renewable energy products. It should aim at integrating women into the other parts of the renewable energy value chain such as producers, suppliers and retailers, installers and repair and maintenance services. This will allow them to benefit more from the policy direction that the government has of increasing access to renewable energy.

5.2 CONTROL OF RESOURCES

To a great degree, control over household resources, including household income, determines the extent of the equality with which benefits accruing from access to renewable energy are distributed between men and women in the household. In this project, males are the main controllers of household income even though women are participating in the control of the income either as female household heads, sole controllers, or as joint controllers with their spouses. Increasing women's control over resources, especially as joint controllers with their spouses, rather than complete takeover of the control, will ensure that both men and women equally enjoy the benefits of access to renewable energy at the household level.

5.3 DECISION MAKING

In this project, there were more women in leadership positions in the solar intervention groups than men and most of them occupied positions that would not stereotypically be associated with women. However, at the national level, women still lag behind men in occupation of such positions. Women are known to be the main providers and users of energy at household level in Malawi. Ensuring that they are at the forefront of decision-making with respect to promotion of renewable energy will ensure that their concerns and desires are taken into account when promoting renewable energy in the country.

Although women outnumbered men in most of the leadership positions in this project, men dominated the discussions during FGDs conducted during this study, suggesting that women may not be active participants in decision-making

processes and the decisions taken by their groups. Empowerment of women so that they are active participants in the decision-making processes must therefore be an issue to consider when promoting renewable energy, otherwise women, as main users and providers of energy at household level, will be left out of the equation.

5.4 GENDER ANALYSIS

According to Oxfam and its partners in this project, no gender analysis was undertaken as part of the design of the project although training in gender mainstreaming was conducted for the partners and this was expected to cascade to the beneficiary population. There are examples of how conducting a gender analysis would have enhanced the results of the project in as far as access to renewable energy is concerned. CARD and CADECOM were of the view that the barbershop enterprise was not entirely suitable for women. In some cases, the enterprise was housed in the premises of one of the members, making it difficult for customers to access the services at night and this was more so for women customers. And in the irrigation schemes, only men participated in providing security services for the solar equipment at night.

Conducting a gender analysis at the beginning of the project would have allowed the project to know the roles played by women and men and the activities they are involved in at community and household level with respect to renewable energy. This would help establish how they are likely to be impacted by access to renewable energy. It would have also helped the project understand the differences between men and women with respect to interests, knowledge, needs and experiences in as far as renewable energy is concerned. There are certain societal and gender norm and relations that govern what women and men can do and cannot do at household community and energy value chain level, which a gender analysis would help to unearth. And as pointed out by Nelson and Kuriakose (2017) it would have helped to understand specific differences among age groups, socio-economic and livelihoods groups, among others. Typically the gender analyses for renewable energy would include questions relating to who does what, who has what, who decides, and why women and men do what they do and what their knowledge bases are[10].

[10] Nelson and Kuriakose (2017)

6.0 SUSTAINABILITY

6.1 SUSTAINABILITY OF PROJECT EFFECTS

The household survey findings show that the majority of the people in both Mchinji and Rumphi district believe that the benefits of access to renewable energy will be sustained beyond the life of the project (Table 34). The same views were expressed by Oxfam and implementing partners as well as through FGDs and key informant interviews in the communities.

Table 34: Percent of beneficiary household that believe benefits are sustainable

	Will benefits continue after project?					
	Irrigation		Value Addition		Enterprise	
District	Yes	No	Yes	No	Yes	No
Mchinji	86%	14%	63%	37%	96%	4%
Rumphi	72%	28%	97%	3%	80%	20%

Source: Impact evaluation (2018)

Amongst households participating in irrigation and enterprises, the most common reason given for the belief that the benefits from access to solar energy will continue after the project was the existence of a strong committee (Table 35). Having money in the VSL for the maintenance of equipment was another reason given by those in value addition and enterprise groups. It should be noted that groups invested the incomes earned from the solar-based interventions into the VSLs.

For enterprise groups having established markets was considered a factor that would lead to sustainability of the benefits while for irrigation groups, the knowledge in new good agricultural practices was another factor. As shown in Table… 66% of the respondents gave existence of established markets as a key factor among value addition groups while 48% considered knowledge of operating solar equipment or system as a key factor that will promote sustainability. Although knowledge in repairing and maintenance of the solar-equipment was rated lowly in the household survey, it was presented as a key factor by participants in FGDs and key informants. For example, a group village headman consulted at Luvili stated that the benefits and activities would be sustained because they had been trained in operation and how to take care of and repair the solar technology. Participants in the FGD at Chimango 2 value addition group reported that they were able to repair their oil press using a worker at a nearby maize mill, suggesting non-availability of such skills amongst the group members

Table 35: Reasons for sustainability

Reasons	Percent of households					
	Irrigation		Value addition		Enterprise	
	Mchinji	Rumphi	Mchinji	Rumphi	Mchinji	Rumphi
Knowledge in good agricultural practices	44%	23%	N/A	N/A	N/A	N/A
Knowledge of operating equipment/system	25%	14%	40%	48%	23%	0%
Know how to repair & maintain	2%	0%	15%	10%	6%	0%
Money in VSL for maintenance	6%	5%	50%	38%	52%	25%
Money in VSL for raw materials	6%	5%	5%	7%	N/A	N/A
Established markets	N/A	N/A	42%	66%	0%	0%
Strong Committee	56%	43%	15%	17%	62%	50%
Good customer relationship	N/A	N/A	N/A	N/A	0%	25%

Source: Impact evaluation (2018)

Oxfam and implementing partners considered the existence of VSL groups a key factor which provides a safety net for repairs and maintenance of solar systems and equipment. Groups have used resources in their VSL to repair their solar equipment. Chimango 2 value addition group in Rumphi have used money from their VSL amounting to MK50,000 to repair their solar equipment. Since groups invested their earnings into the VSL it can be concluded that it is the income from the solar-based interventions which they were using to carry out repairs.

It was also quite evident from FGDs and key informant interviews that most people were very interested in the solar-based activities that have been introduced. For example, the Chairperson of the Project Committee in Luvili in Rumphi stated that "*All activities of the project will continue because people are very interested in the project and also because the groups are well organized. The groups are still meeting every week despite the project having ended a few months ago."* Participants in the FGD at Malabada stated that they would continue with the activities even though funding had stopped and that they were thinking of adding more water storage tanks for their irrigation scheme. Some of the groups such as Kayembe Irrigation scheme are making contributions of MK500 per month per individual to pay guards for the solar system and they are also contributing towards maintenance. At Malabada irrigation scheme in Mchinji it was learnt through FGDs that men were guarding the solar-technology at night on a rotation basis.

The use of locally available raw materials in value addition is providing markets for locally produced crops such as soya, sunflower and groundnuts. Participants at FGDs in both districts of Mchinji and Rumphi as well as key informants indicated that the fact that value addition was providing a market for locally produced crops was one of the factors supporting sustainability. Another factor that supports sustainability is that the groups have been linked with service providers from within

or near the communities which should continue to provide the necessary technical support.

