

IMPACT ASSESSMENT REPORT:

PICO SOLAR LIGHT DISTRIBUTION, USAGE, IMPACTS and IMPLICATIONS

IN

WAKISO AND GOMBA DISTRICTS of UGANDA

By

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Let There Be Light International

In conjunction with

KACCAD

APRIL 2016

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Acronyms

| | |
|--------|---|
| AIDS | Acquired Immune Deficiency Syndrome |
| HIV | Human Immune deficiency Virus |
| KACCAD | Kyosiga Community Christian Association for Development |
| LTBLI | Let There Be Light International |
| NGO | Non Government Organization |
| USA | United States of America |

EXECUTIVE SUMMARY

This report summarizes the findings of a comprehensive follow-up assessment of a targeted solar light distribution program in Uganda. The assessment was conducted in the Wakiso and Gomba Districts of Uganda during 2016 between February- and April. The purpose of the follow-up assessment was to determine the impact of a charitable solar light distribution program on 800 solar light recipients. Targeted recipients were identified as meeting all three of the following criteria: those living in extreme poverty; those living in off-grid or under-electrified areas; those in one or more of the following categories - handicapped; elderly; orphaned; HIV/AIDS positive; new mother; student; community leader/community resource.

The specific objectives of the assessment were:

To establish demographic profiles and recipient categories of those using the solar lights; to determine the frequency of use of the solar lights by individuals and households; to establish the level of use of other lighting sources by households before and after receiving solar lights; to determine the level of monetary savings due to the reduction in lighting expenditure after receiving solar lights by households; to establish how lighting expenditure savings currently are reallocated by solar light recipients; to determine the greatest perceived benefits of solar lights; to determine the frequency of solar light usage by children for school work; to measure perceived impacts on academic performance among families with school-aged children; to

determine the frequency of solar light usage for chores; to determine the frequency of solar light usage for income generation activities; to establish rates of usage of solar lights for income generating activities; to establish rates of usage of solar light for safety; to determine the durability of the solar lights over time; to establish the perceived health benefits of using solar lights; to establish the perceived impact of solar lights on household fire safety; to determine how frequently solar light recipients engage in solar light outreach and education activities with other community members not currently included in LTBLI's solar light distribution programs.

The assessment was exclusive in nature. It covered only recipients of solar lights distributed by LTBLI and KACCAD through LTBLI's Solar Light Distribution Program. All solar lights distributed by LTBLI and KACCAD are rigorously tested and approved for off-grid distribution in low resource settings by LightingAfrica.org. All solar lights were purchased in bulk through vetted vendors in Kampala and distributed by Let There Be Light International (LTBLI) and their distribution partner, Kyosiga Community Christian Association for Development (KACCAD).

A total of 802 recipients in two districts participated in the follow-up assessment. The participants were interviewed by local Field Officers employed by KACCAD as part of the follow-up assessment grant provided by LTBLI. Field Officers and KACCAD staff conducted the assessment interviews in a combination of local languages. Field Officers and KACCAD staff received training on interview techniques and employed a standardize survey tool provided by LTBLI and KACCAD.

Of the 802 solar light recipients interviewed, 465 (58%) were from Gomba, and 337 (42%) were from the Wakiso District. 355 (44.2%) were elderly and 206 (25.6%) were students. 136 (17%) were new mothers, community leaders, teachers, or others. 105 (13%) recipients were handicapped. 60 (7.4%) were widows and 9 (1.1%) were orphans. A total of 69 recipients were found to belong to more than one recipient category. 505 (63%) recipients were female, and 297 (37%) were male. 400 (49.9%) recipients were unemployed. 402 (50.1%) were employed. The occupation of most recipients surveyed was subsistence farming. This was followed by teaching, petty trading, local leadership, health worker, social worker, fishing, boda body (motorcycle) riding, bicycle mechanic, dry cleaning, hairdressing, casual worker, carpentry, building, crafting, tailoring, brick laying and driving. Data was collected using a standardized questionnaire prepared prior to conducting the assessment. The data was processed and analyzed using statistical data analysis software.

Most recipients had been in possession of their solar light for 6 to 18 months with 97% still in possession of the lights at the time of their interview. Those in possession of the solar lights were using them 7 nights/week and 3 or more hours/night. Most recipients were using their solar lights exclusively for household lighting, although a small number were still using other forms of lighting. Most recipients were no longer spending any money on lighting, and all were spending at reduced rates. Savings realized through reduced expenditure on lighting were being used for school fees, food, medicine, and rent. Children were found to be the most frequent users of the solar lights among household members.

Several primary benefits of using their solar light were cited by recipients. These include its bright/strong light, followed by clean, safe and reliable light, reduced risk of fire, improved respiratory health, reduced expenditure on lighting, and improved literacy. Other recipients cited

reduced eye strain, reduced indoor pollution, ability to conveniently feed babies at night, increased ability to do household chores at night, scaring away rats and bugs, and improved general health.

Most recipients had functioning solar lights. However, a small number had experienced breakages or other malfunctions of the lights. The breakages were reported to be due to accidents, including rats chewing the cords and wind blowing the panels from roof tops. There were no cases of burns reported, and all recipients felt that their homes were at a reduced risk of fire now that they were using solar lighting.

The overall conclusion of the follow-up assessment was that the solar light distribution program has greatly and positively impacted the energy poor communities in the districts of Wakiso and Gomba. Findings include: the enhancement of economic stability; the support of educational outcomes; the improvement of health and perceptions of well-being; and the increased safety of recipients and their families. The specific conclusions were that:

There has been a marked and sustained reduction in the usage of dangerous, dirty and polluting forms of lighting energy such as kerosene and wax candles. There is enhanced economic stability among households, as recipients are spending less on nonrenewable lighting and are using the savings to meet other household needs. The program is supporting the education of students in recipient households, improving self-reported measures of academic performance. The program also has impacted perceived health outcomes as measured by self-reports of improved respiratory and eye health. The household safety of solar light recipients has improved, as household fires and childhood burns are prevented and as the solar lights scare away potential thieves, rats, and bugs, and help the users to avoid snake bites at night.

The overall recommendation is that the project should consider that there are several program modifications that should be considered in order to maximize programmatic outcomes and to positively impact solar light recipients. The specific recommendations were that:

There is a need to increase the outreach and educational campaigns in targeted communities to address the proper handling and care of the lights. The program should consider the distribution of lights with integrated solar panels and without external wires to eliminate the breakage caused by broken or destroyed wires. Large families should be given more than one solar light (depending on family size) to meet their greater lighting needs and to reduce their continued reliance on unsafe and polluting lighting fuels. As for the high rate of burns, advocacy should be intensified during outreaches to encourage the increased adoption of solar lighting. Since most recipients were willing to encourage other people to purchase solar lights as an outcome of the project, local vendors and NGOs should be encouraged to supply solar lights to the wider community. Before the solar lights are distributed to the targeted recipients, baseline information should be captured to enable the follow-up assessment to make comparative analyses when determining levels of impact of the project. Baseline data collected should include: weekly lighting expenditure; hours studied per night; academic grades of children; rates of burns; rates of house fires; and rates of respiratory and eye disease.

1.0 INTRODUCTION

1.1 Background#

This report summarizes an impact assessment carried out in the Wakiso and Gomba Districts of Uganda during February to April 2016. It provides: an overview of energy need and access in Uganda; a description of Let There Be Light International's projects in Uganda; the purpose and significance of the follow-up solar lighting assessment; limitations of the follow-up assessment, approaches used in the assessment; results and impacts; recommendations and conclusions.

1.1.1 Overview of energy poverty

Energy Poverty is the state of living without adequate safe, modern energy access. Approximately 1.2 billion people globally live in energy poverty, using nonrenewable, dangerous and polluting biofuels for lighting. The negative effects of living in energy poverty include significant impacts on health, development, education, safety, and well-being. (Baird, Luwaga & Kerman, 2015).

In Uganda only 15% of the country's population is connected to the national grid and the distribution is mainly centered in the urban areas. In the rural areas, where most of the population lives, only 7% have access to electricity (Health Facility Needs Assessment-Uganda Country Summary Report, 2015). However, these rates of historical access are misleading, because they only measure the potential of a household to connect to grid-based electricity and do not measure the actual rate of connection nor do they measure the available reliability and flow of energy to specific areas and households. The historical conceptualization of energy access as a binary (access or lack of access) has now been expanded by the World Bank and SE4All.org to one of a multi-tiered access model. Through this nuanced access model, measures of connectivity and usage are expanded to include 5 distinct tiers of energy access with attendant measurements and benchmarks. When tiered access is assessed, full electrification rates plummet in resource restrained areas including in Uganda.

(http://www.worldbank.org/content/dam/Worldbank/Topics/Energy%20and%20Extract/Beyond_Connections_Energy_Access_Redefined_Exec_ESMAP_2015.pdf)

1.1.2 The need for solar light interventions

Energy Access is vital for the safe and productive development of communities. 1.2 billion people live in energy poverty globally, and 620 million people in sub-Saharan Africa have no access to modern electricity.

(<http://www.worldenergyoutlook.org/resources/energydevelopment/modernenergyforallwhyitmaters/>)

Solar lights are the first step on the energy access ladder and have been identified as a low-cost , high-impact intervention in energy poor off-grid areas. Whereas market-based interventions are meeting the demand of many off-grid households in Uganda, the extreme poor and vulnerable in some communities are unable to purchase solar products or to participate in loan-based or pay-as-you-go solar lighting programs. Accordingly, the need for an effective solar lighting intervention targeting the extreme poor in off-grid areas of Uganda was identified by KACCAD and LTBLI.

Energy Poverty is an important cross-sectoral issue impacting all levels of global poverty including health, education, safety, jobs creation, human rights, and the environment. In this regard, energy access in general and renewable energy in particular, are recognized as core components of sustainable development. Therefore, increasing the level of access to solar energy may help to mitigate the challenges which people face when they are using dirty, dangerous, open-flamed lighting sources common in off-grid areas of the global south.

1.1.3 History of Let There Be Light International

In 2012 Let There Be Light International (LTBLI) began to pilot a solar lighting distribution program with KACCAD, a community development organization in Bulenga, Uganda. Using established social service delivery channels, in late 2012, the first 100 portable solar lights were distributed.

In 2013 – 2014, 200 Solar Lights were donated by LTBLI to vulnerable students, AIDS widows, and the elderly. LTBLI undertakes the first of two lighting surveys on usage and impact in off-grid areas. LTBLI is registered in Connecticut in the United States as a nonprofit entity. Its mission is to raise awareness about Global Energy Poverty and to raise funds for the in-country purchase and distribution of Solar Lights to vulnerable off-grid communities in sub-Saharan Africa. LTBLI's 2014 Annual Appeal provides funding for the purchase and distribution of 300 Solar Lights.

2015 Let There Be Light International becomes a 501(c)(3) charitable organization. 1,085 Solar Lights are distributed to impoverished off-grid children and families in Uganda and Malawi. LTBLI solar electrifies their 6th rural health clinic in Uganda. More than 8,000 people are benefitting from the 1,685 lights distributed, and 45,000 people have access to health facilities with modern lighting and extended hours of operation.

1.1.4 About Let There Be Light International's project in Uganda

Let There Be Light International's Uganda project was founded through a partnership between Let There Be Light International, an aid organization based in the USA, and KACCAD, a local NGO. The decision to institute this project was prompted by numerous reports collected by KACCAD regarding the rising number of victims of household fires in various parts of Uganda. These fires are often caused by kerosene lanterns or candles, which are left unattended, creating a dangerous risk of fire. The field reports showed that children are often the primary victims in the fires. Such accidents had occurred in Wakiso District, the project's origin. The KACCAD field officers, shocked by this alarming report, realized the need for a solution that mitigates

these health and safety risks. Reports further indicated that a large number of those in greatest need are left out of the emerging market-based solar solutions.

The project's objectives are:

- To promote solar light usage among vulnerable, impoverished communities, especially in remote, off-grid areas where conventional electricity is not accessible.
- To improve health services and increase their availability through the provision of complete solar lighting systems in rural health centers

Let There Be Light International's Uganda Project was initially implemented in the Wakiso District in 2013. It expanded in November 2014 to serve the rural district of Gomba, located approximately 85 kilometers away from Kampala, the capital of Uganda. The project raises awareness about energy poverty and distributes low cost, high-impact solar lighting to vulnerable people living in energy poverty. Let There Be Light International's Uganda Project also provides rural health clinics with a complete solar lighting system. The project aims to replace dirty, dangerous and non-renewable lighting such as kerosene and wax candles with clean, safe and renewable solar lighting. Let There Be Light International's Uganda Project targets orphans and vulnerable children, widows, the homebound elderly people, female-headed households, disabled persons; people impacted by HIV and AIDS, school children and others living in extreme poverty.

1.2 The impact assessment

The follow-up solar lighting impact assessment was created and funded by Let There Be Light International and implemented by KACCAD in the Wakiso and Gomba Districts. The assessment sought to establish what, if any, impact the solar light distribution program had on recipients and their family members. The assessment asked questions about household access levels to the solar light, economic impact and stability, indicators of health status improvement, indicators of improved academic performance, changes in fire safety and risk, perceptions of safety at night, and efforts made to publicize or educate others about the competitive advantages of solar lighting.

