Annex Two - Solar Lantern Household Testing Exercise

Nakuru, Meru and Machakos Districts, Kenya

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1. Background

Having created a number of working prototypes the household testing exercise in Kenya has been carried out to measure customer's reactions to the new design for the Lantern. In particular the exercise was designed to test customer reaction to;

- the overall performance of the lantern in terms of charge time, light time, level and quality of light,
- the perceived usefulness of the additional features (radio connection, mains charger etc)
- any feed back from customers on colour and form of the design,
- ability to purchase the lantern at a given price.
- Indication of overall demand for the product.

In addition the tests were designed to highlight;

- any technical problems and potential failure modes,
- any problems for users in understanding the operation of the lantern.
- Suggestions on the product could be improved.
- Preliminary trade off analysis of lantern features against incremental change in price.
- Feedback on suggested names for the lantern.

Thirty prototype lanterns were distributed in Kenya in three different areas using two distinct distribution channels. Participants were asked to buy lanterns rather than to accept them on loan in order to measure true "customer reaction".

Firstly, a batch of 15 was sent to a well established farmers community group (SCODE) operating 8 km from Nakuru. Members of the group are small-scale farmers who are currently off-grid and who have no prospect of connection within the short or medium term. As such they are representative of a significant section of the rural community in Kenya and the Lantern's potential market. Lanterns were distributed to members of the group, who paid a deposit and agreed to later pay the balance or return the lantern for a refund. At this stage the demand for lanterns in the group quickly outstripped supply and led to a total of over fifty enquiries from individuals interested in purchasing a lantern under the same arrangement.

The second batch of 12 lanterns were sold through solar equipment dealers in two district towns serving large rural areas. A site in Machakos (covering Machakos, Kitui and Makueni districts in Eastern Provence) and one in Meru (covering Mount Kenya region) were chosen, and each was given 6 lanterns to sell.

The distributions all took place between mid December and mid January. The last batch of lanterns to arrive was sent to Machakos in mid January, a difficult month to sell, making the dealer's task there even more demanding.

The lanterns were supplied with a solar module, radio, and a dc-dc converter for using the radio from the module. Extras available were Extension lamp, AC mains charger and DC vehicle charger. As a power source, all lanterns used 10 Wp Millenia PV modules manufactured by BP Solarex.

2. Methodology for data collection

Data was collected using two techniques.

A questionnaire was completed by all lantern owners with the help of a trained enumerator, this was designed to assess the issues that the testing was aimed to capture along with other points that the owners themselves wished to discuss. This can be found in Appendix One.

Focus groups were then used to discuss issues surrounding the lantern. Lantern owners, along with solar technicians, solar shopkeepers and other interested parties attended the focus groups. The aim of the focus groups was to discuss issues surrounding the lantern and its applicability to the local market, to build consensus on questions and topics raised and in one situation (SCODE) to discuss payment regimes.

3. Results of the surveys

3.1 Profile of customers Meru/Machakos

All lanterns were sold through shops and businesses which currently sold and installed Solar Home systems. The customer group was made up from 4 teachers, a driver, a shopkeeper and a clerk. Buyers were all males with ages varying from 25-47 years old, the average being 38.

Most of the lantern buyers (5 out of 7) were individuals who currently had working or failed solar home systems. The remaining 2 used kerosene lamps for lighting. The owners had in general a good awareness of PV and were keen to get another system.

3.2 Profile of customers Nakuru.

The 15 customers from SCODE were predominately farmers (8), although 4 were teachers, 2 were government officers and 1 was a retired driver. There were 9 males and 6 females in the group with ages varying from 32 – 57, the average being 44. The farm sizes in the area are small, ranging from quarter of acre to 5 acres, with the majority of the farmers having 2 to 3 acres of land. They usually cultivate maize and beans during the long rains and vegetables during the short rains. The period when the farmers have disposable income coincides with the short rains and vegetable selling, as the maize and beans are used for subsistence. The group from Nakuru were overall from a lower income group although this has not been quantified accurately.

3.3 Expectations at time of purchase.

Expectations of the Lantern from customers was similar across all groups. All but one of the users expected the lanterns to provide better quality lighting and to reduce their dependence on kerosene. One lantern owner (in Machakos) purchased the lantern with the primary intention of charging his mobile phone.

In particular customers said the following features caused them to purchase the lanterns:

- It looks good and is attractive,
- The Lantern is clearly portable (unlike a solar home system),

- The Lantern is easy to maintain unlike a kerosene or pressure lamp,

3.4 Lantern performance

During the trials, the average length of time the lantern was reported as providing light for was 3.4 hours, although 69% of respondents found that the lantern gave 4 or more hours – which was the design specification figure. Some lanterns were found to show decreasing levels of performance in terms of light duration, but this was probably due to battery discharge during transit leading to lasting damage. In fact, several lanterns were not working and had to have new batteries before they could set out into the household testing due to this same problem. This problem has been addressed by defining changes to the charge controller.