However, one major factor that will foster sustainability of the benefits will be the ability of the communities and those supporting them to solve the challenges experienced by the participants in the three solar-based interventions. Approximately 99% of those amongst enterprise participants who felt the benefits would not be sustainable gave the lack of money for repairs and maintenance as the main reason. Those in irrigation gave reduced water availability as the main reason. A key informant at Luvili reported that the activities were sustainable but he did not know how they would solve the problems with the solar-based irrigation system that had been installed on their scheme.

6.2 PROJECT BUSINESS MODEL

All solar equipment and accessory equipment was procured by the project because the investment capital requirements were beyond the financial capacity of the beneficiary communities. Community contribution was mainly in kind. As an entry point, the project targeted existing VSL groups. The VSLs were also envisaged as the sources of finance for repair and maintenance of the solar equipment and systems provided to the groups. While the study's findings show that beneficiary groups who earned an income from solar-powered interventions invested the earnings into their VSLs, this study found only one such case. During the FGD, members of Tikondwe Business Club in Mchinji reported that they were able to repair their phone charging equipment when it burnt out using funds from their VSL. The most common arrangement, however, was the establishment of separate bank accounts. For example, Chimango 2 value addition group in Rumphi established a repair and maintenance fund amounting to MK50,000. As at the time of the study this fund had been used up. The group has agreed to start contributing MK3,000 each to replenish the fund and repair the oil press, which had broken down. Members of Kayembe irrigation scheme in Mchinji were contributing MK500 per member per month toward repairs and maintenance. During the FGD with Kadammanja group in Mchinji, it was reported that although they had a VSL, they were using part of the funds earned from the business to carry out repairs and maintenance. Members of the Malabada irrigation scheme in Mchinji have established an account for repairs and maintenance but as at the time of the study, there was no money in the account. From these findings, it is reasonable to conclude that the anticipated financing model of using the VSLs for repairs and maintenance has not worked.

It was also evident from the study that the cost of repairs and maintenance of solar equipment in the enterprise interventions was largely borne by the groups themselves. According to Oxfam, enterprise groups were more willing to buy parts

to repair or maintain their solar equipment than were irrigation and value addition groups. Discussions with members of enterprise groups during the study confirmed Oxfam's observation. For example, the press at Chimango 2 in Rumphi had broken down but had not yet been repaired as at the time of the study. The batteries at Chimango 1 in the same district had not been replaced. However, Tovwira Barbershop and phone charging enterprise in Rumphi managed to buy a new inverter at the cost of MK25,000. Considering that the equipment used in irrigation and value addition is more expensive than that used in business enterprise groups, the finding that enterprise groups were more able to meet their own cost of repairs and maintenance can hardly be surprising. Therefore, it was perhaps over-ambitious to expect funds from the VSLs to be adequate enough to meet the cost of repairs and maintenance of the more expensive equipment found in irrigation schemes and value addition groups, especially in the start-up years of the interventions.

7.0 OTHER BENEFITS

There are a number of other benefits that participants in the three solar-based interventions have enjoyed. For those in value addition and enterprise groups one such additional benefit has been knowledge in business management and entrepreneurship gained through training that has been provided through the project. Each group had a vision clearly written and pasted on the walls of their premises. In Chikwawa Trading Centre in Rumphi we were presented with a business plan that the Chimango 2 group producing sunflower oil had prepared after undergoing training. At Chimango 1 we were able to review and appreciate business income and expenditure records kept on a daily basis. However, in some enterprise groups in Mchinji, record keeping was considered a challenge. Either the records were not kept or they were poorly kept, especially on lanterns sold, number of people served by the barber shop and phone charging.

Other benefits that have accrued to a smaller proportion of the household include improved nutrition and health status and knowledge in operating the solar equipment that has been supplied through the project.

8.0 POLICY ENVIRONMENT

Since the comprehensive study on the policy and regulatory environment (and gaps) governing renewable energy in Malawi produced at the beginning of the project, there have been a number of developments on the policy scene that are in support of effective adoption of renewable energy in Malawi. There is now a new Energy Policy of 2018 replacing the 2003 energy policy. The overall goal of the National Energy Policy (2018) is to provide a guiding framework for increased

access to affordable, reliable, sustainable, efficient and modern energy for all sectors and every person in the country. Among other things, the policy emphasizes sustainable and clean energy, which is accessible to all and has policy statements specifically for the promotion of renewable energy.

Through the policy, government commits to strengthening the exploitation of renewable energy resources by:

1. Promoting the use of renewable energy technologies and the manufacture of renewable energy products such as solar panels,

2. Supporting small-scale renewable energy initiatives by communities or entrepreneurs,

3. Promoting capacity building in all areas of renewable energy technology, programming, supply and services, as well as in entrepreneurship and management, taking into account gender and social issues ; and

4. Building strong partnerships with the private sector and Civil Society Organisations (CSOs) (including Public Private Partnerships) to promote the manufacture, distribution, use and financing of improved renewable energy technologies.

Government has also developed the Malawi Renewable Energy Strategy (MRES) 2017. The strategy sets out a set of priorities and actions to achieve the country's vision for renewable energy, namely 'universal access to renewable electricity and sustainable bioenergy sector '. The strategy aims to promote:

- Grid-scale renewables
- Clean energy mini-grids.
- Off-grid solar
- Bio-energy.

By 2025, it is expected that there will be 50 operational clean energy mini-grids in Malawi. For off-grid solar, Malawi will adopt international standards for off-grid solar products and solar home systems (SHS) to raise quality across the country and ensure consumer confidence. In the transport sector, the government aims for the percentage of bioethanol in petrol to reach 20% by 2025 and percent of biodiesel in total diesel supply to equal 30% by 2030.

A multi-stakeholder Malawi Renewable Energy Partnership Group (MREPG) will be established in collaboration with the United Nations Development Programme (UNDP). The MREPG will bring together donors, non-governmental organizations (NGOs), public sector bodies, academia, and the private sector and will be tasked with delivering actions in the MRES and other actions it may recommend as the sector develops.

As part of the strategy, the government will, in the long term, introduce a delivery agency for renewable energy to be called the Malawi Renewable Energy Agency (MREA). MREA will implement projects and programmes, which meet the aims and objectives of the MRES. In addition, the strategy proposes the expansion of the Rural Electrification Fund from focusing on extending the national grid to include a range of other activities. Part of the strategy is the employment of Energy Officers to be placed at district level and tasked with advising the general public and informing local energy plans, among others. In addition, the government plans to ensure that all importers of renewable energy products are licensed. Through this strategy, the government also commits to providing additional fiscal incentives such as VAT relief if empirical evidence is available on the fiscal impact of such reliefs.

The other development has been the development of the Sustainable Energy for All (SE4ALL) Action Agenda, which together with the MRES will facilitate and promote the exploitation of renewable energy in Malawi.

Furthermore, the government has developed the new Malawi Growth and Development Strategy (MGDS) III. The MGDS III has a section dedicated to energy and industrial development. Under this, the goal is to provide sufficient sustainable energy for industrial and socio-economic development of the country. One of the outcomes is that underserved communities be able to use renewable and clean energy[11].

Another supporting factor for renewable energy in Malawi is the existence of political will in advancing renewable energy as demonstrated through the inclusion of renewable energy in the energy policy, the development of the MRES and public pronouncements regarding renewable energy. However, Malawi does not yet have a renewable energy Act to regulate the renewable energy industry in Malawi. This is something that Oxfam in collaboration with other stakeholders should continue to advocate and lobby for.