During the assessment exercise, the data collectors asked the recipients all questions listed on the survey, as they filled out the individual questionnaires. 5 Field Officers conducted the survey in the Wakiso District. 4 Field Officers collected data in the Gomba District, with the help of 8 objectively identified and trained volunteers living in the district. Also, the local leadership helped the data collecting team to easily track the solar light recipients eligible for participation in the follow-up assessment survey. The field workers were trained by taking them through the entire questionnaire and explaining to them how to complete it. They were also trained on ethical issues of such surveys. The Executive Director of KACCAD Mr. Luwaga Derrick oversaw the training sessions, while the field operations were coordinated by the Follow-up Assessment Survey Administrator, Mr. Luberenga George Mike. The assessment exercise was conducted over 8 weeks. For travel to and from the Gomba District, the data collection team used the organization's (KACCAD's) vehicle. However, since the data collectors were moving to various

parts of the district at the same time, local means of motorcycle transport popularly known as boda boda was used for traveling within the district.

1.2.1 Purpose of the assessment

The overall objective of conducting the follow-up assessment was to measure the impact of LTBLI's Solar Light Distribution Program in Uganda. The assessment sought to establish the levels of impact among the beneficiary communities, in order to: improve LTBLI's Solar Light Distribution program; to collect information about energy access, need and usage among those living in energy poverty for broad research and intervention applications; to inform LTBLI's outreach, education, and engagement with renewable energy policies and access positions; to identify unexpected externalities associated with solar light distribution projects.

The following were the specific objectives of the assessment:

1. To determine the frequency of use of the solar lights by households
2. To establish the level of use of other lighting sources by households before and after receiving solar lights
3. To determine the level of savings due to the reduction in lighting expenditure after receiving the solar lights by households
4. To establish what the lighting expenditure savings are used for by the households
5. To establish the level of access to the solar light among household members based on demographic makeup
6. To determine the greatest benefit of the solar lights to the beneficiaries
7. To determine the extent of solar light use on school work and performance
8. To determine the extent of solar light use upon chores
9. To determine the extent of using solar lights for income generation activities
10. To establish any changes in the level of earning as a result of using solar lights for income generating activities
11. To determine the level of solar light use for safety purposes at night
12. To determine the durability of the solar lights when in use by households
13. To establish among households the level of health benefits of using solar lights
14. To establish the recipients' perception about the risk of fire after receiving solar lights
15. To determine the potential outreach and educational multiplier effects of the program

1.2.2 Significance of the impact assessment

The follow-up assessment was expected to measure the impact of the ongoing program and to greatly expand the data collected on usage and satisfaction rates of the recipients. Data collected and analyzed is to be used in LTBLI advocacy, outreach, fundraising, and program refinement. Furthermore, the follow-up assessment was expected to identify programmatic gaps in targeted geographical areas. The findings would further help in identifying areas where information was lacking and areas of further research. All this would be geared at ensuring improved programmatic implementation for satisfactory service delivery and a more comprehensive addressing of the poor communities' lighting needs.

1.3 Limitations encountered

In carrying out the impact assessment the following were limitations:

- Some recipients especially in Gomba districts had moved to other locations and it became difficult to trace them.
- Traveling within the remote district of Gomba was risky on several occasions especially in the evenings when retiring from the day's work. In many of the remote villages which we visited there were no taxis, and the boda boda cyclists (motorcycle operators) were not willing to transport people for long distances away from their stages at night. Yet in many cases we were working till dusk in order to minimize the days to be spent in the field, since we had a limited financial budget. In such difficult incidences we would end up yielding to paying extra fares for traveling back to Kabulasoke town where we were residing during the data collection exercise.

2.0 APPROACHES#

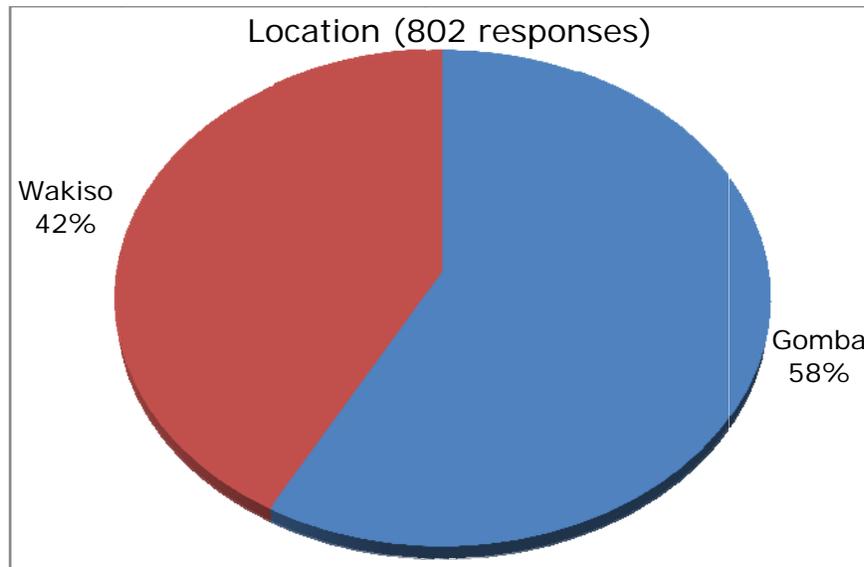
2.1 Assessment design#

The assessment exercise was exclusive in nature because it covered only recipients and or users of solar lights issued by Let There Be Light International under the Solar Light Distribution Program. However, within the sample, the exercise covered recipients of various demographic characteristics.

2.2 Sample characteristics

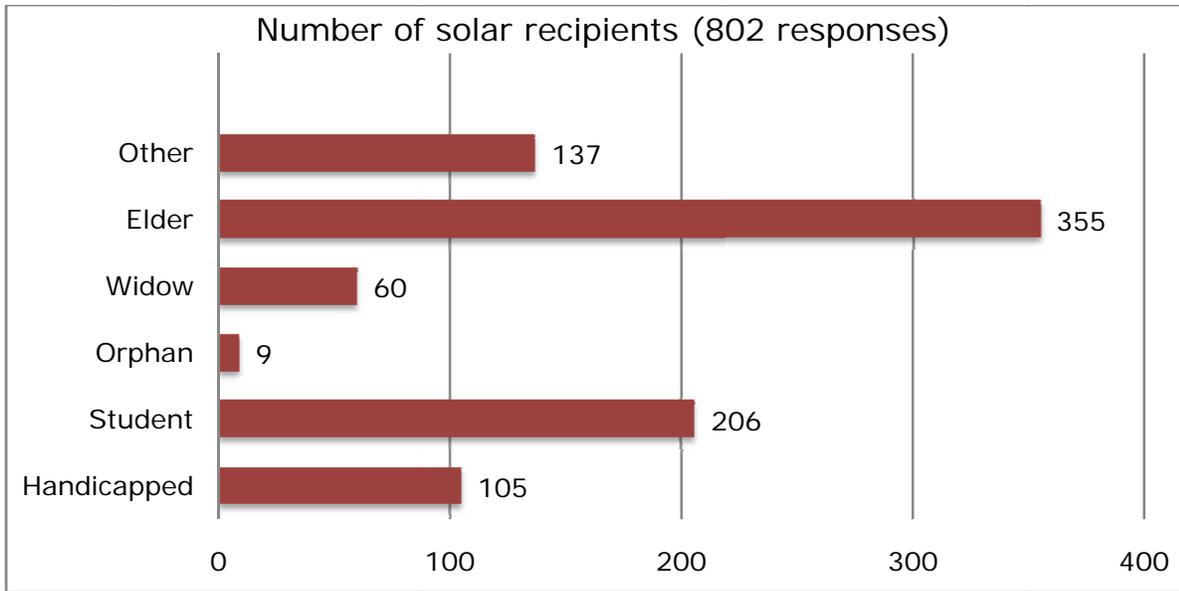
2.2.1 Recipient location

A total of 802 recipients were surveyed. 465 (58%) were from Gomba and the remaining 337 (42%) were from Wakiso districts.



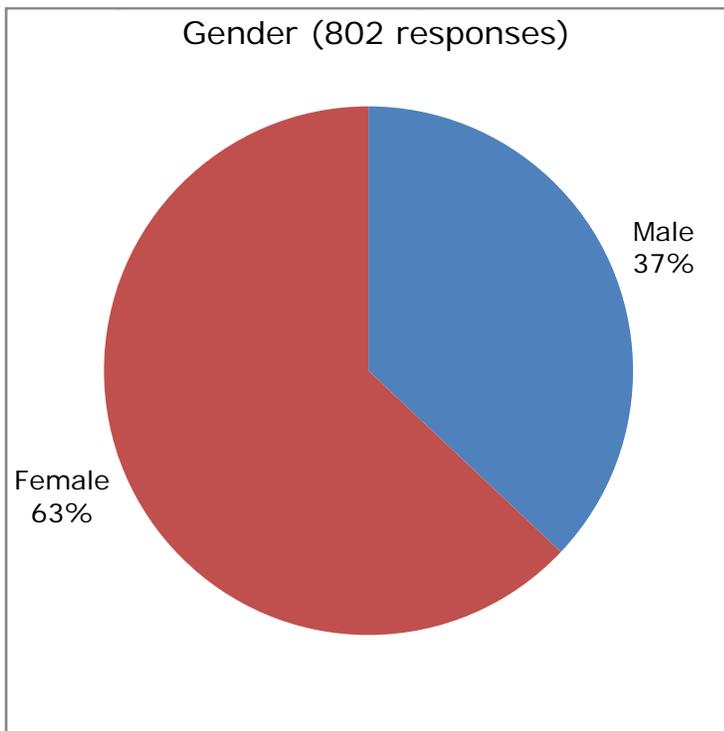
2.2.2 Recipient status

Of the recipients surveyed, 355 (44.2%) were elderly and 206 (25.6%) were students. 136 (17%) were classified as "Other," including new mothers, community leaders, and teachers. 105 (13%) recipients were handicapped. 60 (7.4%) were widows and 9 (1.1%) were orphans. A total of 69 recipients were found to belong to more than one recipient category.



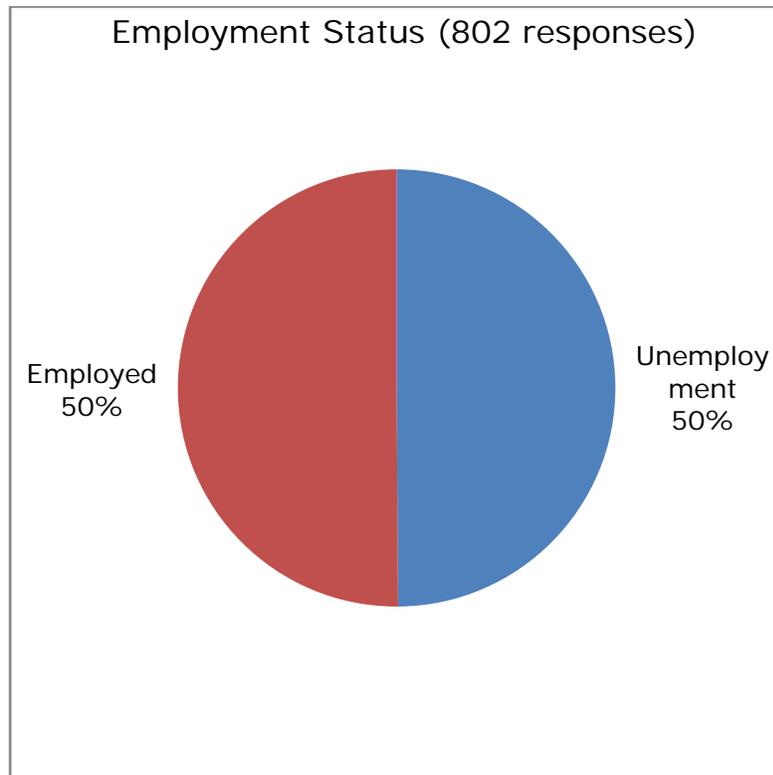
2.2.3 Recipients by gender

Of the total number of recipients, 505 (63%) were female and 297 (37%) were male.



2.2.4 Recipient employment status

Of the recipients surveyed 400 (49.9%) were unemployed while the remaining 402 (50.1%) were employed.



2.2.5 Type of occupation

The occupation of most recipients surveyed was subsistence farming. This was followed by teaching, petty trading, local leadership, health worker, social worker, fishing, boda boda (motorcycle) riding, bicycle mechanic, dry cleaning, hairdressing, casual worker, carpentry, building, crafting, tailoring, brick laying and driving.