One participant in Nakuru had kept a daily log of how long the duration of light from the lantern lasted. In over 35 cycles it had lasted over 4 hours in all but 2 instances and would often give up to 4.5 hours of light.

Most users connected the lantern for charging in the morning, the average time being between 7:00 and 8:00 am. Some left the lantern out all day, but others noticed when it was fully charged and stop charging then. In these cases customers sometimes used the panel for other purposes after the lantern was fully charged. On average the lantern took 5½ hours to charge, and this is in line with the predicted performance characteristics of the lantern, battery and 10 Wp solar module.

3.5 Lantern Use

Lantern use amongst different members of the family was roughly equally spread. Of the stated “main users” of the lantern, 40% were women, 30% were men and 30% were children. It was noted in some interviews that the lantern was a source of competition amongst family members with each household member wanting to use the lantern for her/his own purpose.

According to the survey, the room that the lantern was used in most often was the living room (76% said that this was the room they used it in most). Some used the lantern in the bedroom, but only 23% said they used the lantern at all in the kitchen (all but one of these families had alternative power sources for electric light at their house). This seems to point to the fact that the kitchen is seen as low priority when it comes to providing light.

Only 10% of users suspended their lanterns using the hook feature. Comments received surrounding this point are that people fear it will fall and break, and some lanterns due to the nature of prototyping had “loose” insides and would not perform as technically well when hung upside down. Most owners were happy to place the lantern on a table, cupboard or bookshelf, but the hook feature does have its uses.

42% of users listened to the radio for an average of 9 hours per week and 26% of owners used the extension lamp around 5 times per week. While this depended on the personal preference of the user, several owners admitted that they didn’t use the radio or lamp because they wanted as much lighting time from the lantern as possible.

3.6 Savings

Most of the users agreed that the monthly expenditure on the use of kerosene has reduced dramatically. 53 % of people saw a decrease in the amount they spent on lighting (kerosene, batteries for torches, recharging of lead acid batteries). 36%

reported that their expenditure had remained the same (but that they had enjoyed an increase in the overall quantity and quality of light once they had purchased the lantern), the remaining 11% were not aware of the exact change in their expenditure.

Were there was a saving, this averaged Ksh 95 per week, which translates into a saving of over £3.50 per month. The figures however, vary widely and more data and analysis is needed to find accurate cost savings as some respondents found it difficult to put an exact value on the savings. While participants use the lantern as a torch to go out of house, it is not clear whether the bill for torch batteries has drastically gone down, but for radios it is clear that those who use the lantern radio spend significantly less on batteries.

Overall the figures show that there is a genuine demand amongst customers for a product that will reduce the cost of lighting their homes and that they are prepared to invest a significant amount to see these long term savings, along with having an improved lighting system in their homes.

3.7 Lantern Pros and Cons

The following advantages of the Lantern were perceived and reported by all customers

3.7.1 Pros

- the lantern is portable,
- the product is clearly of good quality,
- the lantern operates cleanly without soot
- it produces good quality light
- it results in savings on kerosene and gas
- it is convenient to use

Most of the customers commented positively on the shape and the colours of the lantern. This shows that good product design is an important aspect of customer satisfaction even in developing countries.

We were aware that the lantern is relatively heavy by European standards (3.3kg - predominantly the battery) but no one complained about the weight. In fact some customers mentioned that the weight of the lantern was good in that it made it feel sturdy.

3.7.2 Cons

The following drawbacks of the lantern kit were identified by customers;

- Duration of operation shorter than desired
- PV Modules cannot be used to charge another battery

3 customers mentioned that the light was very bright and was not comfortable to their eyes (all had previously had been using kerosene lamps). All three were over 50 years old but the state of their eyesight was not known.

To counter this, two other elderly users reported that the lantern has enabled them to read for much longer than previously. With kerosene, their eyes “hurt after a short while”, but now one stated that “even my wife is staying up reading all night”

3.8 Desired Improvements

Despite the variety in the profile of individual customers the suggested improvements to the lantern design were consistent across the groups. Customers asked for;

- longer duration of light,
- bigger battery (with greater capacity to store charge),
- more and brighter extension lamps.

The three primary improvements that arose from the interviews and all the focus groups are for longer duration, a bigger battery and more and brighter extension lights. All these improvements relate to increasing the overall output of light and have a cost implication. When the implication on price was explained to the participants, all were quick to state that they would accept the current lantern at the current price.