9.0 MARKET ENVIRONMENT

9.1 VALUE CHAIN ACTORS

9.1.1 Producers and Suppliers

The renewable energy market is predominantly one involving the importation and distribution of solar PV systems for various uses including home lighting, small

[11] Government of Malawi (2017) The Malawi Growth and Development Strategy (MGDS) III.

scale value addition, small scale enterprises, and irrigation. There are no local manufactures of renewable energy technologies and most of the technologies are imported from China, Asia, Europe, North America and some countries in Africa. The suppliers are largely a combination of players who deal in solar energy products as part of their main business, which could be hardware, agricultural wholesale or another type of shop and those dealing specifically in solar energy products and systems as their main line of business, located in urban centres and some rural trading centres. Development partners, including bilaterals, multilaterals and NGOs, are distributing solar technologies and creating supply chains and sharing information to the public about the benefits of solar energy. Some players are targeting the off-grid market in rural areas, while others are focusing on pico-solar products (plug-and-play products) which are cheaper and rarely require installation. There are few suppliers in remote rural areas, meaning that rural consumers are unaware of these products and the benefits that can accrue from them.

According to a study by BIF2 (2014), there is a "grey market" for solar technologies, especially pico-solar products (PSPs) in Malawi. This grey market has since grown and is blamed for the proliferation of counterfeit and substandard solar-based technologies, especially PSPs. A 'grey market" is one in which PSPs that do not meet national or international quality standards are sold. According to the Malawi Revenue Authority, most of the players in this market use uncharted routes to import the products.

The majority of the suppliers do not deal directly with smallholder farmers in their role as farmers. One of the few that does so is Foundation for Irrigation and Sustainable Development (FISD), promoting and providing loans for solar-based irrigation systems. Most of the suppliers deal with smallholder farmers merely as members of their communities. And although it is the requirement of the Malawi Energy Regulatory Authority (MERA) that all certified suppliers of renewable energy products and systems provide a warranty period of at least 1 year during which they provide after-sales services including repair and maintenance, most suppliers prefer to simply replace the items if within the warranty period rather than repair the faults.

Information on the total number of suppliers of renewable energy products and systems in Malawi is not readily available. However, as of 10th May 2017, there were 37 companies registered with MERA as renewable energy suppliers and installers down from 71 in 2014.

9.1.2 Consumers

Consumers of renewable energy products and systems are largely individuals and households without access to grid-electricity but they also include households with access to grid electricity who buy these to deal with intermittent power supply. They

also include organizations such as NGOs, programmes, and projects promoting renewable energy as well as institutions.

9.1.3 Support Services

Renewable Energy Industries Association of Malawi (REIAMA) was established in 1999 with the mission to "promote efficient and sustainable use of renewable energy technologies (RETs) in Malawi to the satisfaction of the end user and all stakeholders". Its membership includes individuals and companies involved in the production, supply, importation, exportation, installation and servicing of RETs in Malawi. And organizations, individuals, projects, and programs that have sufficient and verifiable interest in the promotion, production, supply, importation, exportation, installation and servicing of RETs in Malawi.

The Cooperation Network for Renewable Energy in Malawi (CONREMA) serves as platform for information sharing, stakeholder exchange and best practice learning in the renewable energy sector. It has a database of renewable energy interventions at community level which will serve as a platform for evaluating failures and successes in approaches and technologies, detecting sustainability challenges and facilitating cost-benefit analyses.

Enterprises involved in the importation and supply of renewable energy products face the challenge of access to finance. Most rely on private equity and/or development grants. In rural areas village savings and loans are acting as a source for financing businesses and the acquisition of renewable energy technologies.

As of 10th May 2017, there were 37 companies registered with MERA as suppliers and installers of renewable energy technologies and systems in the country.

9.2 ACTUAL AND POTENTIAL DEMAND

According to a study conducted by DFID and Business Innovation Facility (BIF), around 13% of households in Malawi have access to off-grid lighting in the form of solar products[12]. This is more than the households that are connected to the national grid[13]. According to the 2018 census, there are 3,984,929 households in Malawi[14]. Based on the DFID and BIF study, this means that 518,041 households have access to off-grid lighting in the form of solar products and 3,466,888 households do not. Assuming that those living below the poverty line are not part

[12] BIF (2016) Off-grid Lighting and Phone Charging Study.

[13] MRES 2017

[14] NSO (2018) 2018 Malawi Population and Census Preliminary Report

of the potential market, then it can be argued that the total potential market for solar-based lighting is 1,698,775 households.

The preliminary population and housing census report also puts the number of people living in urban areas at 2,783,364 and the number of those living in rural areas at 14,780,385. Of these 1,672,300 in urban areas and 7,515,975 in rural areas fall within the economically active age group of 15-64 years as defined by the National Statistical Office (NSO). Approximately 25% of urban dwellers and 1% of rural people have access to electricity. This translates to 418,075 urban dwellers and 751,598 people in rural areas who are economically active having access to electricity, leaving a total of 1,254,225 people and 6,764,378 people in urban and rural areas, respectively, without access to electricity. If it is assumed once again that those living below the poverty line are not part of the potential market and that 13% are already on off-grid lighting, it can be argued that approximately 3.42 million people make up the potential market for solar lighting while approximately 3.93 million make up the potential market for renewable energy products and systems in general. This is of course very simplistic because for an individual to be part of a market, he or she must have a desire for the product or service and be willing to pay for it. Thus, being above the poverty line does not in itself qualify an individual to be part of the market. Nevertheless, these figures serve to show the potential size of the market.

9.3 MARKETING STRATEGIES

Market players are using a number of strategies in promoting the adoption of solar energy in Malawi. While some are using cash sales, there are a number who are using the pay-as-you go (PAYG) system for systems and products that require a more substantial capital outlay than such products as solar lanterns. For example, Zuwa Products offers PAYG. Under this system consumers are required to make a down payment of at least 20% of the cost of the product or system and pay the balance over a period of 18-21 months, with a minimum monthly payment of MK1,000. Customers are given the choice of paying monthly, weekly, or daily. Sunny Money, one of the largest players on the solar market, is also offering products on PAYG. Foundation for Irrigation and Sustainable Development (FISD), through FISD Fund offers solar loans at 7% interest with full repayment over a year.

Partnerships that aim at increasing access to solar energy products in Malawi have also emerged. For example, Maeve Project has partnered with Nyumba Builders. In this partnership, Maeve Project brings in Lighting Africa approved systems, which Nyumba Builders stocks together with its building material products, allowing buyers of building materials stocked by Nyumba Builders to consider using solar

for lighting the homes they are building[15]. Another partnership involves FINCORP, a microfinance institution and Sunny Money. In this partnership, FINCORP offers loans to households to buy affordable solar systems from Sunny Money[16]. FINCORP pays Sunny Money for the supply of the solar systems to the borrower and the borrower has 8 months within which to repay the loan to FINCORP.