2.3 Data collection#

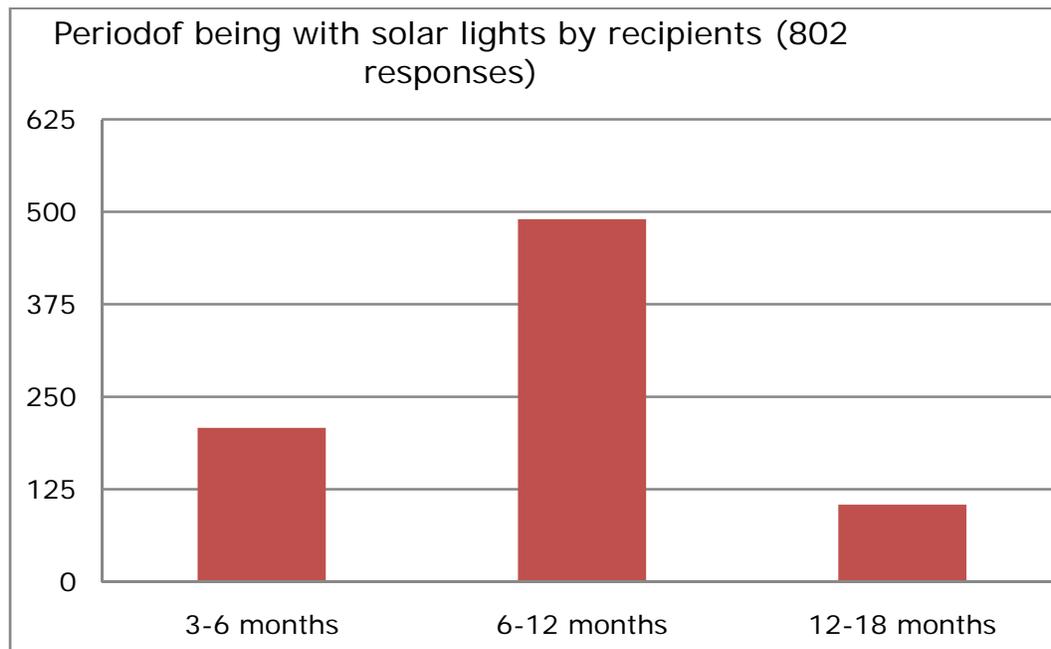
Information was obtained using an impact assessment tool developed by LTBLI prior to conducting the assessment exercise. The tool captured both quantitative and qualitative data. Information was gathered about demographic characteristics of the recipients, duration of solar light possession and use, previous type of light source used prior to getting a solar light, previous and current expenditures on lighting, benefits that have accrued due to using solar light, and solar light awareness among the communities in which the recipients live. A copy of the tool is included at the end of the report.

2.4 Data processing and analysis#

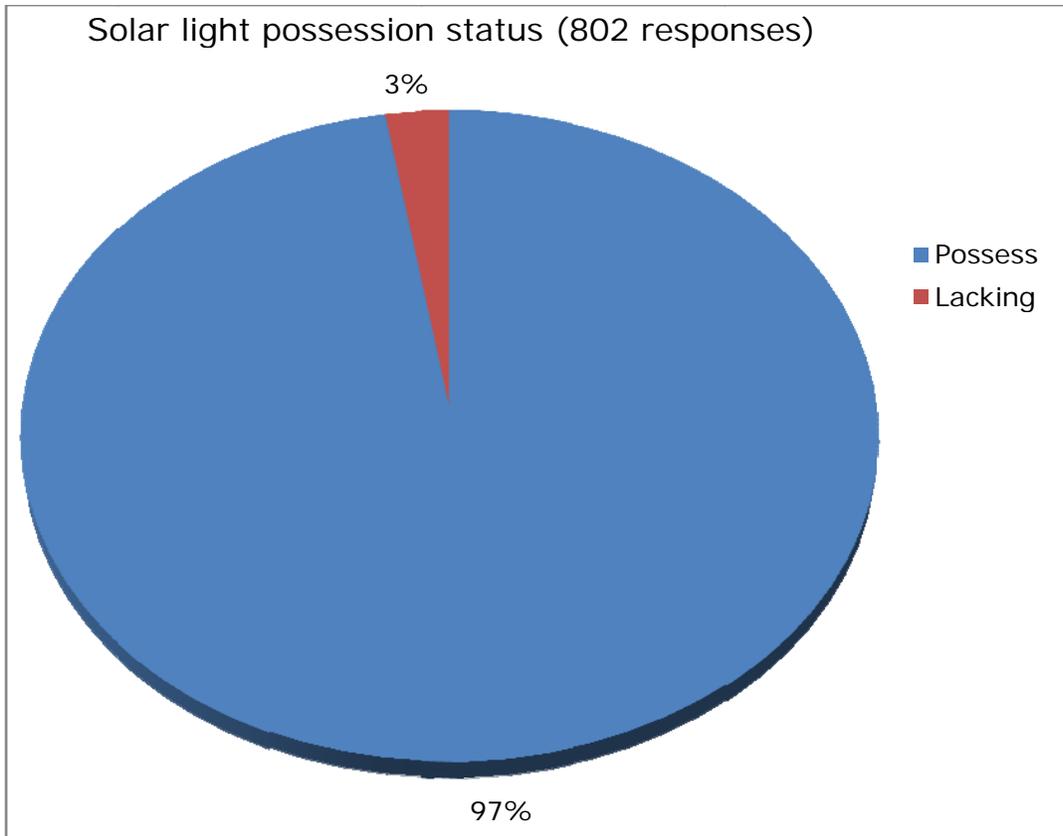
Collected data was entered into processing sheets (Google sheets) and subjected to analytical software, which enabled us to come up with the interpretations, conclusions and recommendations contained in the report.

3.0 RESULTS AND IMPACTS

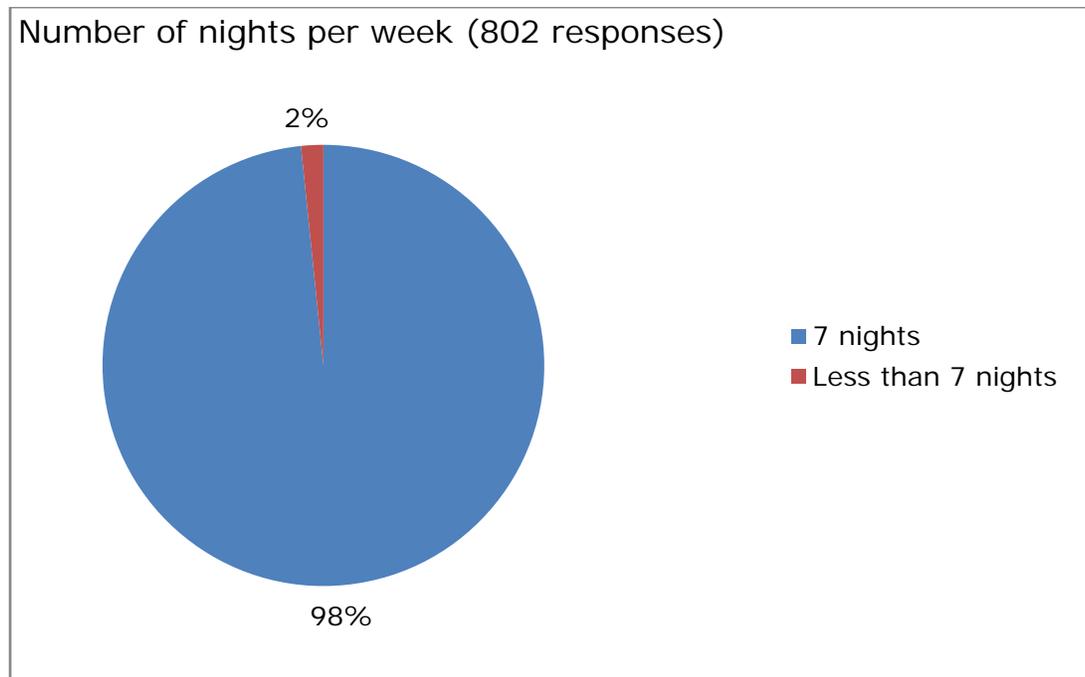
Of the recipients who participated in the assessment exercise, 26% had possessed their solar lights for 3 – 6 months, 61% for 6 – 12 months, and 13% for 12 – 18 months. The results indicate that most recipients had possessed their solar lights for a considerable period of time (over 6 months) and, accordingly, had benefitted for a long period.



On the issue of whether they had the solar lights in their possession, 781 (97%) recipients indicated that they still had the lights while the remaining 21 (3%) recipients no longer had them. Those who no longer had the solar lights indicated that theirs had either been stolen (4 cases of theft reported by the elderly) or had become non functional (17 cases) and had been returned. These solar light recipients were waiting for replacements. The high retention rate indicates that recipients attached great importance to the solar lights (probably due to the benefits they were obtaining from them) and handled them with great care, thereby prolonging their durability. The few cases of non-functioning lights were due to unfortunate incidences, which were beyond the recipients' control (for example death of inbuilt batteries, breakage of panels after being blown from roof tops by strong winds or solar sets accidentally broken by children while playing).



Regarding the number of nights per week during when the solar lights are used, 789 (98.4%) recipients reported that they were using the lights 7 nights per week, while 13 (1.6%) recipients were using the lights less than 7 nights a week. The respondents using the lights less frequently were those whose houses were connected to the electric grid after receiving the solar lights. These recipients were using their solar lights only when power blackouts occurred. The results indicate that the vast majority of recipients are heavily dependent on their solar light.



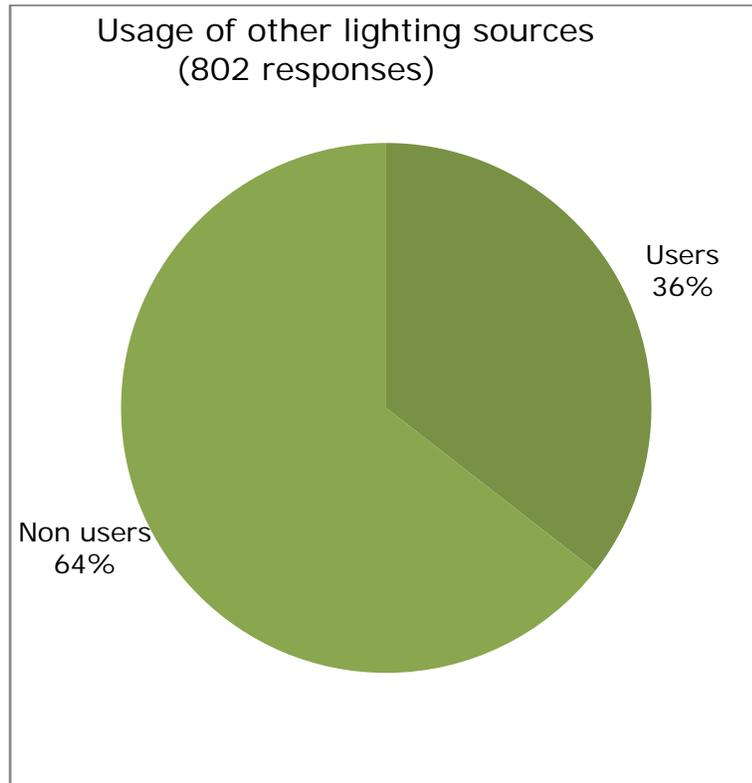
The average number of hours per night that the solar lights were used was 5.4 hours/night. 73% of recipients used their solar light for 3-6 hours/night, with 4 hours/night the most frequently cited. The window of most common usage was from 7:00pm to 11:00pm. This is the period when family members are awake and when pupils are doing their schoolwork. Approximately 13% of solar light recipients were using their lights for 11 to 14 hours. Most households using their lights for prolonged periods consist of impoverished elderly residents in huts lacking windows. The elderly reported that they leave the solar lights on in order to be able to see well and to scare away rats. Also, some pupils wake up in the early hours of the morning to do academic revision, and this adds to the number of hours when solar lights are in use. Results indicate that new mothers were using the solar lights for longer than average, because their new babies are awake for periods during the night.

Table 1: Number of hours of solar usage by recipients (Hrs: # of hours; Rec: # of recipients)

| Hrs | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 11.5 | 12 | 14 |
|-----|---|-----|----|-----|-----|-----|-----|-----|-----|-----|----|----|---|----|----|------|----|----|
| Rec | 3 | 1 | 61 | 2 | 122 | 7 | 206 | 4 | 125 | 111 | 17 | 21 | 5 | 3 | 5 | 1 | 90 | 9 |

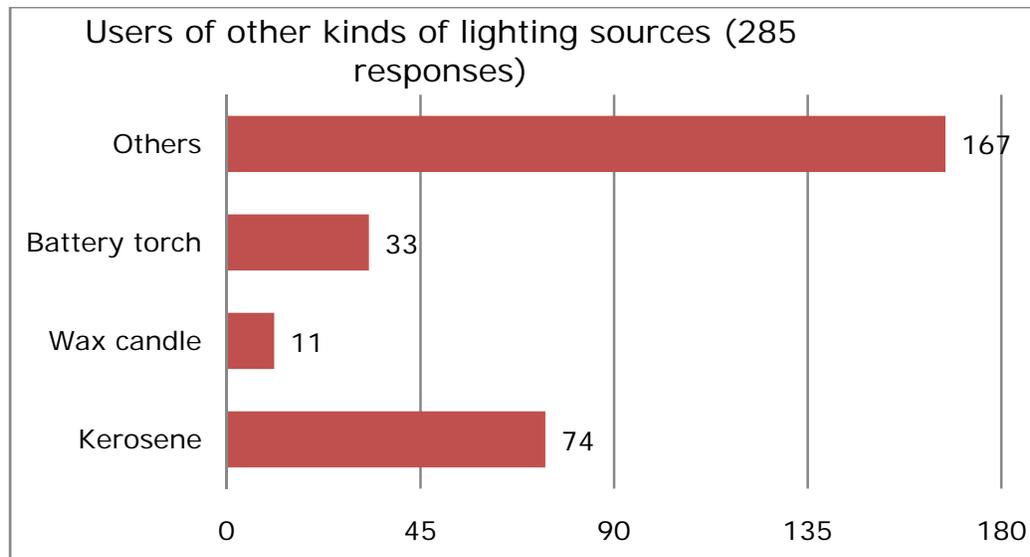
Source: Primary data of the impact assessment

285 (35.5%) recipients indicated that they used other sources in addition to solar light. 517 (64.5%) were solely using solar lights. There were many cases of large families in which one solar light did not meet their entire lighting need. In such cases the families would opt for other types of lighting sources. Furthermore, among those using other sources of light are those whose homes had become connected to the national grid or cases whereby solar lights had become faulty and had not yet been repaired or replaced.