Other improvements were suggested to a lesser extent below (one or two customers in each group), and many of them will be incorporated into the production model of the lantern.

- Battery charge/discharge status indicator not clear to all users
- The time period between warning signal and switch off when the lantern battery reaches its lower limit is not long enough
- The On/Off switch is confusing
- Charge port and radio outlet port s not well labeled
- Circuit board was seen in some cases not to be reliable
- The lantern design should allow easier access to the battery
- A feature of the lantern/kit should include a battery tester to allow measurement exact state of battery charge
- The radio provided should be capable of being powered with dry cells as well as from the lantern output
- The panel provided should be capable of charging other appliances
- There should be an option to run a television from the outlet socket on the lantern
- The Lens should be made clearer in order to give a better light quality
- Some lantern prototype developed cracked casings

3.9 Price sensitivity

An overriding aspect of both the questionnaires and the focus groups was that this is a very price sensitive market. At the shops which took part in the study, the lanterns were sold for 7,500 Ksh with 57% of customers paying cash, and the rest leaving a deposit and paying in instalments.

When interviewed, dealers said the price they could sell the lantern for was around 6,600 Ksh, but end users in the focus groups tended to settle on a price of 6,000 Ksh. If the price was raised to 6,600 Ksh less than half stated that they would buy it and none said they would pay more than 6,900 Ksh.

At SCODE community group, everyone had put down 1,500 Ksh as a deposit and a focus group was arranged to settle the price. Payment by instalments was a system that customers were used to, with rapid payment leading to a discount. The price was set at 7,400 Ksh payable in August (six months after initial lantern purchase agreement), but immediate payment lead to a discount of 2,400 Ksh and other discounts were available at each month end.

The project costing analysis has lead to the conclusion that a final selling price of USD 100 can be accomplished and presently this equates to around 7,500 Ksh.

4. General market size for the lantern*.*

Although the survey was primarily intended to provide feedback on the technical design and performance of the lantern, the opportunity provided by the household testing was also used to get an indication of potential demand for the product.

The demand that was stimulated by an increase in awareness of the product created by those using the lantern as part of the test, has far exceeded the expectations of all those involved in the project. Both dealers who were involved in the household testing exercise have commented that they would like to have more lanterns to sell, as they know of several people willing to buy straight away. SCODE community group had over 50 people offering to be part of the household testing and now has many individuals and groups wanting to know when the lanterns will be for general sale in Nakuru. Although the evidence is qualitative rather than quantitative, there is without doubt a very high level of potential sales in the areas where the lantern is known. The lantern also attracted some national press coverage (Daily Nation) which led to the Nairobi office of ITDG EA being inundated the with calls.

5. Name for the lantern

As part of the focus group work, users were asked to indicate their preference for a number of brand names for the lantern. The users who had the opportunity to give their views on the name seemed not to have noticed that the lantern did not have a brand name. The groups were provided with 9 names which had been selected from a list of several hundred generated by ITDG supporters. No one name received overall backing. The conclusion is that the users did not have any major concerns with the name of the lantern. Their main concern is with the pricing and the performance.

6. Comments on suggested improvements

The purchaser criticisms of the lantern, and the desired improvements, all have to do with limitations of the lantern in its output. All these are price related. A larger battery, a brighter extension lamp, longer hours and brighter lights all require more power and hence a more expensive product. Again this shows how rapidly end-users expectations increase and outgrow the small energy supply capacity of the available system.

While stating a wish for more light and power output, none of the individuals or groups interviewed stated that the present output or duration of light was unacceptable.

- One solution regarding the length of light duration is available. A proposal was put forward to participants to exchange the 7W fluorescent tube for a 5W tube. This would lead to 5½ hours light time as opposed to 4 hours, but a reduced

lumen output from 400 to 250 lm. In interviews, 44% of owners would want a 5W bulb, rather than a 7W, but the difficulty lay in explaining the difference between 7W and 5W to people, who were apprehensive of any mention of less light output from the lantern. The focus groups gave an equally ambiguous picture with audiences split roughly 50:50 as to whether a 5W tube giving more hours is better than a 7W tube.

- The status indicator will probably be changed to two separate LEDs to provide better understanding of the state of the lantern, and to help overcome confusion regarding the On / Off switch. Some respondents felt they were leaving the lantern on, when it turned itself off, and were trying to press the switch to then turn it off. Some users mentioned that the LED was hard to see when the lantern was on, on in direct sunlight, so further work on the light pipe detail will address this problem.

- The warning flash built into the circuit board will be increased from 5 seconds before disconnect to around 60 seconds to give people longer to find alternative lighting.