9.4 REGULATORY FRAMEWORK

The solar energy market is regulated by the Malawi Energy Regulatory Authority (MERA), the Malawi Bureau of Standards (MBS) and, to a lesser extent, the Malawi Revenue Authority (MRA)[17]. MERA is responsible for issuing licenses for importation, sale, installation, and maintenance of solar products. Any registered company involved with the supply, retail, installation and maintenance of RETs is required to obtain a license from MRA and be a member of the REIAMA or any other government approved renewable energy association. They must also be willing to issue a warranty, enter into service agreements with end users, and own a maintenance workshop, and have their technicians accredited with MERA.

According to MRA, the licensing fees are as shown in Table 36:

Table 36: Fees payable under Part V for Renewable technologies (by-law 43)

No	Type of fee payable	Amount (Malawi Kwacha)
1	Application fee for renewable energy technologies licence	10,000.00
2	Fee upon issue of license for renewable energy technologies licence	5,000.00
3	Annual licence renewable fees for renewable energy technologies licence	10,000.00

Source: MRA website.

MBS issues import certificates for products that adhere to national standards for solar products. Currently there are 52 Malawi Standards governing renewable energy technologies. These standards are considered outdated as some of them were developed in the 80s and early 90s.

[15] The Nation (2018) Firms partner on Solar Energy. Tuesday, 4th December.

[16] The Nation (2018) Let there be light. Friday, 30th November.

[17] MRES 2017.

MRA helps with enforcement of standards on imports. MRA also provides the general public and private sector with relevant and correct information on taxation issues such as import duty rates.

9.5 BARRIERS IN THE MARKET

9.5.1 Proliferation of Substandard and Counterfeit Products

There is a proliferation of substandard and counterfeit products on the market. According to the MRA, these products enter the country through uncharted routes. They are brought in by importers and retailers mostly using informal cross-border traders. As a way of addressing this issue, the government through the MRES proposes to adapt and adopt the Lighting and Global Standards, which were developed by the World Bank and the International Finance Corporation (IFC). These standards were adopted by many countries worldwide as robust international industry standards. These standards will replace national standards developed by MBS which are considered outdated. According to the MRES 2017, the benefit that will accrue from adopting these international standards is that products are already tested and monitored internationally by the World Bank and the IFC and a list of devices that have met the standards is published online. This list could then be used by the MBS to assess imports and only requiring in-country verification, leading to a reduction in the burden and cost for MBS and importers. Oxfam, in collaboration with other stakeholders, should seriously consider following up with government so that these standards are adapted and adopted as soon as possible.

9.5.2 Duties and VAT on Solar Products

The second market barrier is that some of the solar products and components of solar systems still attract full duties and Value Added Tax (VAT). Table 37 shows products/components that are duty free but subject to 16.5% VAT.

Table 37: Duty free solar products that are subject to VAT.

Solar Energy Product	HS Code (Tariff Subheading)	Applicable duty rate(s)
Solar powered pumps (irrigation)	8413.81.10	Free (0%)duty; 16.5% VAT
Solar water heaters	8419.19.20	Free (0%) duty; 16.5% VAT

Solar Inverter	8504.40.90	Free (0%) duty; 16.5% VAT
Solar battery Chargers	8504.40.91	Free (0%) duty; 16.5% VAT
Solar primary cells & batteries9	8506.80.10	Free (0%) duty; 16.5% VAT
Solar accumulators	8507.80.10	Free (0%) duty; 16.5% VAT
Solar mobile phones	8517.12.10	Free(0%) duty; 16.5% VAT
Energy saver bulbs	8539.89.91	Free (0%) duty; 16.5% VAT
Solar panels/cells/ modules	8541.40.10	Free (0%) duty; 16.5% VAT
Solar regulators/ controllers	9032.89.91	Free (0)%) duty; 16.5% VAT
Solar energy lamps	9405.40.30	Free (0%) duty; 16.5% VAT

Source: MRA.

Table 38 shows a list of solar energy products/components that attract full duties.

Table 38: List of solar products/component with full duties rates.

Solar Energy Product	HS Code (Tariff Subheading)	Applicable duty rate(s)
Solar- powered fans	8414.51.90	10% duty; 20% excise; 16.5% VAT
Solar–powered fridges	8418.29.00	25% duty; 20% excise; 16.5% VAT
Special low-energy torches	8513.10.90	10% duty; (0%) excise; 16.5% VAT
Solar cooking oven	8516.60.99	25% duty; (0%) excise; 16.5% VAT
Solar radios	8527.13.90	25% duty; 20% excise ; 16.5% VAT
Solar –powered TVs	8528.72.19	25% duty; 20% excise; 16.5% VAT
Cable	8544.20.90	10% duty; (0%) excise; 16.5% VAT

Source: MRA

The duties combine with inflation and foreign exchange rates to increase the cost of solar energy products in Malawi. It is pleasing to note, however, that the

government is willing to consider, as part of the MRES, additional fiscal relief for solar energy products but wishes to base its decision on evidence from a study on the impact of such reliefs. This study was conducted in August 2017 by Economic Consulting Associates with the support of DFID and concluded that complete removal of import duty and VAT would lead to increased uptake of renewable energy, especially pico-PV units, solar household systems, and cooking stoves. In addition, the study concludes that although there will be a negative impact on the amount of taxes collected by the MRA, this impact would be offset by additional business revenue arising from businesses operating for longer periods and VAT paid through consumption of new workers in the sector[18]. In fact, the study projected that the government would be in a positive fiscal position from the first year of removal of import duty and VAT. Oxfam should consider using the findings of this study to advocate and lobby for the complete removal of import duty and VAT on all renewable energy products[19].

9.5.3 Inadequate Human Capacity

The other issue relates to inadequate human capacity at all levels in renewable energy technology products, services, installation and maintenance and marketing. According to practitioners in the field, most technicians working in the industry are more knowledgeable in electrical installation but have limited knowledge and expertise on the solar side of the systems and products. This led to poor installations leading to product failure. The issue of human capacity is expected to be addressed through an EU funded project that aims at facilitating and enhancing solar technology through capacity building. The project is working with Miracle Technical Institution in Karonga, ZAYED Energy and Ecology Centre in Nkhatabay and Mzuzu Technical College in Mzuzu. The project will construct the first laboratory for testing solar panels at Mzuzu Technical College and introduce a solar and electrical installation course.

Christian Aid is implementing a Women and Sustainable Energy Project called "Breaking Barriers," which aims to increase women's access to production, marketing, and distribution of sustainable energy products and services, as well as influence environment policy. It is facilitating existing women's groups to establish women-led sustainable energy enterprises. Women are accessing finance through savings and loans groups and receiving training in business management and sustainable energy enterprises, including solar lamps, solar shops, cook stoves and biodigesters[20].

In January 2019, the Technical, Entrepreneurial and Vocational Education and Training Authority (TEVETA) began offering training in solar photovoltaics through

[18] Economic Consulting Associates (2017)

[19] Note that the study assessed the impact over a 10 year period of duty and VAT exemption.

[20] www.christianaid.org.uk

apprenticeships. This is likely to increase human capacity at the community level. Oxfam, in collaboration with other key stakeholders, should consider supporting this effort through, for example, provision of scholarships for the apprentices.

9.5.5 Lack of Finances

Renewable energy technologies are expensive to buy and the majority of potential consumers do not have the finances. In a survey by BIF in 2016, 55% of users of solar lighting and 40% of non-users mentioned lack of money as a barrier to acquisition of solar lighting products.