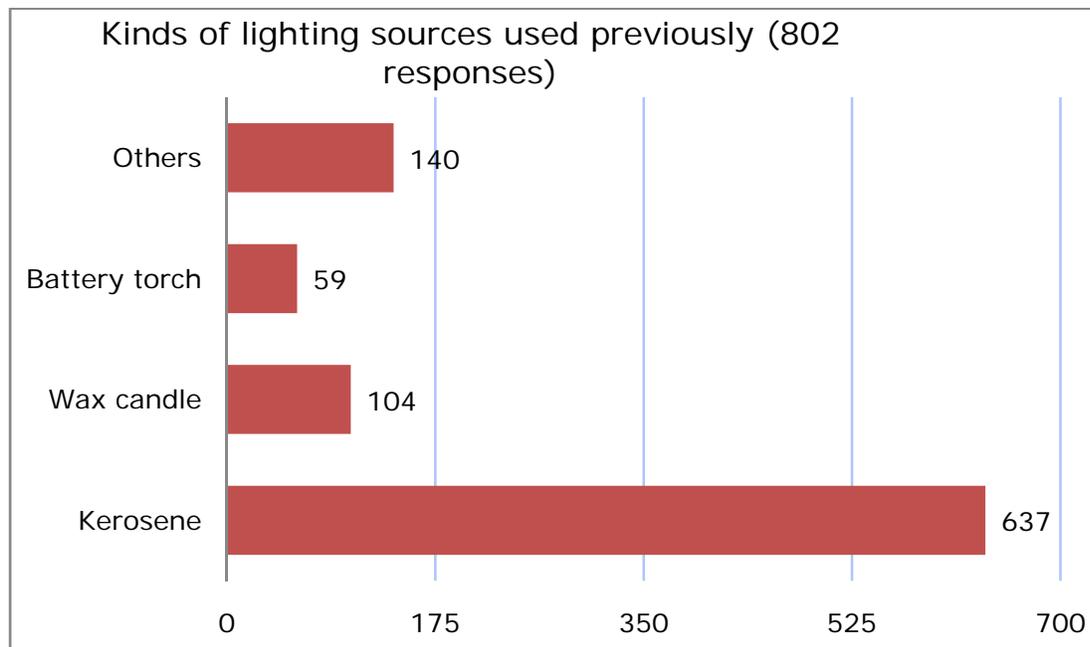


Of those who were using other sources of light, 74 (26%) were still using kerosene, 11 (3.9%) wax candles, 33 (11.8%) battery torch, and the remaining 167 (58.6%) were using other light sources including grid-based electricity.

The overall results indicate a significant overall reduction in the percentage of recipient families using dangerous, dirty, polluting types of lighting energy from a total of 92% prior to receipt of the solar light (79.4% using kerosene and 13% using wax candles) to 36% after receipt of a solar light.

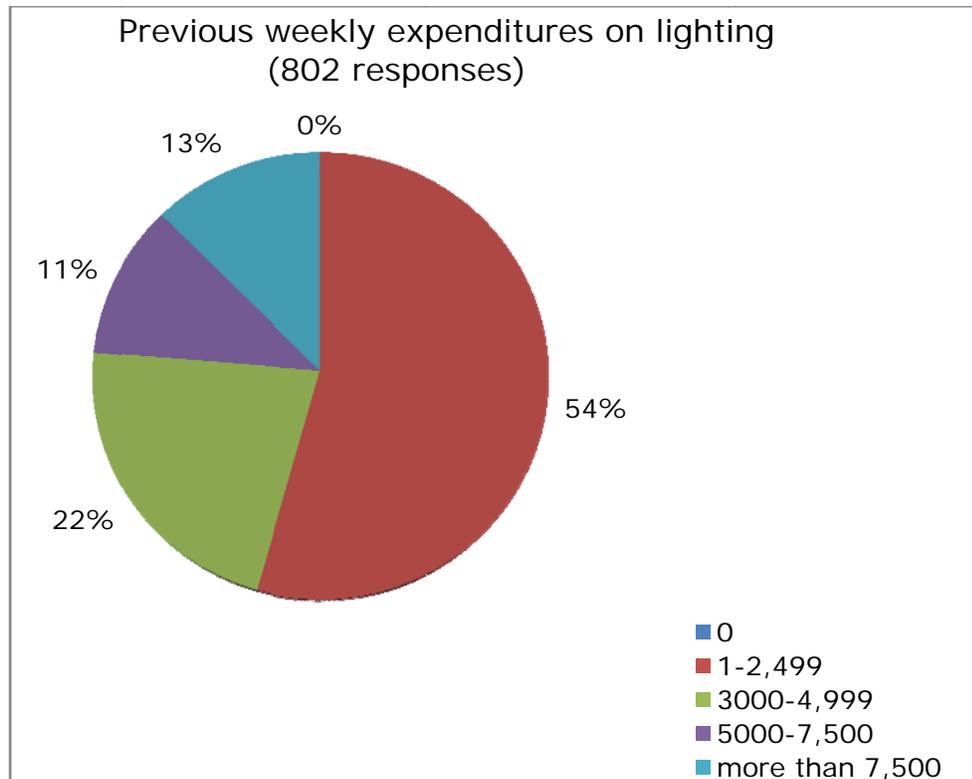


Concerning the previous type of light sources used before receiving the solar lights, 637 (79.4%) recipients said they were previously using kerosene, 104 (13%) wax candles, 59 (7.4%) battery torch, and 140 (17.5%) other. The anomaly exhibited by percentages is due to the fact that 129 recipients were using more than one kind of lighting sources previously before receiving solar lights. The results however indicate that previously, recipients were mainly using the dangerous, dirty and environment polluting non-renewable forms of lighting sources. The implication in this case is that most families were at great risk of fire accidents and potential exposure to respiratory diseases and other negative health impacts.

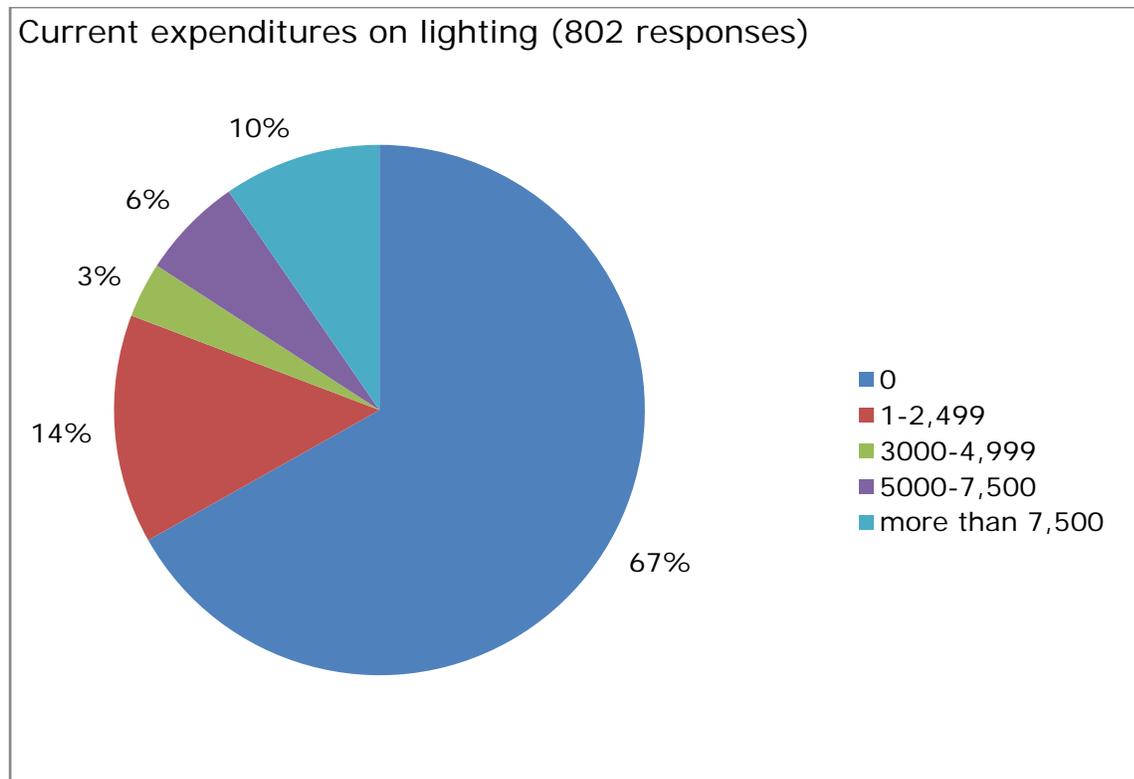


Weekly expenditure on lighting before receiving a solar light also showed marked changes. 434 (54.1%) of the surveyed recipients indicated that prior to receipt of a solar light, they were

spending UGX 1 – 2,999/week (\$.90), 175 (21.8%) were spending 3000 – 4,999/week (\$.90-1.50), 89 (11.1%) were spending 5000 – 7,500/week(\$1.50-2.25). 100 (12.5%) were spending more than 7,500/week (\$2.25). These results indicate that the previous expenditures on lighting were quite high considering that the recipients were living in extreme poverty, which is characterized as living on less than \$1.25/day per capita. It should be noted that many *entire households* targeted for solar light distribution live on far less than the *per capita* threshold and that the average household size of the targeted recipients is 5.4 people. Thus, in a household with 5.4 people and an income of \$1.25 per day, the per capita income may be less than \$.25/day.

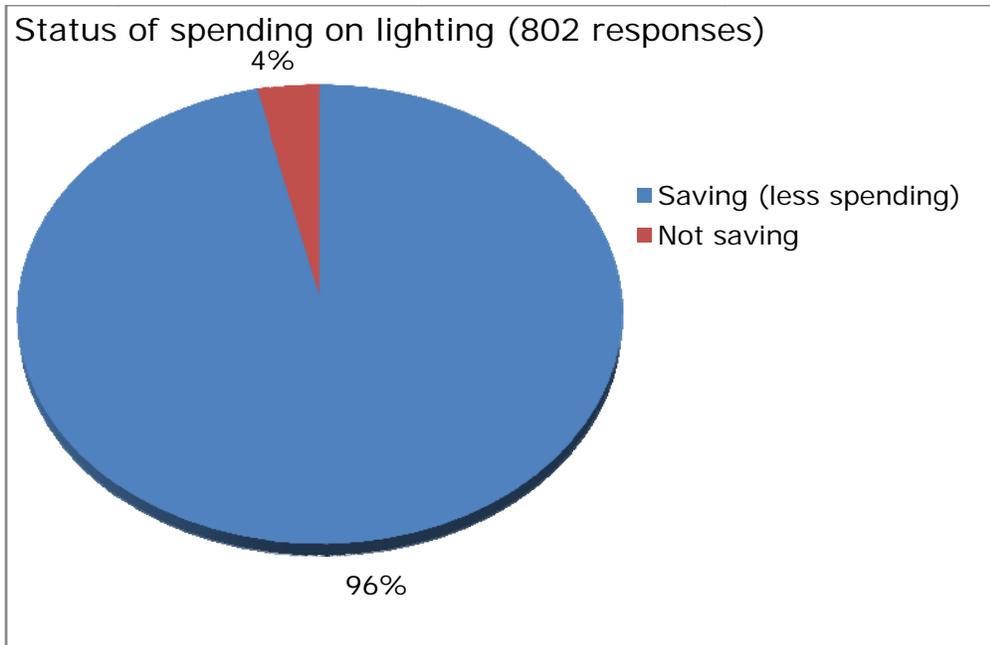


After receiving a solar light, 536 (66.8%) recipients no longer spend any money on lighting. 112 people (14%) were spending UGX 1 – 2,499/week. 27 people (3.4%) were spending UGX 3000 – 4,999/week. 50 (6.2%) were spending 5000 – 7,500/week, and 77 (9.6%) were spending more than 7,500/week. The high number of recipients who no longer spend on lighting (66.8%) implies that the solar lighting program has positively impacted the financial stability of most recipients. However the fact that some recipients are still spending on lighting even after receiving solar lights implies that there are other issues which came into play. Such factors include cases of large families or grid connectivity.