- The input and output sockets will be labeled with symbols understandable to non-English speaking and illiterate users.

- Circuit board reliability is constantly being improved upon, and further design and de-bugging of the circuit will continue until it is perfect.

- Radio dry cell connectors were removed as part of the testing so that radios stayed with the lanterns. This doesn't have to be the case on the production models, and one enterprising owner had already taken his radio to an electrician to get the leads reconnected for using dry cells.

- The 10Wp panels gave ample time available for charging other equipment once the lantern was full. The production models will be supplied with a smaller panel that will need nearer to all day to receive a full charge. This will give a lot less time for charging other applications, although it would be possible to supply adapters separately to those who want (and can pay for) them.
- Television is a big draw for people, as Black and White 12V televisions are becoming available cheaply (USD 50). Many people asked about using the lantern to power these sets. The current battery would be big enough to give power for a conventional 12V TV for a short period only. Currently the outlet is protected against using these and other high power appliances by an internal resettable fuse. The lantern is capable of powering the smaller LCD type, hand held TVs although the cost of these is still high.
- Easier access to battery compartment can be achieved by supplying the lantern with conventional slot headed fasteners. The prototypes used for the household testing were fitted with Allen headed fasteners in order to prevent unauthorised access and tampering with the charge controller. This is generally required by manufacturers if they are to offer a warranty for the product.
- The body and some internal components of the lantern seemed susceptible to cracking. Two of the lanterns that were returned to Nairobi offices for repair had cracked casing. The prototyping process (silicon tooling and cold cure polyurethane resin) does not enable the use of materials such as glass filled. This inevitably results in a prototype with slightly different mechanical properties. The production material (glass filled polypropylene) has been carefully selected

with the working conditions of the lantern in mind and we are confident that the production models will be strong enough to withstand the predicted wear and tear. Where prototypes have shown signs of moulding failure, the opportunity has been taken to develop features such as corner radii and wall thickness' to increase strength and diffuse zones of high stress.

7. Conclusions

The users expressed concern on the availability of technicians to fix the lanterns once they develop problems. The project team is aware of this and any company taking on the distribution of the lanterns will need offer good after sales service to lantern owners. Spare parts for the repair of the lantern will be available once the lantern is put in the market to give the best possible after sales service.

As a result of the exercise it has become clear that the lantern is viewed by its users as a very important component in improving their everyday lives.

There are clear impacts on lifestyle such as the fact that the lantern leads to savings through reduced use of kerosene, it produces no smell or fumes, it operates silently and produces a quality of light that is a noticeable improvement on kerosene alternatives. Perhaps one of the simplest but most significant impacts is that it allows people to extend their waking and productive hours. In the words of one user, "with my hurricane lamp every hour of light uses more kerosene so to save money I switch it off and go to bed, with the solar lantern our light is free".

8. Images

Checking Livestock - Nakuru

Studies after dark - Nakuru

Listening to the midday News - Meru

Extending working hours - Meru

Finishing an important order - Nakuru

Wood working at night - Nakuru

Appendix One

Solar Lanterns Market Testing Report

Nakuru District Kenya

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Thursday, May 18, 2000

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Background

The solar lanterns were designed with inputs from the potential customers gathered before the design was done. One of the main issues of concern was the cost as it determines the acceptability and also the competitiveness of the product with other solar products especially the small (10Watts) solar home system. The costing aspect is rather complicated by the fact that a trade-off has to be reached between desirable features with incremental cost of the lantern. The market test was therefore meant to determine those priority attributes that the customers view with interest and concern and the desired cost of the lantern. Once determined, the information is to be used during the finalisation of the design and in the manufacture of the lantern.

1. Market Testing

Market testing started in December 1999 and continued over the months of January, February, March and April 2000.

2. Expected outcome

The market testing of the prototype lanterns was aimed at providing the following information: -

- The overall acceptance of the prototype and the price.
- Specific customer feedback on lantern characteristics like weight of lantern, light colour, intensity and shape of the unit.
- Suggestions on product improvement.
- Trade off analysis of the different features against incremental changes in product price.
- General market size of the lantern.
- Name of the lantern

3. Methodology

The prototype lantern market testing was done in two approaches. The direct marketing of the product to customers in the rural areas and the sale of the lanterns over the counter in shops selling solar products. The ITDG EA Energy Programme was supposed to carry out the direct marketing approach. It was carried out with the assistance of an NGO, which works with the community members in the testing area. The NGO's name is Sustainable Community Development Services (SCODE). SCODE is also implementing a solar home system project on the basis of cost sharing. This made it easier and quicker to establish a rapport with the communities. The quick rapport establishment was necessary as the timing and the effectiveness of the testing was crucial.