10.0 CHALLENGES EXPERIENCED BY BENEFICIARIES

10.1 INADEQUATE WATER FOR IRRIGATION

During FGDs, members of irrigation schemes in both districts stated that one of their main challenges was that the installed systems were not able to supply adequate water for the planned size of the irrigation scheme. These sentiments were confirmed by key informants and through systematic observations. This has led to a reduction in command area and hence, the number of households that were able to actually irrigate. For example, the total command area for Kalonde irrigation scheme in Rumphi is approximately 10 ha but due to problems of water supply only 8 out of an initial 170 members were able to irrigate 3 ridges of beans each.

Most the systems had just been upgraded to improve availability of water for irrigation at the time of this study. This has been done mainly by introducing storage tanks, booster pumps to improve water pressure, and in some cases, procurement of additional solar panels, pump maintenance, replumbing and rewiring of the systems.

Despite these efforts, however, the schemes still have problems of making irrigation water available to the majority of the farmers. In some cases as was the case in Mchinji, the work has not been completed as shown in Figure 4. As at the time of the study, one storage tank was yet to be installed. Fifty six (56) farmers had already prepared their plots totalling 5 ha but could not start irrigating because water was not yet available. It is understood, however, that the works will be completed in due course.

Figure 4: Uncompleted storage tanks in Mchinji. Source: Photo by Patrick Chimutu 2018

Figure 5: A well dug to access irrigation water from a stand pump. Photo by Munday Makoko, 2018

At Kalonde scheme, the introduction of a booster pump has increased water pressure but the system is still only able to support 8 farmers growing three ridges of beans each instead of a planned 170 participants and 10 ha of command area. At Timbaninyanja in Luvili in Rumphi the water pressure from the storage tank is so low that to get water farmers have dug small wells around the standing water taps (Figure 5) into which they let the water flow and then draw from it using watering cans or buckets. The maize that farmers have grown is drying due to lack of water (Figure 6).

Figure 6: Maize drying up at Timbaninyanja irrigation scheme. Photo by Munday Makoko

Discussions with key stakeholders, including staff of partner and collaborating institutions such as the Ministry of Agriculture, Irrigation and Water Development and the Technical Entrepreneurial and Vocational Training Authority (TEVETA) point to inadequate and in some cases complete lack of involvement of personnel knowledgeable in irrigation design and solar systems and inadequate project resources to procure irrigation systems with the appropriate capacities for the size of the schemes where they were to be installed. In Mchinji, agricultural staff bemoaned their being involved late in the project. In Rumphi the story is the opposite of what happened in Mchinji. Although government irrigation staff were involved in the initial design of the irrigation scheme and produced Bills of Quantity (BoQs) in line with the size of the scheme, they were never involved in subsequent changes to the design and layout of the scheme. In addition, due to limited resources in their budgets, implementing partners stated that they were only able to buy what they could afford with the resources in their budgets instead of what was in the BoQs.

10.2 NON-FUNCTIONAL EQUIPMENT

Amongst beneficiaries of the value addition and enterprise technologies, non-functional equipment was a major challenge. Approximately 66% of the respondents belonging to enterprise groups in Mchinji gave this as the main challenge they faced compared to 20% in Rumphi. Among value addition groups, non-functional equipment was a major challenge for 48% in Mchinji and 37% in Rumphi.

Inverters and batteries were among the equipment that failed. Tovwirane barber shop, for example, had to replace the inverter at the cost of MK25,000. Mazgoolo Hair Salon at Chikwawa in Rumphi district also experienced a similar problem. During the evaluation, the press at Chimango 2 value addition group in Rumphi was not working because of problems with the PV system. The batteries at Kapiliwanda soybean flour value addition group were flat as at the time of the evaluation and were not recharging. According to key informants, this was due to the fact that these were installed without charge controllers to protect them from excess charge. It also suggests wrong equipment sizing and matching of components. According to CARD, groups always tried to add units to the set system and in the process, overloading the system which often times led to parts burning out.

10.3 MEMBERSHIP DROP-OUT

Membership drop-out was another challenge mentioned by participants of FGDs and key informants. According to information obtained from FGDs and key informants, this was experienced by groups in all three interventions. The problem is more pronounced in Rumphi than in Mchinji. Key informants at Kalonde irrigation scheme in Chikwawa in Rumphi district stated that the membership had dropped from an initial 170 to 98 and because the irrigation system is only able to irrigate about 1 ha instead of the planned 10 ha, only 8people are able to irrigate 3 ridges each of beans. Only three members were now operating the Titemwane Shop in Luviri from an initial membership of 10 and Tovwirane barbershop is now a one man enterprise[21]. Membership of Chimango 2 sunflower processing group has dropped from 50 to 30. At Malabada Irrigation Scheme in Mchinji, the initial membership was 61 but this had dropped to 48 as at the time of the study.

Some of the reasons given for dropouts were marriage, emigration especially to South Africa and some members not seeing the benefit of participation. For irrigation schemes, however, the major reason given by key informants and participants of FGDs was the inability of the installed irrigation systems to provide adequate water for the command area, leading to only some of the members being able to irrigate. Key informants at Luvili stated that this year only 23 members grew crops while the other 27 did not because in the previous year their maize crop dried up when it was almost at maturity stage because there scheme had no water because the river which was their main water source, dried up.

[21] The study team met and interviewed the remaining three members of Titemwane shop and the one person who is now running the barber shop.

Another key reason for membership drop-out were the delays in project start-up. Participants of FGDs explained that people were dropping out of the groups because their own expectations were taking too long to be met.

10.4 LACK OF INPUTS

Lack of inputs was a major challenge faced by irrigation farmers in both districts. In Mchinji this was reported by 35% of the respondents while in Rumphi, 43% considered it as the main challenge they faced.

10.6 LOSS OF EQUIPMENT TO LENDERS

In one case at Chikwawa in Rumphi, money lenders confiscated the solar-powered dryers from a salon and there were reports that another group of lenders was planning to confiscate the solar panel for unrepaid loans by the only member left from an initial group of 10 women. It is reported by key informants at the time the loan was being taken the other nine members had already left the group because of a lack of transparency regarding earnings from the salon by the one member left in the group. Although this may be just one isolated incident, it does pose the threat of the solar equipment being regarded by potential lenders as security for their loans.