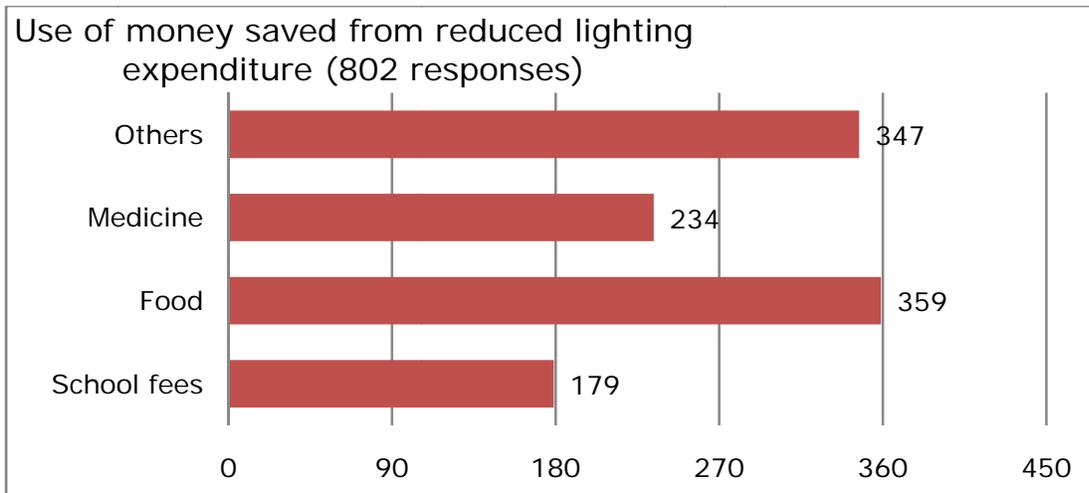


When asked whether they were spending less per week on lighting than before receiving a solar light, 773 (96.4%) recipients said yes, while the remaining 29 (3.6%) recipients indicated that they were not saving money. The high percentage of recipients who spend less on lighting implies an increased capacity for the recipients to meet their other financial obligations and increases their chances of having investment capital to finance income generating activities or to boost on-going small businesses where applicable.

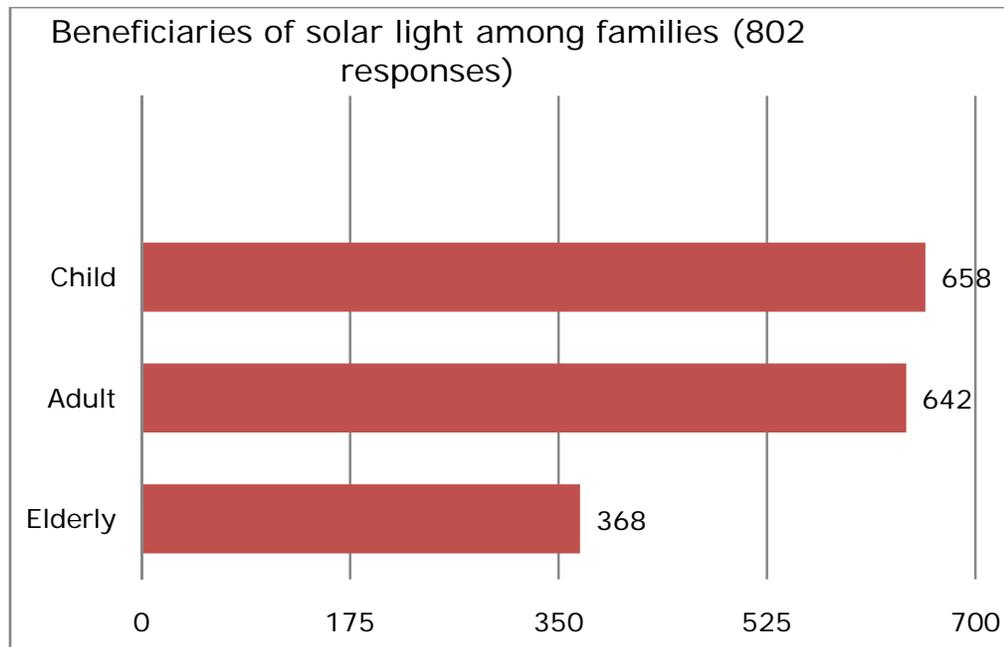
For the 3.6% recipients who reported that they were had not reduced their expenditure on lighting, most were recipients who were waiting for replacement lights for faulty lights. A few respondents were from households now connected to the electric grid or households that now rented houses with hydro electric connection after receiving a solar light. This was found to be true for some households in the Wakiso district.



Regarding the current use of monies previously allocated to lighting expenditures, 179 (22.3%) recipients indicated that they were using the savings on school fees, 359 (44.8%) on food, 229 (28.6%) on medicine. 347 (43.3%) were using the savings on other uses such as soap, salt, rent, and clothing.

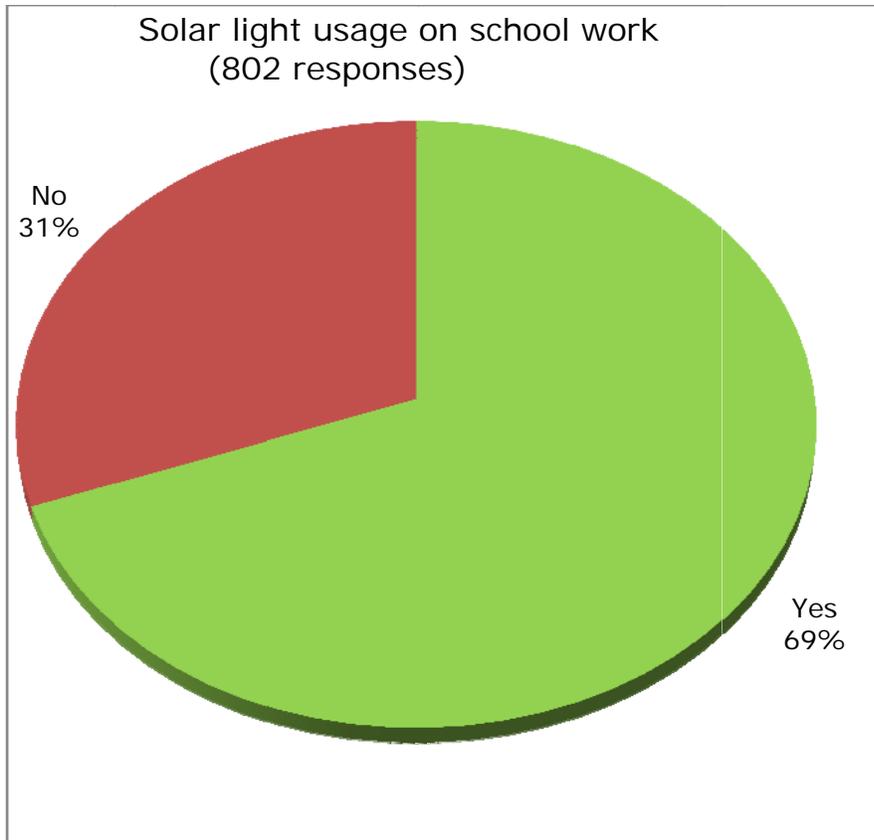


Regarding the specific member of the household who uses the solar light, 658 (82%) recipients reported that children used the lights, 642 (80%) indicated adults, while 368 (45.9%) reported elderly persons.

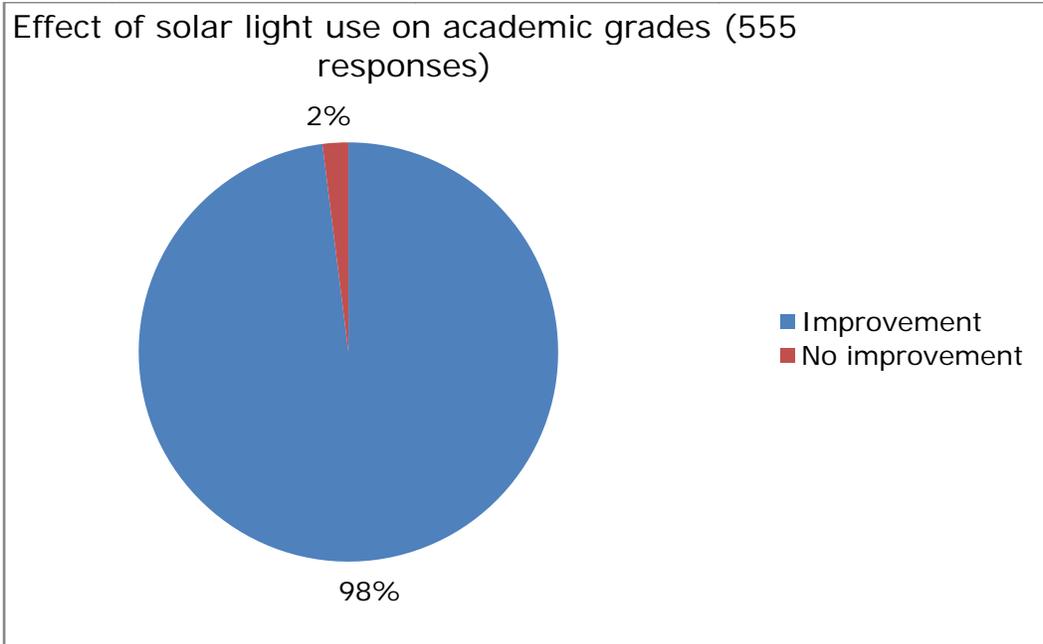


Most recipients considered the "bright/strong light" as the greatest benefit of the program, followed by "clean," "safe," "reliable light", "reduced risk of fire", "improved respiratory health", "reduced expenditure on lighting" and "improved educational impacts". Other recipients considered the following as their greatest benefits from using solar lighting: reduced eye strain, reduced indoor pollution, ability to conveniently feed babies at night (as pointed out by new mothers), and increased ability to do household chores at night, rat and bug scaring at night and also, improved general health. The results show that using solar lights in homes has caused a number of benefits thereby improving the recipients and their family members' lives.

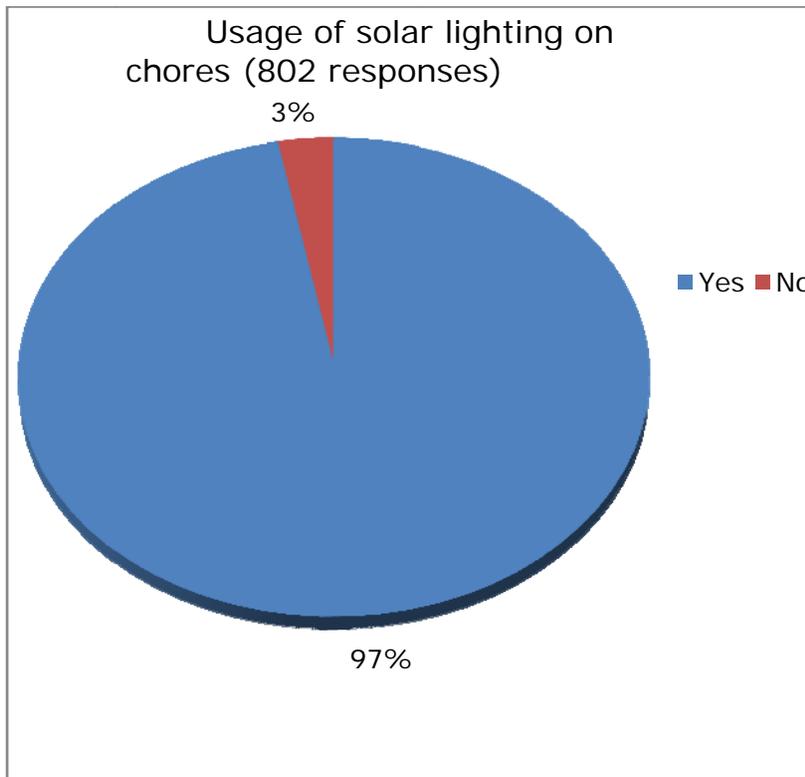
When asked whether the solar lights were being used for school work, 555 (69.2%) people responded affirmatively, while the remaining 245 (30.8%) indicated a negative response. An assessment refinement was identified here, since all families, including those without school-aged children (including the elderly and those with very young children not yet in school or those not able to afford to send their children to school) answered this question and skewed the overall finding. The results do indicate that the major use of solar lighting in energy poor households with school-aged children is for school work. This in turn indicates how important solar lighting is to the extreme poor families in regard to the education of their children. These results correlate well with the 98% of respondents who note an improvement in the academic grades of their children who use solar lighting for school work.