The process

A focus group meeting was organised with potential customers and they discussed among other things the price and the operations of the lantern. An agreed price of Ksh 5000 was wholly accepted as the most affordable to the majority of the potential customers but the

selling price of the lantern was agreed to be Ksh 7500. A demonstration of the lantern and how it works was also done and an agreement on payment regimes was reached. The customers were requested to pay Ksh 1,500 as down payment and the rest to be paid later.

A contract was drawn for the customers and signed when collection of the lantern is made. It was meant to bind the customers (users) to an agreement that they will honour the conditions set for the testing of the prototype. Customers were made aware that the lanterns are prototypes and they will be expected to participate with the project team on the testing process. They were also informed that there are possibilities that the lanterns might not work as well as they would expect, as they are prototypes.

There were 15 lanterns to be tested in Nakuru. The meeting and the discussions were made in December 1999. During this time an arrangement had been reached with a private firm Solagen ltd. to supply the solar panels to the customers. The period coincided with the Christmas season and the solar panels were delayed and some reached the customers in January although the solar lanterns were bought as early as Mid-December. The delay caused some problems and anxiety, which will be discussed in detail later in the report.

After the panels were delivered, the testing continued and the months of January is regarded as the time the testing started in earnest. The testing was carried out through the months of February before the first visit was made to check on how the lanterns were performing.

A questionnaire was conducted which had questions to help assess the issues that the testing was aimed to capture. Another focus group meeting was organised and the details of the progress of the testing were discussed. The other major issue that was discussed was the pricing of the lantern and the payment regimes. A set of agreements was reached on when the customers would clear the balance and the increase in cost of the prototype lantern as the payment is delayed. The final cost of the lantern was fixed at 7,400 to pay in July 2000.

5. Results of the survey

5.1 Family situations in the test area

The average family size like any other area in rural Kenya is 6. The farm sizes in the area are small ranging from quarter of acre to 5 acres. Majority of the farmers are small holder with 2 to 3 acres of land. They usually cultivate maize and beans during the long rains and vegetables for sale during the short rains. The period when they farmers have disposable income coincides with the short rains as they cultivate maize and beans for subsistence during the long rains. Some of the farmers get extra income from sale of milk and gifts from their relatives who are working elsewhere from the Bahati region. Sometimes the farmers are involved in other activities to assist in getting income for the families such activities include: sale of second hand clothes, sale of vegetables on kiosks and repair of various things for other people among other activities. The farmers also

own, chicken and livestock (goats and cows) for milk. Some plant fruits and vegetables including bananas

5.2 Overall acceptance of the prototype and the price.

The overall acceptance rate can be gauged from the queue that is waiting for the lanterns, the people who have approached the ones with the prototypes and the many inquiries including the fact that even those whose lanterns performed dismally, the enthusiasm to own now is still there. Some customers have expressed the need for having two. The other aspects that show acceptance is the fact that dispute the fact that the acceptable price of the lantern is Ksh. 5000, the customers have continued to request for the lanterns even after it became clear that the price will not be lower than Ksh, 7500. Majority of the customers when interviewed in the focus group interviews and also when interviewed individually, they suggests that the price should be lowered to about Ksh. 500 although they still agree that they can still pay for the lantern at Ksh 800. They however, expressed the need for paying by installment.

The light was excellent compared with what hey used before and they use the lantern for other purposes such as moving with it in the dark outside the house when inspecting the cow pens at night. The users are finding the lantern useful for occasions such as church gathering (preaching that is done in homes at night), gathering in homes when there are visitors especially during occasions such as weddings. They also use it to read at night (the old read the bible while the children study at night)

One thing that is demonstrating acceptance is the fact that there is competition of the lantern among the members of the same family. For example the child want to read while the mother want to cook with it while the young men and women want to use it for other purposes

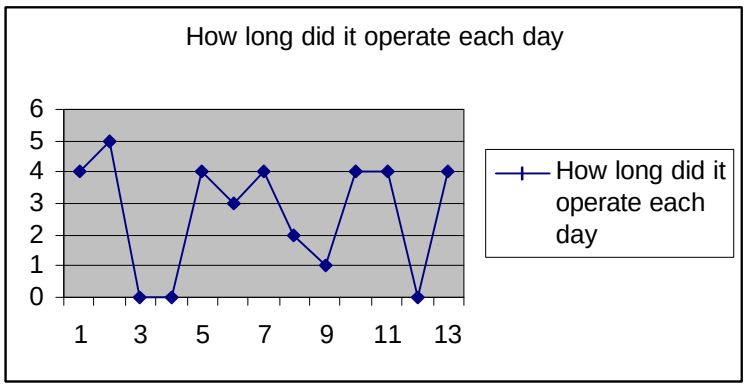
5.2.1 Expenditure of kerosene and others

All the users agree that the monthly expenditure on the use of kerosene has reduced dramatically. While they use it as a torch to go out of house, it is not clear whether the bill for the fry cells has drastically gone down for torches but for radios it is clear that it has really been reduced for those who used the lantern on the radio.