10.5 LIMITED MARKETS

Focus group discussions with value addition and enterprise groups revealed another challenge and that was limited markets. Value addition groups believed that through product certification by Malawi Bureau of Standards (MBS) they would be able to serve larger and better markets such as supermarkets like People's and Shoprite. This view was also held by Oxfam and implementing partners to the point that training in standards was organized and held for the groups following recommendation of the Mid-term evaluation that Oxfam should support the product certification process (Box 1). In the current impact evaluation, we did not find any evidence to suggest that the value addition groups were producing in excess of what their local markets could absorb. Entry into and survival on markets, such as supermarkets is not only a matter of product certification but also about satisfying the market's quantity and frequency of supply of the product. Considering that all

Box 1: Mid-term evaluation findings on product certification

- Farmers were particularly pessimistic that their processed products would be able to compete favourably on the market in the absence of product certification and reliable buyers
- To ensure that the processed products meet the acceptable quality standards, Oxfam in Malawi and partners should engage Malawi Bureau of Standards and advocate for speedy

value addition groups have very small equipment with limited capacity and that they still are struggling to obtain adequate raw materials, it is unlikely that they would meet these requirements even if they were to have their products certified. In addition, the process of product certification is a very stringent process with standards which these groups are unlikely to meet. According to the MBS, for any product to be certified the minimum standards set for that product must be met. For example, for cooking oil one such standard is the requirement for refining. Other standards for product certification include the environment within which the products are processed such as availability of water, toilets, and changing rooms. The minimum standards are applied equally regardless of the size of the enterprise. Despite the fact that these minimum standards were being worked on in the extension period, it is our considered view that instead of working toward certification, the groups should be assisted with accessing adequate finances for their operations, including procurement of raw materials and packaging materials and labels as well as addressing the problems currently faced such as breakdown of equipment.

10.6 INADEQUATE FEASIBILITY STUDIES

The study team only accessed a copy of the feasibility study undertaken by CARD for solar-based enterprises in Mchinji. The team has not accessed feasibility studies for interventions done by CARD and feasibility studies undertaken by CADECOM. The analysis of the CARD report reveals major weaknesses that are admitted by CARD itself. For example, the feasibility report does not provide adequate information on the market such as the level of demand, composition of the demand, factors that determine demand and the existing competition among other things. It therefore does not show how the type and size of solar technology, including size of processing equipment for value addition groups, was arrived at.

Our observation of the layout of the irrigation schemes we visited, point to the likelihood of installations not being based on feasibility study findings. The same applies to some of the changes to the original designs. For example, at Kalonde irrigation scheme in Rumphi, it was noted that the storage tanks were installed near the river from which water was pumped for irrigation, with expectations that the head achieved through the raise tanks would irrigate land that is on a higher elevation that the location of the tanks. This explains why a booster pump was found to be necessary. At Timbaninyanja in Luvili, key informant and farmers consulted through FGDs reported that the river, which was the source of water for the scheme dries up every year from the month of October and yet this was the river that was targeted to supply water to the scheme. No wonder that during 2017, farmers' maize crop dried up when nearing maturity stage because the river had dried up. This is a clear indicator of either a not well done feasibility study or one that was not done properly. The source of water has since been changed to a

borehole. But even in this case, it was evident that the location of the borehole and the height of the storage tanks that have been installed were not based on any technical assessments.

The lack of properly done feasibility studies could explain some of the problems currently faced by beneficiaries. For example, Chimango 2 value addition group complained that their oil making press was too small even for the local market demand they had. When asked what lessons had been learned from the implementation of the project, Oxfam stated that "when considering irrigation, more care should be put on site selection". Similarly, CARD stated that "proper feasibility needs to be conducted and implementation must be done according to the feasibility recommendations". Both statements confirm our observation that feasibility studies may not have been adequately done and followed.

11.0 LESSONS LEARNED

- A number of lessons were learned through the implementation of the renewable energy interventions. The following are some of the key lessons:

- In the promotion of solar energy technologies, it is important to involve qualified technicians with knowledge and skills in not only electrical installations but also the solar part of the installation. This way, product failure will be minimized.

- When considering the promotion of solar energy for irrigation, more care and attention should be put on site selection.

- Renewable energy technologies, especially solar powered technologies used for irrigation and value addition, have a high capital cost, which communities cannot afford on their own.

- Projects need to provide for adequate resources in their budget for the procurement of the appropriate capacity of solar-based technologies to ensure satisfactory performance of the technology and participants' confidence in the technology. This will not only increase the likelihood of success but also reduce the problem of membership dropouts.

- Inadequate enforcement of product standards can lead to the proliferation of counterfeit and substandard products, especially PSPs, by unregistered private sector players.

- For value addition, access to better and sustainable markets is key. However, certification as suggested in the project is not the solution for such small entities because the requirements for certification are beyond their means. In addition, the businesses have more pressing issues to

address such as non-functionality of equipment and access to finance, which can enhance their performance.

- When promoting solar-based enterprises, it is important to select enterprises that women would be comfortable to participate in. Even though some of the barbershops were managed by groups of women and men, the view of the partners of the project was that women may not be particularly comfortable with such enterprises. A gender analysis would have helped identify the social norms and relations that determine the kind of interventions men and women can freely participate in.

- Proper and detailed feasibility studies need to be carried out and project implementation should be based on the findings and recommendations of such studies. Such studies can, for example, assist with selection of proper sites for irrigation as well as determining the appropriate size of equipment to be used in the intervention.

- Promotion of solar irrigation, value addition and business enterprises should be accompanied with awareness campaigns regarding other renewable energy technologies that beneficiaries can benefit from at household level.

12.0 CONCLUSIONS AND RECOMMENDATIONS

12.1 CONCLUSIONS

There are indications that access to renewable energy and solar energy in particular can have a positive impact on households in terms of their livelihoods, income, and food security. However, the benefits from access to renewable energy in this project have been limited by a variety of challenges faced during implementation.

Findings of this study indicate that access to renewable energy and solar energy in particular, can have a positive impact on poor rural households in terms of their livelihoods, income, food security and women's empowerment and gender relations.

Access to solar irrigation, value addition and business enterprises provided the participating households new sources of income. Mean household incomes were generally higher amongst beneficiary households than in control groups. And more households among beneficiaries experienced an increase in income over the past three years since the start of the solar interventions than their control counterparts. However, the additional income was not used to purchase other types of solar gadgets, perhaps because of inadequate awareness of the benefits of the other types of solar technologies.

Participation in solar-based irrigation, solar-based enterprises, and solar-based value addition has contributed to improved food security among the participating households. More people were having three meals a day than before the start of the interventions and fewer households experienced a hungry season during the 12 month period prior to the study than in control communities.

On average, more households from the beneficiary sample owned each type of asset than households from the control group except for ownership of beds and mobile phones. However, most of the assets were bought before the interventions started. Therefore access to renewable energy has not had an impact on asset ownership, at least not as yet.

The project achieved its objective of targeting more women beneficiaries. The project also managed to get more women in leadership positions although the situation was the same among the control groups. However, being in positions of leadership does not seem to have enhanced women's participation in the decision-making processes as demonstrated during FGDs when men dominated the discussions.

Women were participating in the control of household resources as well as in decision-making in the household. They did this in their capacity as female

household heads, sole decision makers, or jointly with their spouses. However, it is not possible to attribute this directly to the project considering that in most areas the interventions started in the second or third year of the project.

The positive effects of the interventions are yet to exceed the cost of provision of renewable energy technologies as these effects take time to be realised. But there are signs that this could happen in the future. However, their achievement is jeopardised by a number of challenges faced by the beneficiaries, including non-functional equipment and limited markets.

In as far as continuity of activities beyond the project, the findings show great commitment and interest to do so among the beneficiaries. However, the financing model which anticipated the VSL to provide a safety net for repairs and maintenance has not worked so far except on one case.