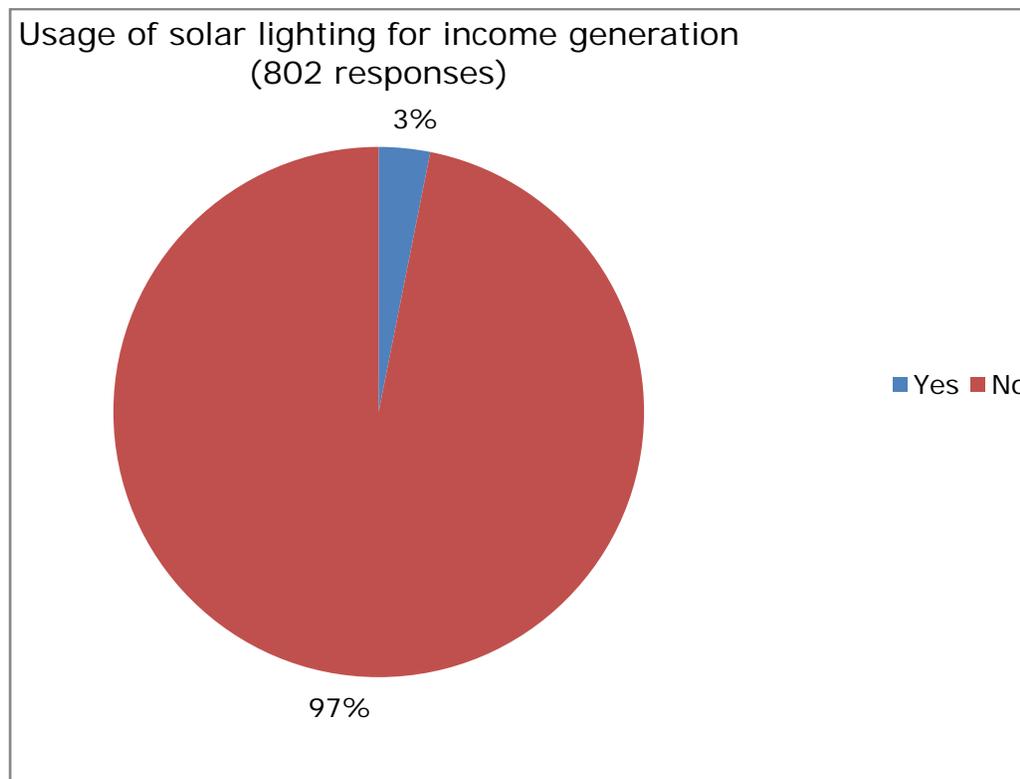
Overall, 544 (98%) of recipients with school-aged children reported an improvement in grades, while 11 (2%) indicated no improvement in academic performance. The improvement in academic performance may be attributable to the fact that the pupils now have reliable lighting, which enables them to do their homework in the evenings. The improvement was relative, as pupils were now scoring fairly well compared to their previous academic performances. Academic baselines are important to accurately measure this effect going forward.



When asked if they use their solar lights for chores, 778 (97%) recipients responded affirmatively, while the remaining 24 (3%) responded negatively.

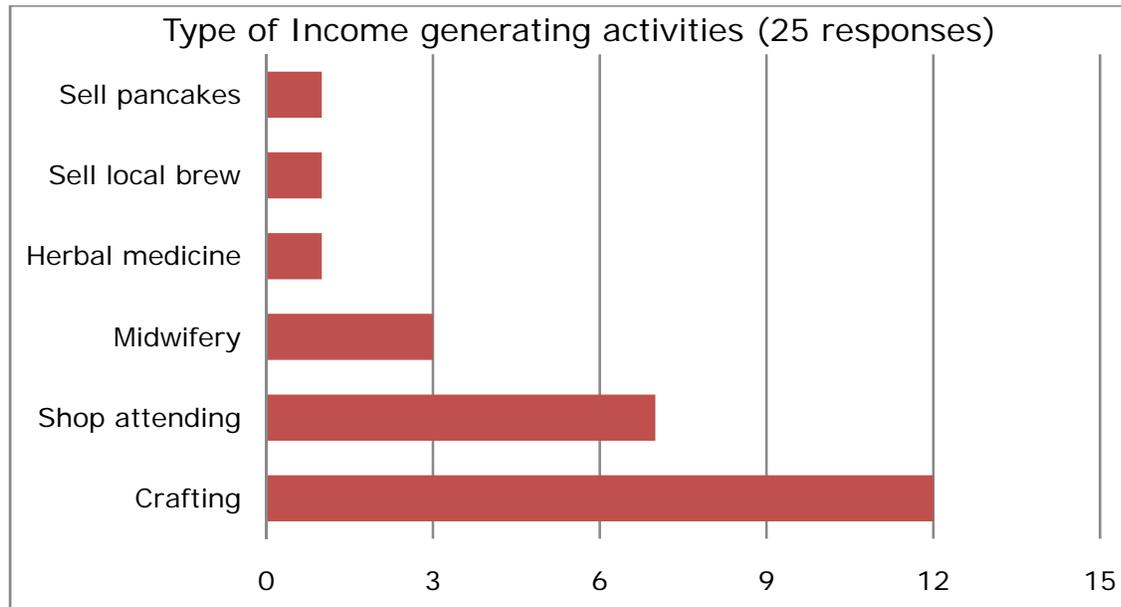


Regarding the use of solar lighting for income generation, 25 (3%) recipients indicated that were using the lights for income generation activities while 777 (97%) recipients indicated that they were not. These results indicate that a higher percentage of the recipients use the solar lighting for other purposes than income generation. Such purposes include domestic chores, safety at night and academic purposes (for the case of pupils and students). This result correlates well with the 97% of recipients who indicated that they were using solar lighting for household chores at night and the 69.2% of the recipients who indicated that solar lighting is used for school work. Also, as indicated under recipient's type of occupation, most of the recipients surveyed were subsistence farmers. Therefore the high number of recipients who do not use solar lighting for income generation correlates with that large number of subsistence farmers, since farming activities are done during day time and therefore do not need lighting.



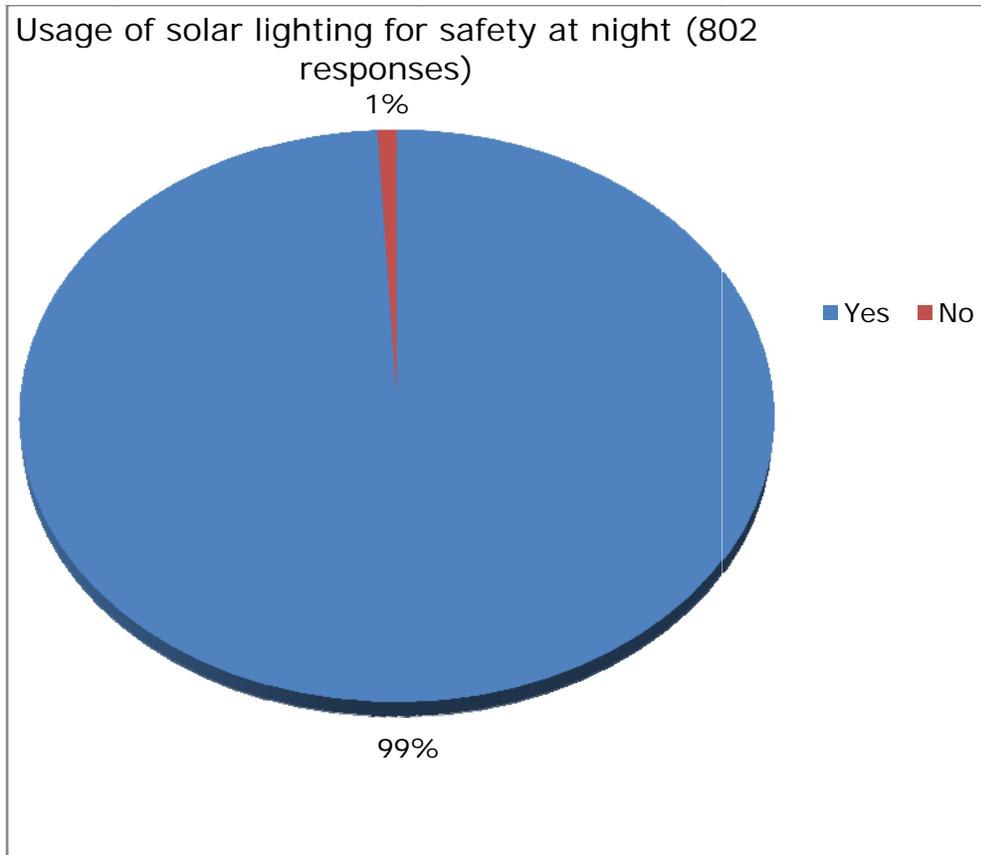
Regarding the income generating activities for which the solar lights are used, 12 responses indicated crafting, 7 shop attending, 3 midwifery, 1 preparing herbal medicine, 1 selling local brew and 1 selling pancakes in the evenings. These results indicate that most people who use their solar light for income generating activities are involved in crafting. Secondly, the results show that the crafting is done at night during the time when the family has retired from other day's work. This means that the solar light provides an opportunity to the users to do a variety of income generating activities, doing some during day light while doing the crafting at night, thereby increasing the chances of generating more household income from diversified sources. Also, since shop attending continues even at night, using the solar light has helped the shop

attendants to carry on their businesses, thereby increasing the chances of generating more income. As regards midwifery, this activity demands constant preparedness because neo-natal incidents can occur at any time of night. Thus the availability of solar light helps the midwives to be able to attend to their patients even in the wee hours of night, hence reducing chances of neo-natal and post-natal maternal mortality. As for the businesses of preparing herbal medicine, selling local brew and selling pancakes, the use of the solar light has helped the business operators to work even at night.

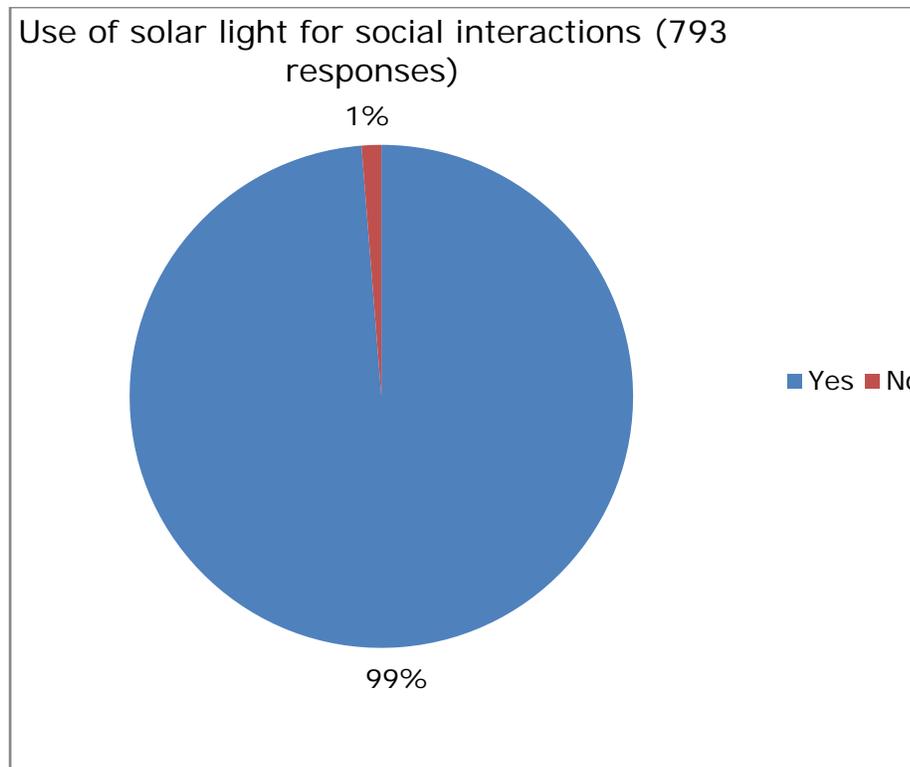


The average weekly extra income earned by using the solar light for income generating activities was UGX 9,160 (about 1,308 daily extra income), the equivalent to about \$2.65/week.

On the issue of whether solar lighting was being used for safety at night, 795 (99.1%) recipients indicated that they use it for safety purposes, while 7 (0.9%) recipients responded that they do not. The high percentage of solar use for safety at night is explainable by the fact that in the extreme energy poor households there are rats and other safety risks. Also, the act of leaving the solar lights on may scare away potential thieves.