5.3 Specific customer feedback on lantern characteristics like weight of lantern, light colour, intensity and shape of the unit.

Most of the customers mention that the shape and the colours of the lantern are all right. None complained about the weight. They have not used all the features of the lantern for example the provision for hanging the lantern on the roof for better lighting. None of the users is hanging the lantern. They attribute this to fear of the risk of the lantern falling off the hook and getting destroyed. 3 customers mentioned that the light is very bright and it is not comfortable to their eyes. The three are elderly in their 50^{th} but we never followed it to know whether they have eye problem. The rest are happy with the light and some requested whether the translucent glass could be made transparent for better lighting. They are happy with the colour of light. None complained about the colour of light.

When the users were asked whether they would prefer less light for increased time of use. They agreed that they would rather have more light than less light with longer period. They were given the example of increasing the light from 4 hours to 5 hours by using a 5 watt bulb which is slightly cheaper rather that the 7watt that gives 4 hours but slightly more costly. (NB: the price difference is negligible for the two bulb sizes so can not be used for making the choice).



The lantern gave about fours hours of lighting as shown above.

5.3.1 Concerns raised buy users

The users were uncertain about charging time, as they could not tell how to assess it. They were advised that the charging time is normally four hours but they should use the light provided that flickers as it is charging and stops flickering after the lantern is fully charged. The concern was raised before the second focus group meeting but was clear after the explanation was done. Initially before the solar panels arrived, some users had used the mains electricity to charge the lanterns and it caused some confusion when they started using the solar lanterns.

5.4 Suggestions on product improvement.

Several aspects of the lantern were recommended for improvement. They include increasing the number of hours the lantern is able to give per night. This was discussed during the focus group meeting and it was agreed that it is only possible if the price will not be affected otherwise it is not possible at the moment as the price is still beyond what the accepted price is.

The other aspect that the users suggested that it should be improved is the switch. They would prefer one that can easily indicate when it is off and when it is on.

They would also prefer if the lantern could also be used with a black and white TV. It was discussed during he focus group discussions that this is not possible, as the battery provided in the lantern can not be used for that purpose.

Some suggested that the radio should be able to be used with batteries. The design team incorporated the aspect of the radio of not being able to use the batteries. It was a measure to ensure that the radio is only used with the lantern. This is a feature that had

importance only during the testing period and therefore not considered important for final product design purposes

5.5 Price sensitivity of the respondents

The customers are very sensitive to the price of the lantern. In fact, they are only happy with paying Ksh 5000. However, they suggest that for them to be able to pay more that Ksh. 5000, they should be allowed to pay in installments. The installments should be tied to the seasons that the farmers have income from the farms. It should be noted that for the lanterns to be sold nationally, the seasonal implication may be ignored and sales tied to school seasons rather than harvesting or planting seasons. It has been observed that users do not have disposable income when the schools are re-opening.

5.6 Comparative rating of the lantern with other light sources.

All the users rated the lantern very highly despite the fact that the circuit system failed in some of the homes by the time the survey was over. This might be explained by the fact that most of the customers have only the hurricane lamp or the pressure kerosene lamp to compare with, as the ones with solar home systems were not among the customers.

62 % of people saw a decrease in the amount they spent on kerosene once they had the lantern. This saving averaged Ksh 46 per week, which translates into a saving of around £1.50 per month. The figures however, vary widely and more data and analysis is needed to find accurate cost savings. The figure shows that the customers have got a genuine need of the solar lantern to reduce the cost of lighting their houses and that they are prepared to invest a significant amount to see these long term savings, along with having an improved lighting system in their homes.

The solar lantern is capturing the market that would like to purchase the solar home system but can not afford it. The lantern that were working perfectly gave about 4 hours of light each night as can be seen from the analysis. The users are happy with 4 hours but not less than that.

5.7 Trade off analysis of the different features against incremental changes in product price.

As earlier mentioned in the report, the users are not keen in increasing the cost of the lantern although they are keen on increasing the number of hours of lighting. The need however, is expressed in the open discussion with the users and after it is explained to them that any increment on desirable features will lead to increase in cost, they retract their opinion. This leaves us with two assumptions that the price is main determining factor in the adoption of the lantern and should be pegged as low as technically possible.