The policy environment is being made more conducive to the promotion of renewable energy in Malawi. A new Energy Policy has been developed as well as a strategy specifically focussed on renewable energy: the Malawi Renewable Energy Strategy of 2017. However, there are still a number of gender issues that must be considered when promoting renewable energy in Malawi. These are access, control of resources, decision-making, and gender analysis. The market environment could also be better than it is currently. The proliferation of substandard and counterfeit products, especially PSPs poses a threat to customer confidence on renewable energy products. In addition, the continued levying of duty and VAT on renewable energy products and components poses the risk of keeping renewable energy technologies out of reach of the majority of the people who should benefit from them. It is pleasant to note, though, that the government is willing to consider waiving such taxes if provided evidence on the fiscal impact of such a policy. Fortunately, such a study has already been undertaken that shows positive impacts of a policy shift toward duty and tax exemption.

Finally, the project has provided a learning ground that can inform future interventions in the area of renewable energy in general and solar energy in particular. A number of areas for advocacy or lobbying and support to the renewable energy industry have also emerged from this study.

12.2 RECOMMENDATIONS

- Based on the findings from this evaluation the following recommendations are proposed:

- Oxfam and its partners should consider providing support to the communities to address the system challenges they are currently facing with the solar energy technologies that have been introduced. These

include the inability of the irrigation systems to provide adequate water to the farmers for irrigation and broken down pieces of equipment amongst value addition groups. If these problems are not sorted out quickly, the sustainability of the interventions will be doubtful.

- Similar projects in the future should provide for adequate funding in the project budgets to enable implementing partners to procure solar energy technologies of the appropriate capacity for the intended purpose.

- Oxfam, in collaboration with other stakeholders, should advocate for the review and adoption of the proposed duties of the district energy officers and lobby for their recruitment and deployment to districts. The University of Strathclyde has developed a proposal on the roles and responsibilities of the District Energy Officers.

- Oxfam, in partnership with other key stakeholders, should closely monitor the implementation of the MRES to ensure that the actions spelt out there-in are implemented.

- Oxfam and other key stakeholders should continue to advocate and lobby for the drafting and eventual enactment of a renewable energy act.

- Oxfam, in collaboration with other key stakeholders, should follow up with the government on the adaptation and adoption of the Lighting Global Standards developed by the World Bank and the IFC in order to curtail proliferation of counterfeit and substandard solar energy products on the Malawi market.

- In the future, similar projects be based on proper and detailed feasibility studies and be implemented based on the recommendations of such studies.

- Considering that the positive effects of interventions promoted in this project generally take time to exceed the cost of provision, future projects of this nature should have a longer duration, such as 5 years or more.

- Rather than working toward product certification, value addition groups should work toward increasing production to levels that can meet bigger market demands in terms of quantity and frequency of supply. Certification should be a medium to long term objective.

13.0 CASE STUDIES

13.1 KAYEMBE IRRIGATION SCHEME, MCHINJI DISTRICT

Kayembe Irrigation Scheme is located in Kayembe Village in the area of Group Village Headman Kayembe in Traditional Authority Dambe in Mchinji District. The scheme is supported by CARD with funding from Oxfam in Malawi. This solar-irrigation scheme started in 2015. The scheme has 56 members, 27 of whom are women. Although the total irrigable land on the scheme is 15.8 ha, the solar system that has been installed is capable of irrigating 5 ha. Members say that CARD has promised to support them to expand the irrigable area to the full command area but this is yet to happen.

The scheme is led by an executive committee comprising of 5 women and 5 men. Each farmer has been allocated a plot 20 m x 50 m. The committee sub-divided the area into equal-sized plots. The solar irrigation equipment, including the solar pump and pipes were provided by CARD in partnership with Oxfam with funding from the Scottish Government. The community contribution in the project included digging the trenches for laying pipes and moulding of bricks, which have been used to build the pillars for mounting tanks, as well as collecting sand and stones for the same construction works.

The irrigation scheme begun in 2012 with funding from the African Development Bank. It had 127 members. Before the Oxfam project farmers used diesel powered pumps which was expensive for the farmers to operate. The pump also broke down and repairs took too long to be carried out. As a result of the high running costs farmers abandoned the scheme. “We used to spend MK3,000 or more per week on fuel for the pump and this became too expensive for us”, said Robin Chunga, Chairperson of the Scheme.

In 2016, farmers grew tomatoes, cabbages, onions, potato, maize and beans on the new scheme that was now powered by solar. Those that grew high value crops such as cabbages, tomatoes, potato and onions earned more than those who grew lower value crops such as maize and beans. Members say that the highest earning farmer was able to make MK376,000 from crops grown from July – December that year while the lowest earner made MK8,000. The average income from sales of crops was estimated at MK99,800. Some of the farmers used the income earned from the scheme to buy goats (Figure 7). Then the pump broke down and some members left the group.

Figure 7: A woman beneficiary with one of her goats

The scheme members are facing a number of challenges. One of the challenges is low water pressure. “The water comes out very slowly but we believe that will improve once the installation of the second storage tank is completed”, said Emily Kosamu, a member of the irrigation scheme. Other challenges faced were the lack of markets to sell their crops, expectations not being met, lack of knowledge in repair and maintenance, and the use small hose pipes for watering plants which makes it difficult to irrigate and low power when the day is cloudy.

The solar pump was repaired and storage tanks were being installed as a way of increasing irrigation water availability. Additional solar panels had been installed to deal with the low power during cloudy days.

Despite these challenges and the fact that the CARD project ended on September 30 2018, the farmers indicated that they would go on with the activities on their own as they perceive they will benefit once they have adequate water for irrigation. They are contributing MK500 each every month to pay night guards for the solar panels. They have also began contributing toward a fund to be used for repair and maintenance costs. (7)

13.2 KASEKESE COOPERATIVE

Kasekese Cooperative is a value addition group in Mchinji District. It started value addition in 2016. It processes peanut butter. The group comprises of 65 members, of whom 52 are women, 2 are male youths, 3 are female youths and the rest are men. It is led by an Executive Committee composed of 13 members, 8 of whom are women.

Before the coming in of CARD the group was aggregating produce to sell as a group, but they decided to do value addition in order to make more money. They use own grown groundnuts; but some members produce groundnuts as a group and then sell the groundnuts to the cooperative and increase their shares in the cooperative from the revenue

The value addition equipment was provided by CARD for free. The contribution of the group is in the form of rental of premises.

Figure 8: Peanut butter produced by Kasekese Coop.

The groups produces 50 bottles per week each weighing 250gm. They produce approximately 2,450 bottles per year. At a unit selling price of K500/ bottle, this gives them MK1, 225,000 per annum. Thus, each member would get MK19, 000, but in practice this money is invested in shares in the cooperative. "We are making more money now than before getting involved in the value addition business" said one female member of the group. "For example, before the project we were selling the groundnuts at K350 per kg. But now, from one kilogramme of groundnuts we are able to produce 950gm of peanut butter which we sell at K1000". She continued. "So, even though the project has come to an end, we will continue with the business because of the benefits we see still coming" said another member. Through the project the members have built capacity in running a business and they have some financial literacy. The lesson they have learned through involvement in the value addition business is that to do well in business, one needs to have skills and knowledge in business management

So far, their main challenges have been a small customer base, problems of transport to go and market their product, high cost of rentals, frequent hikes in rentals of the premises, lack of a warehouse which means they have to store their raw materials in dwelling houses, and difficulties in procuring packaging materials as their previous supplier is no longer in business.