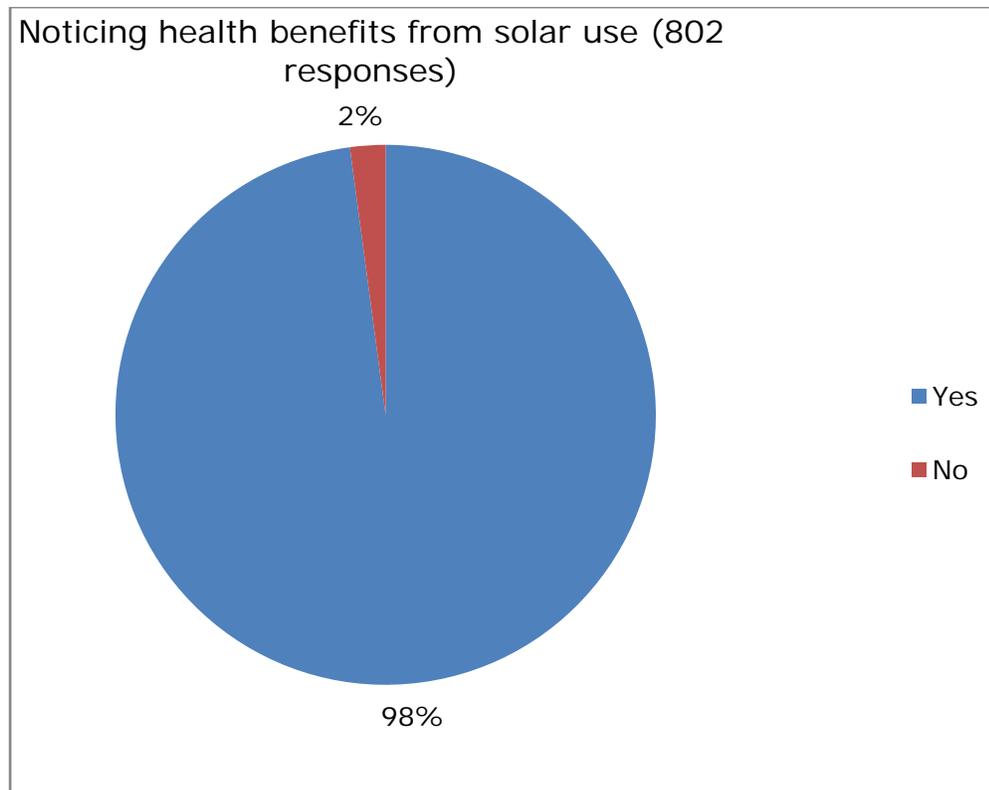
Concerning the use of solar lights for social interactions, 783 (98.7%) recipients use their solar lights for social interactions, while 10 (1.3%) recipients responded to the contrary. This finding may have implications on measurements of wellbeing and community cohesiveness.



Regarding the issue of the durability of the solar lights, 76 (9.6%) recipients indicated that their solar lights had broken, while 719 (90.4%) recipients responded that theirs had never broken.

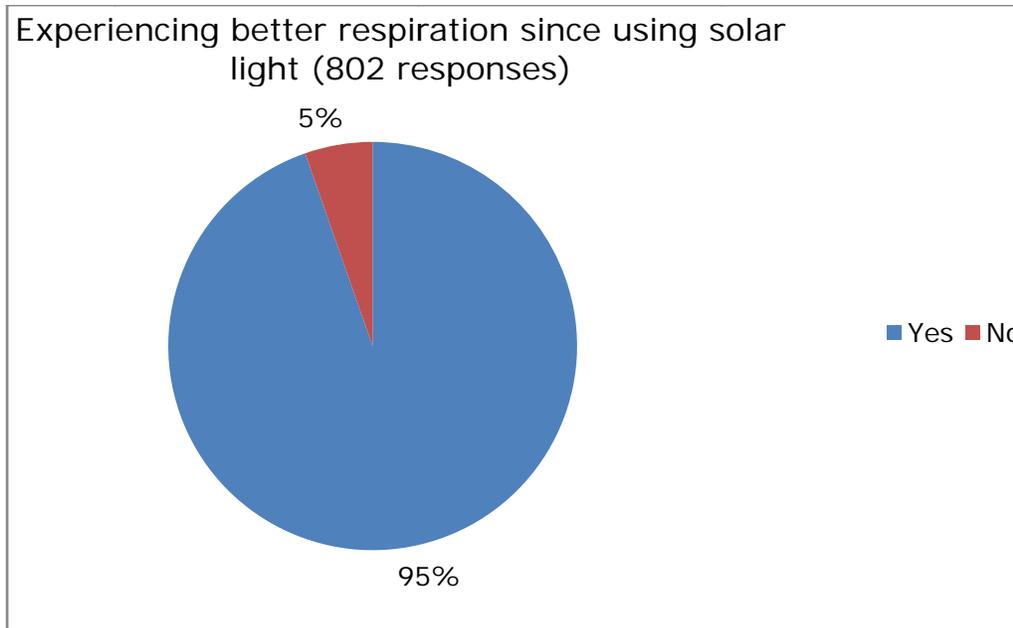
When breakages were indicated, the assessment sought to establish the causes of the breakages. The recipients responded that some solar lights just suddenly failed to charge, the cause of which was unknown to the users. Others had been damaged due to rats chewing the cords. In some cases the recipients suspected the solar batteries died. In other cases the charging pins had been broken. There were also cases whereby the panels had been accidentally broken by children while playing. Also, in some cases the panels had been broken after being blown by the wind from house roofs. There were also 4 incidences of stolen solar lights from elderly recipients.

On the issue of whether recipients noticed any health benefits from using solar lights 785 (97.9%) recipients self-reported that they experienced improved health indicators, while the remaining 17 (2.1%) recipients indicated no discernible benefit.

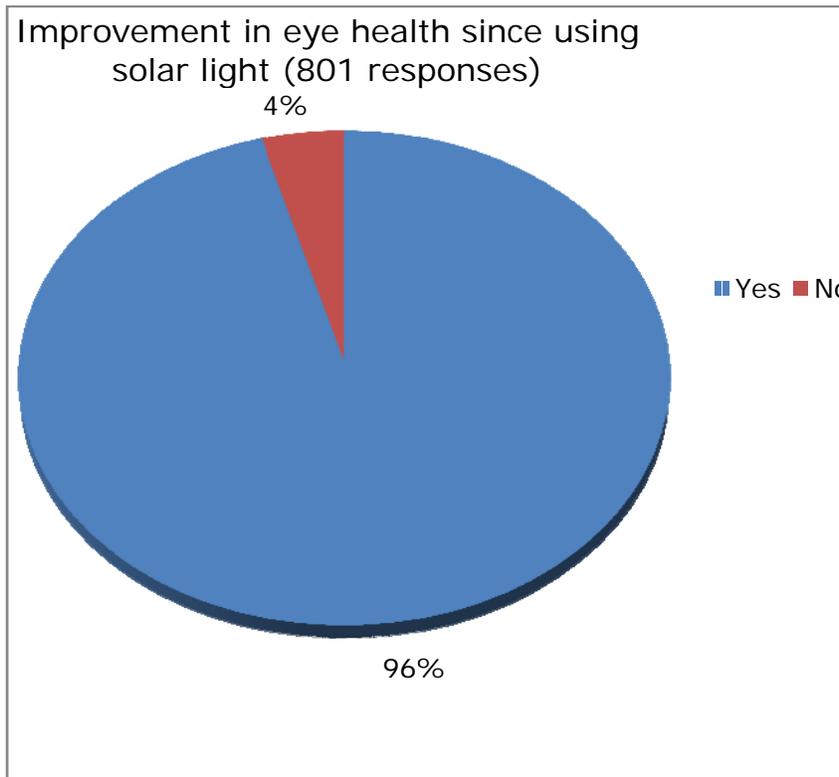


For those who noticed health benefits, most recipients noted that solar lighting does not produce dangerous and dirty smoke. This was followed by the perceived reduced risk of fire accidents, reduced risk of fatal respiratory problems, good quality of air for inhalation, reduced complaints of vision related problems (such as eye irritation and eye strain), not causing electric shock, reduced risk of accidental ingestion of kerosene by young children, the availability of light for people to wake up and take medicine, reduced incidences of injury while walking at night, enabling recipients to save money for medication, reduced risk of snake bites at night, and scaring away rats hence the reduced risk of contracting rat related diseases.

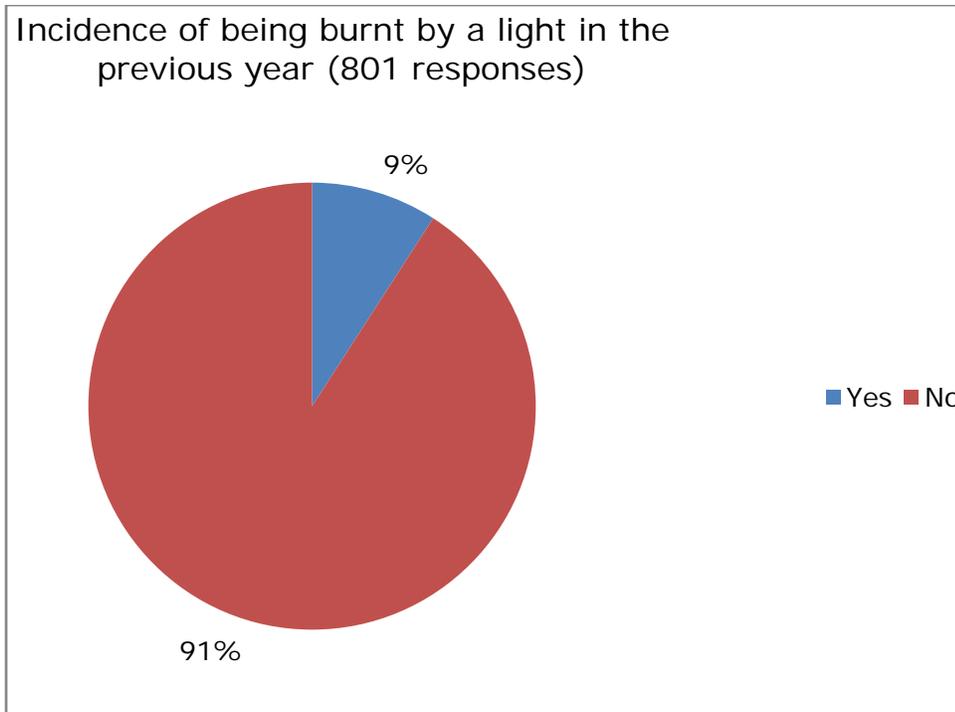
The assessment also asked whether the recipients or anyone in their homes had experienced better respiratory health since using solar light. In their responses 759 (94.6%) responded in the affirmative while the remaining 43 (5.4%) recipients responded in the negative. The results are an indication of positive impact on self-reported health indicators.



Another question asked was whether the recipients or anyone in their homes had experienced an improvement in eye health or reduction in eye irritation since the families started using solar light. 766 (95.6%) recipients responded yes, while 35 (4.4%) recipients responded no.

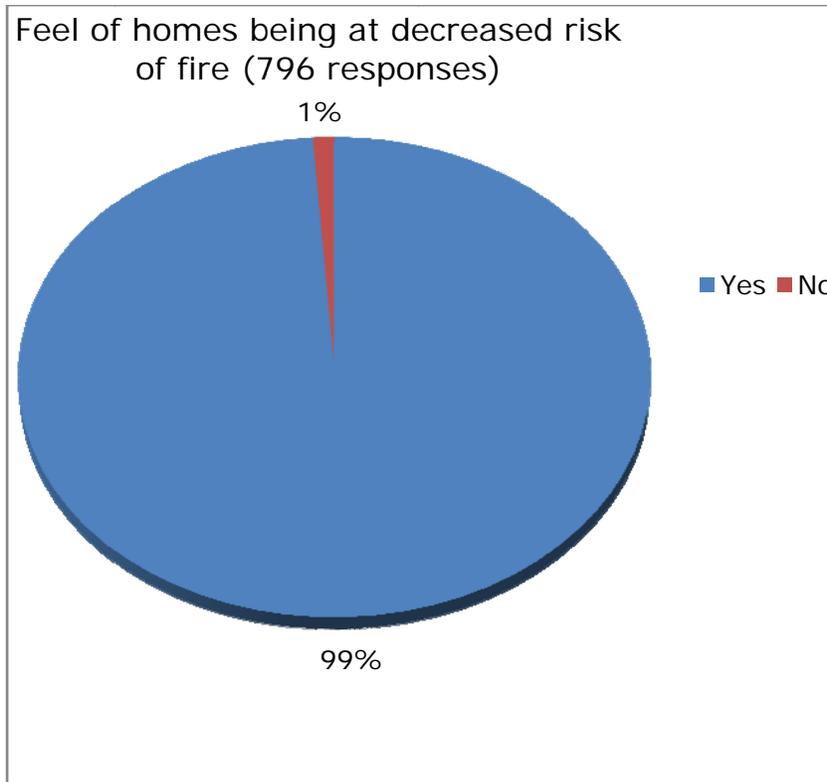


The assessment sought to establish whether recipients or anyone in their homes had been burned in the last year by a light. Only 73 (9.1%) recipients responded affirmatively, while 728 (90.9%) recipients responded negatively.