5.8 General market size of the lantern.

The demand raised by the awareness created by those using the lantern has been very. There is a women group that is waiting to here from SCODE when the lanterns will be available for sale. There are several reported cases of people waiting to be included in the lantern sales. This shows very high level of potential market in the areas where the lantern is known. The price of £ 80 does not seem to deter the market although we have

found out from the discussion with the community that £50 could have been the ideal price for the lantern.

5.9 Name of the lantern

The users who had the opportunity to give their views on the name seemed not to have noticed that the lantern did not have a brand name. They were provided with 9 names eventually and only two gave a similar name. The conclusion is that the users did not have any concerns with the name of the lantern. Their main concern is with the pricing and the performance.

6. Comments on the overall results about the features that the users thought need to be improved or modified

- The users did have comments regarding the flashing indicator light. They mention that it is sometimes difficult to know when the lantern has charged as the indicator is faintly seen especially when it is very sunny. However, this did not affect the charging process, as the users understood the operation of the lantern very well.

- The body of the lantern seemed susceptible to cracking. Two of the lanterns that were returned to ITDG offices for repair had cracked casing. This is true for the outer and the inside casing that holds the circuit.

- The switch although very well designed seems to confuse most of the users. They can not understand when it is off or on and this though a minor problem has been expressed as something that could be modified. Some users suggested that it should be an on and off type of switch.

- The handle although some mentions that it casts a shadow does not seem to be so and this should not worry the design team. Two individual users mentioned the light to be very strong but this is again contradicting what the majority votes as the best feature of the lantern. The problem could be solved possible by providing options for a 7W or a 5W bulb.

- Only one individual and only once used the hook at the back of the lantern. None wanted to hang the lantern on the roof for fear of falling and damaging it. The above indicates the value attached to the lantern.

- Not many people connected the radio at night when using the lantern but some did so during the day. The extension feature is however a very strong selling marketing point for the lantern. Some users use the extension during bedtime. It seems highly attractive to men

- The users felt that the length of the light period should be extended but they found themselves in a dilemma when it was explained that this would increase the overall cost of the lantern. However, there seems to be possibility of incorporating the 5W light for longer hours but less light for some customers.

- There are two who complained that light is too bright and strong to their eyes and may need a diffuser to reduce it. One individual suggested the provision of a voltmeter to check the state of the charge. One other feature, which the users commented on, is the abrupt way the lantern turns off without warning. Although the red light flashes before that happens, the users would prefer the lantern itself to flash so that it gives them a warning to start preparing themselves before it happens. In other words it is impossible to predict when it will go off and catches the users unawares. Needs a warning signal.

7. Conclusions

The lantern is viewed by the users a very important component of the lives of those who have bought it and they mention such impacts as the savings they make as a result of reduced use of kerosene, the lantern has no smell like the hurricane lamp, no noise like the pressure lamp, has got strong light and can be moved from one place to the other.

The users expressed concern on the availability of technicians to fix the lanterns once they develop problems. This seems to be a serious problem that needs to be addressed when the final lantern is made.

Spare parts for the repair of the lantern needs to be available once the lantern is put in the market to avoid disappointment that has been experienced by some users as a result of faulty circuit boards. The radio should be made to work with the batteries as well as the lantern to give the users choice.

Appendix Two

Meru Focused Group Report March 1, 2000

1.0 Group Composition.

The focused group discussion was attended by 15 participants (13 men and 3 women) distributed as follows;5 solar dealer/technicians, 5 shopkeepers, 2 teachers, 2 farmers and 2 mechanics. Of the group, 10 individuals had a solar electric systems/lanterns while 2 had mains connection in their rural homes. The highest level of education within the group was O-level with diploma in education (teachers). Only 2 people within the group had purchased the ITC lanterns (each had a 12 Wp PV systems), while one person had a lantern from an earlier test marketing initiative.

2.0 Lantern Features

Respondents were asked what features they liked /did not like most about the lantern giving reasons. The following responses were perceived:

Feature	**Comments**	
	Like	**Not like**
Portability	The lantern is compact and portable	
Shape/Aesthetics	The shape is appealing and looks nice	
Switch	The switch cannot be accidentally be switched ON or OFF	Difficult to know wether switch is ON or OFF
Screen	The diffusing effect of the screen is good, does not affect eyes when reading. Clear screen might damage eyes. It is also tough and cannot break easily. Light spread excellent	
Handle	Convenient and strong enough to carry the weight.	Handle is not collapsible
Charge status indicator	Single charge indicator multi-color LED a brilliant concept	Charge indicator cannot be seen when light is ON . Indicator should moved to on the side
Lantern Color	Dual color is beautiful and should be provided in a variety of colors for the lower section. Top white color acts as a good reflector .	
Charge and discharge ports		Too close to each other. Should be clearly labeled. Polarity should be shown.
Plastic Material		Material is stainable and cannot be

		cleaned easily.
Weight	Just right. Makes lantern stable,	
Robustness.	Looks strong and robust	

Dealers' opinions was sought as to why they thought they could sell / not sell the lantern. 3 out of 5 dealers thought they would sell the lantern because of its favorable features(small , compact, portable) and affordability.