3.3 CHIMANGO 2 FARMERS GROUP

Chimango 2 is a value addition group that is processing sunflower cooking oil. It is located in Kalonde Village in the area of Traditional Authority Chikulamayembe in Rumphi District. The groups started value addition in 2015. They were supported by CADECOM with funding from Oxfam.

The group comprises 30 members, 26 of whom are women. A 10 member Executive Committee composed of 8 women and 2 men provides leadership to the

group. Initially, the group had 50 members but 20 have since withdrawn because of delays in project start up. The value addition equipment was acquired in 2017.

The group produces 4 litres of crude cooking oil per day. The oil they produce is all sold locally without any difficulties meaning they have local demand for the oil. They sell at K1,000 per litre, meaning they can make up to MK4,000 per day. “Our wish is to have our oil certified by MBS so that we can sell the oil in bigger markets such as Shoprite in Mzuzu”, said one of the members during an FGD.

The major challenges being faced by the group are the small capacity of the processing equipment, which limits their oil production, the switch for the oil processing equipment breaks down frequently and that they have not been trained in carrying out minor services of the equipment. In addition, “when it is cloudy less power is produced and that affects how much oil we can produce in a day”, said one of the members of the group.

The group has established a special repair and maintenance fund. At some point this fund accumulated to MK50,000 but the money has since been used up for repairs.

“The main lesson we have learned is that patience pays when waiting for a project to start. Those who left the group now want to re-join but they cannot be allowed back’ said one of the members.

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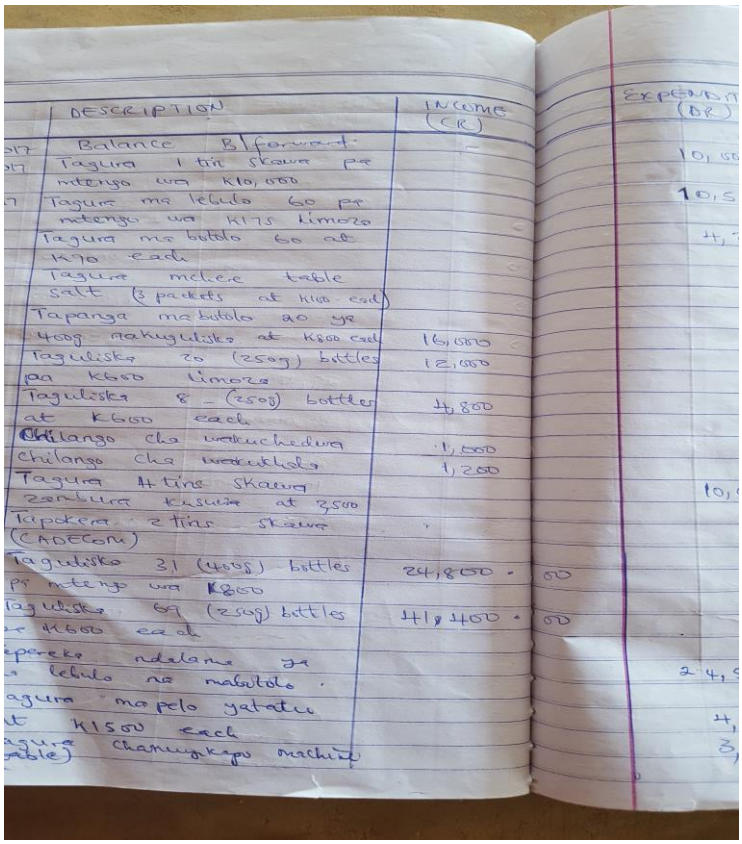
16. APPENDICES

APPENDIX 1: LIST OF PEOPLE CONSULTED

No.	Name of Person	Organization	Position in Organisation
1	Davie Mkandawire	ZUWA Energy, Lilongwe	Systems and Business Development Manager
2	Robin Chunga	Kayembe Irrigation Scheme. Mchinji	Chairperson
3	GVH Kayembe	Mchinji	
4	Robert G B Banda	Kasekese Cooperative, Mchinji	Chairperson
5	Joyce Mwezi	Kadammanja, Mchinji	Chairperson
6	Stola Mayamika	Mchinji District Agriculture Office	Agriculture Business Development Officer
7	Mr Kuliyani Chadooka	Mthilansembe Cooperative. Mchinji	Chairperson
8	Esther Chibwana	Tikondwe Business Club, Mchinji	Chairperson
9	Medson Juliasi	Tikondwe Business Club, Mchinji	VSL Agent
10	Melina Clement	Tikondwe Business Club	Business Overseer
11	Michael Mseka Mwale	Malabada EPA	Agricultural Extension and Development Officer
12	Melton Luhanga	CARD	Executive Director
13	Boniface Mbundungu	CARD	Value Chain Specialist
14	Mr Steve Kamuloni	Malawi Bureau of Standards	Director of Quality Assurance
15	Mr Chikavumbwa	Malawi Bureau of Standards	
16	Mr Kasakula	Malawi Energy Regulatory Authority	Senior Renewable Energy Specialist

17	Fletcher Chimphanga	Blue Zone	Pump Segment Manager
18	Kenani Mushari	Department of Irrigation, Rumphi	Assistant Irrigation Engineer
19	Mkandi Chirambo	Department of Irrigation, Rumphi	Assistant Irrigation Engineer
20	Rumbani Msiska	District Agriculture Office	District Agricultural Development Officer
21	Gift Buitoni	Malabada Irrigation Scheme, Mchinji	Chairperson
22	Sitola Magombo	District Agriculture Office, Mchinji	Business Development Officer
23	Vitu Jere	CARD	Projects Officer
24	Temwa Mkulitswa	OXFAM in Malawi	Project Manager
25	Hyton Lefu	OXFAM in Malawi	
26	Chimwemwe Phiri	CADECOM Hq	National Coordinator
27	Henry Simukonda	CADECOM, Rumphi	Field Officer
28	Charles Soko	CCJP, Rumphi	Field Officer
29	Lowani Kalua	Kalonde Scheme, Rumphi	Chairperson, Project Committee
30	Amos Mkandawire	Kalonde Scheme, Rumphi	Project Committee Member
31	Norah Longwe	Mazgolo Hair Salon, Rumphi	Member, Mazgolo Hair Salon
32	William Gondwe	Luviri, Rumphi	Chairperson, Project Committee
33	Watson K Gondwe	Luviri, Rumphi	GVH Kang'oma
34	Kenneth Gondwe	Luviri, Rumphi	GVH Makuni Gondwe
35	Wanangwa Msowoya	CADECOM, Mzuzu	Diocesan Programme Manager
36	Komani Tembo	TEVETA, Mzuzu	Training Programmes Specialist (Informal Sector)
37	Lovemore Mtsitsi	CISANET	Programme Manager

APPENDIX 2: SAMPLE OF BUSINESS RECORDS



Forty percent of the people on our planet—more than 2.5 billion—now live in poverty, struggling to survive on less than $2 a day. Oxfam America is an international relief and development organization working to change that. Together with individuals and local groups in more than 90 countries, Oxfam saves lives, helps people overcome poverty, and fights for social justice. To join our efforts or learn more, go to **www.oxfamamerica.org.**

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