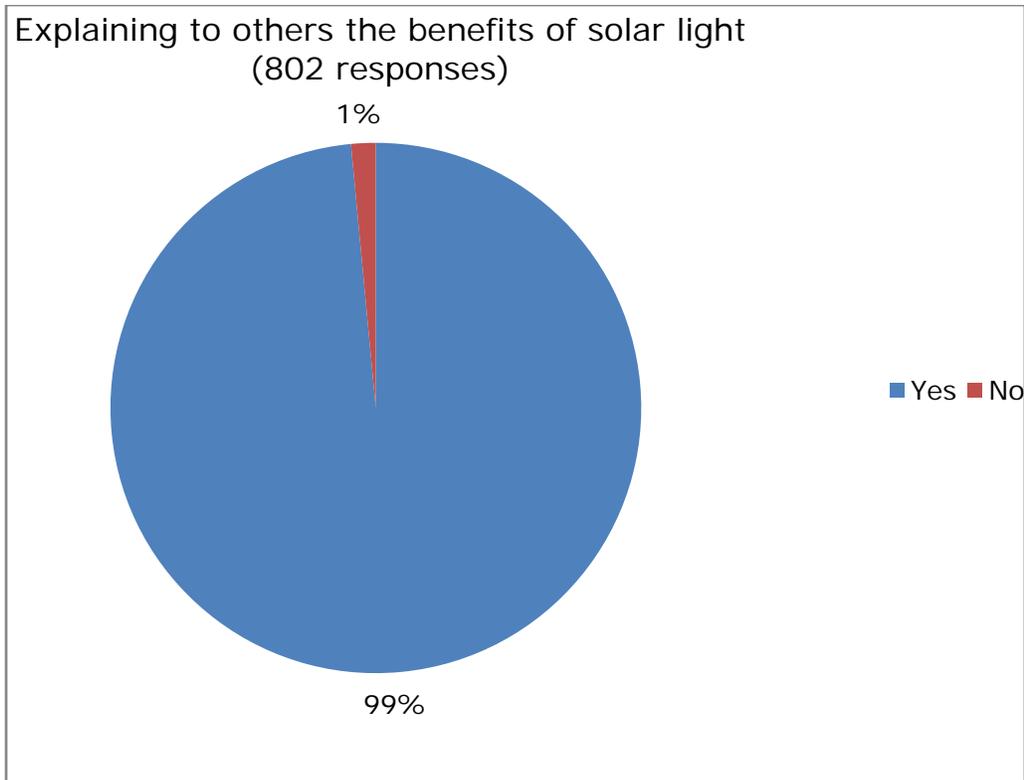


In situations in which a family member had experienced a burn since using the light, most incidences were due to large family size and the inability of a single solar light to meet the full lighting need of the household. As a result of incomplete need being met, many large families continue to use open-flame lights in their homes resulting in an ongoing rate of childhood burns.

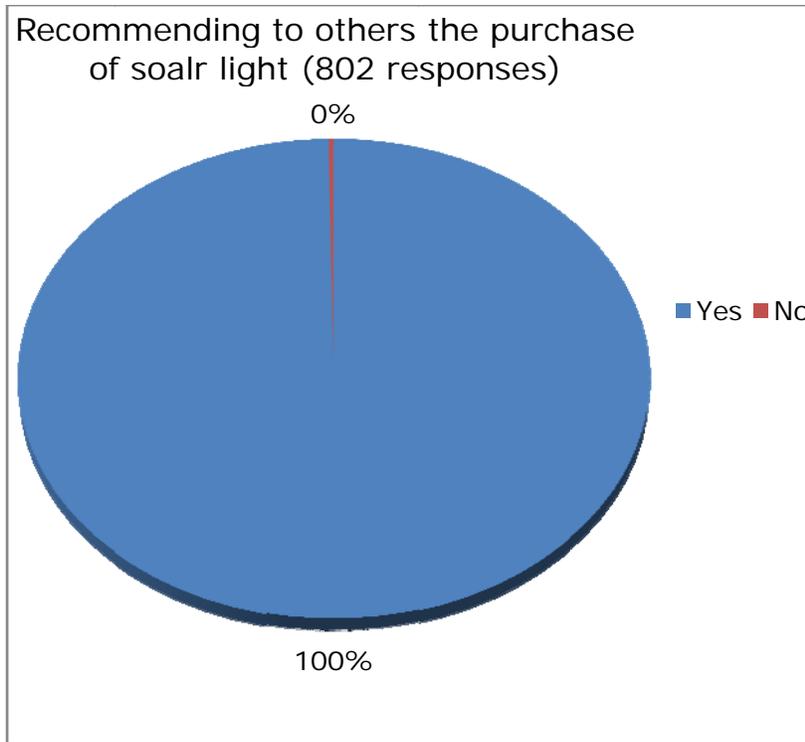
The questionnaire sought to determine self-reported rates of fire safety and wellbeing. When asked whether recipients felt that their homes were at decreased risk of fire now that they were using their solar light, 787 (98.9%) recipients responded affirmatively, while 9 (1.1%) recipients responded negatively.



A stated goal of Let There Be Light International's Solar Lantern Program is to expand community-level awareness about the benefits of using safe, renewable solar lighting on a residential basis and to promote the expanded uptake of solar products by off-grid communities. To that end, the questionnaire asked recipients about their communication patterns with family and community members about their solar lights and its perceived benefits. 790 (98.5%) recipients indicated that they had explained the benefits of their solar light to friends and/or family members. The remaining 12 (1.5%) recipients had not explained to others the benefits of their solar light.



The assessment exercise also sought to establish whether recipients would recommend the purchase of a solar light to friends or family members basing on the recipients' experience. 800 (99.8%) recipients responded that they would recommend the purchase of a solar light, while the remaining 2 (0.2%) recipients indicated that they would not.



These results indicate that the vast majority of solar light recipients felt that they had significantly benefitted from using their solar lighting to the extent that they were willing to recommend the purchase of a solar light to friends and family members. This high rate of satisfaction and the potential for referrals should be noted as a key component of awareness raising and market building in remote off-grid areas. In fact, despite receiving a donated solar product, these 802 recipients would recommend the purchase of a solar product to others. The implication of this finding is that LTBLI's solar light distribution program among the extreme poor is seeding the market for solar energy vendors in the country.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Overall conclusion#

Basing on the results of the assessment, the overall conclusion is that the solar light distribution program has greatly and positively impacted the energy poor communities in the districts of Wakiso and Gomba by enhancing economic stability, supporting educational outcomes, improving indicators of health and well-being, increasing the safety of recipients and their families. Furthermore, the solar light distribution program is effectively building awareness about off-grid renewable and seeding markets for solar products in impoverished off-grid communities in Uganda.

4.2 Specific conclusions#

Basing on the interpretation of results obtained from analyzing the assessment data, the following specific conclusions were drawn:

4.2.1 Benefits from solar lighting have greatly impacted the recipients

- Most recipients (97%) retained the lights for 6 months or more, handling them with great care after realizing the benefits of using the solar lights.
- Most recipients (98.5%) had made efforts to explain the benefits of solar lighting to other community members.
- Most recipients (99.8%) were willing to recommend the purchase of a solar light to a friend or family member.

4.2.2 The safe, renewable solar lights have effectively replaced the dangerous, dirty, expensive forms of lighting previously used by the targeted recipients.

- Previously, most recipients (79.4%) were using kerosene and wax candle lighting. However, only 35.5% now still use the dangerous forms of energy and 64.5% now solely use their solar light
- Most recipients (98.4%) use their solar light for 7 nights/week
- The majority of recipients use their solar light for 5 or more hours/night

4.2.3 Using a solar light has impacted economic stability among households

- All recipients surveyed were previously spending on lighting. Now, 66.8% of recipients no longer spend on lighting
- Most recipients (96.4%) are currently saving money on lighting expenditure.
- Recipients are using their savings to pay school fees, buy food, medicine, clothes, and for rent

- Few recipients use their solar lighting for income generation purposes

4.2.4 Solar lighting has supported the education of children among recipient households

- 98% of recipients with school-aged children indicated improvements in academic grades
- 82% of the solar light users were children. Since children are the major users of the solar light among household members and most recipients use their solar lighting for 3 or more hours per day, the solar lights are being used broadly for educational pursuits.

4.2.5 Use of solar lighting has impacted health benefits upon recipients

- 97.9% of recipients surveyed indicated that they noticed health benefits from using solar lighting
- 94.6% of recipients had noticed better respiratory health among members of their households
- 95.6% of the recipients had noticed an improvement in eye health among their household members

4.2.6 Using solar lighting has provided safety benefits to the recipients

- 99.1% of the recipients surveyed indicated that they use solar lighting for safety purposes
- Some recipients use solar light to scare potential thieves at night
- Other recipients use the solar lighting to scare away rats within houses
- Other recipients use the solar light to avoid snake bites at night
- 98.9% of the recipients felt that their homes were at a reduced risk of fire

4.3 Overall recommendation#

The overall recommendation is that the project should continue to address energy poverty through the provision of safe solar lights to at-risk, vulnerable community members living in off-grid areas of Uganda. To further improve programming, LTBLI and KACCAD should consider program refinements that address education, outreach, product failures, market enhancement, and pre-distribution data alignment.

4.4 Specific recommendations#

The following are the specific recommendations:

- a) There is the need to educate recipients about the proper care and handling of their solar lights for increased durability, pest control and theft. Also, lights with integrated solar

panels would eliminate issues with wires and breakage. In this way solar light breakages and losses will be minimized.

- b) Large families should be allowed to receive more than one solar light (depending on family size) to eliminate the usage of kerosene and other dangerous lighting sources.
- c) Advocacy and educational outreach should be intensified during distributions to encourage the increased adoption of solar lighting in order to mitigate burn rates and other health risks associated with nonrenewable lighting sources.
- d) In order to align distribution data collections and follow-up assessments, pre-distribution rates of burns, measures of academic performance and health status data should be collected by LTBLI and its distribution partners.

5.0 APPENDICES

5.1 Survey tools

Let There Be Light International's Solar Light Impact Assessment Tool 2016

Program Tool of Let There Be Light International (copyright)

* Required

1. Survey Date *

Example: December 15, 2012

2. What is your name? *

given name / family name

3. What is your solar light recipient status? *

choose all that apply

- Handicapped
- Student
- Orphan
- Widow
- Elder
- Others

4. gender *

Mark only one oval.

- Male
- female
- other

5. What is you occupation?

6. Employment Status *

Mark only one oval.

- Employed
- Unemployed

7. Location *
Impact Assessment Report 2016

Mark only one oval.

Gomba

Wakiso

8. How many people live in your household? *

enter a single number

9. How many months have you had the solar light? *

check one

Mark only one oval.

6-12 months

2-18 months

36 months

10. Do you still have the light? *

Mark only one oval.

yes

no

11. If you do not have the light, please explain why not. *

12. How many nights per week is the light used? *

enter a single number

13. How many hours per night is the light used? *

enter a single number

14. Do you use other sources of light? *

Mark only one oval.

Yes

No

15. What kinds of other lighting sources do you use? *
Impact Assessment Report 2016

check all that apply

- Kerosene
- Wax Candle
- Battery Torch
- Other

16. What kinds of lighting sources did you use prior to receiving your solar light? *

check all the apply

- Kerosene
- Wax Candle
- Battery Torch
- Other:

17. Before receiving a solar light, about how many shillings did you spend per week on lighting? *

Mark only one oval.

- 0-2,499
- 3,000-4,999
- 5,000-7,500
- more than

18. About how many shillings per week do you currently spend on lighting? *

Mark only one oval.

- 0-2,999
- 3,000-4,999
- 5,000-7,500
- more than 7,500

19. Do you spend less on lighting per week now than you did before receiving a solar light? *

Mark only one oval.

- Yes
- No

20. If yes, how much money do you save each week by using the solar light?

enter a single number

21. If you spend less now, what do you use the money saved on? *

check all the apply

- School fees
- Food
- Medicine
- Other:

22. Who in the family uses the solar light? *

check all that apply

- Child(ren)
- Adult(s)
- Elderly
- Other:

23. What is the greatest benefit, if any, of the solar light? *

24. Is the solar light used for school work? *

Mark only one oval.

- Yes
- No

25. If yes, how many hours per night is the light used for school work? *

Enter a single number

26. If yes, have there been any improvements in grades or scores by the student(s)?

Mark only one oval.

- Yes
- No

28. Is the solar light used for chores? *

Mark only one oval.

Yes

No

29. Is the solar light used for income generating activities? *

Mark only one oval.

Yes

No

30. If yes, what activities?

31. If yes, how many extra shillings do you
now earn per week?

enter a single number

32. Is the solar light used for safety at night? *

Mark only one oval.

Yes

No

33. Has your solar light ever broken?

Mark only one oval.

Yes

No

34. If yes, what went wrong and what did you
do?

35. Do you notice any health benefits from using your solar light? *

Mark only one oval.

Yes

No

37. Have you or anyone in your home experienced better respiratory health since using your solar light?

Mark only one oval.

- Yes
- No

38. Have you or anyone in your home experienced an improvement in eye health or a reduction in eye irritation since using your solar light?

Mark only one oval.

- Yes
- No

39. Have you or anyone in your home been burned in the last year by a light?

Mark only one oval.

- Yes
- No

40. Do you feel that your home is at a decreased risk of fire now that you use a solar light?

Mark only one oval.

- Yes
- No

41. Have you explained the benefits of your solar light to others in your community? *

Mark only one oval.

- Yes
- No

42. Would you recommend the purchase of a solar light to a friend or family member based on your experience? *

Mark only one oval.

- Yes
- No

5.2 PHOTOS



5.3 References

Kyosiga Community Christian Association for Dev't & Let There Be Light International. (2014). *Baseline Survey Rrport On Solar Light Needs Of Communities In Gomba*. Wakiso,Uganda: KACCAD & LTBLI.

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