It was intriguing to note that even the lantern owner did not notice the fact that the screen discolored on continued exposure to sunlight.

3.0 Preferred Light Usage.

All respondents (who did not have lighting systems) agreed that they would preferred the lantern to Kerosene lamps. Even those with installed systems said they would still buy the lantern given that it is portable and easy to use.

The main reasons given for the preference were; better light output (white light), clean and portable . Lantern can be used as a supplementary source even for those with solar home systems.

Starting with the 3 lantern owners, the respondents were asked what was the single most important reason why they bought the lantern. All the three gave the reason that lighting was important to them and they also needed supplementary source. Other reasons included, 'free energy source', 'cleaner than kerosene lamp' and 'easy to operate'.

Lantern owners indicated that including the radio had made the deal very attractive thus largely influencing their decision to purchase. Other respondents indicated that they would buy the lantern primarily for lighting.

One dealer suggested that the lanterns would be ideal for boarding schools without grid connection and could replace the kerosene lamps that they currently use. These he said were expensive and unsafe (fire hazard)

4.0 Light Quality.

The opinion of the respondents was sought about the color of light emitted by the lantern. Respondents gave varying opinions. Even though a majority (11 out of 16) preferred white light, 4 preferred cool white, while 1 preferred 'yellow' light (incandescent type). After further discussion, respondents suggested that the two versions (white and cool white) be provided at sale. However the 'white' version was agreed on as the standard.

Asked to describe the difference between light produced by the lantern and that from a Kerosene lamp, one of the respondents had the following to say : "yellow light from lantern is dull and unattractive in contrast to the bright and modern light from the lantern". A majority concurred with his description.

Sample lanterns were switched and the respondents' opinion on glare sought. The respondents did not experience any glare especially with the diffuser screen in place.

Also sought was the respondents' opinion on the intensity of light versus daily duration of service. Two options were given: a 5W light for 5.5 hours or a 7 W light for 4 hours. Again, the respondents were equally divided (8 for each option) on the vote.. Further discussion led to the agreement that both options should be provide to satisfy those after duration and intensity.

For duration of use, respondents agreed on a daily duration of 4-5 hours.

5.0 Cost

Dealers were asked to suggest a price at which they could sell the lantern and a module small enough to sufficiently charge the lantern in one day. It was made clear to them that the current module is oversized for the lantern. One dealer suggested Kes. 6,000, another Kes. 6,500 while 3 dealers agreed on Kes. 7,000 .

Other respondents were then asked to give their view based on the dealers' prices. After an extensive discussion, respondents agreed on a value of Kes. 6,000.

6.0 Price Sensitivity.

Starting with the agreed respondent price of Kes. 6,000, the respondents' sensitivity to price was tested. The price was increased by Kes.300, then Kes. 500 and finally by Kes. 900. At each stage the opinion of the respondents on whether they would still buy the lantern was sought and discussed. The results were as follows:

When the price is increased by Kes. 300 everyone agreed that they would still buy.

When the price was increased by Kes.500 , 9 out of 16 agreed they would still buy. A discussion ensued and the features of the lantern were explained further. At the end , all respondents agreed they would buy and that this would be the maximum price, beyond which it would be difficult to afford. The Kes. 900 increment was therefore not discussed.

7.0 Warranty ,Expected Life And Spares.

Starting with dealers , the effect of availability of spares on lantern sales was discussed. All respondents agreed that the availability and affordability of spares would be very important to them if they were to buy or sell lanterns. Main components in question included lights and batteries.

Respondents agreed on a warranty period of one year for parts and service at the price of Kes. 6,500

The expected service life of the lantern was put by the respondents at 3- 5 years.

8.0 Other comments

a) Modules and module mounting

Beginning with lantern owners, opinion on the module performance was sought. All lantern owner agreed that the module was to big and the lanterns always showed 'fully

charged' by 11.00 a.m. on a sunny day. Other respondents asked if it was possible to buy two lanterns and one module then charge them systematically. Others even asked for a modification that would allow them to charge a separate battery after the lantern was fully charged.

Respondents agreed that mounting the modules was easy given their design. However further discussions with the lantern owners revealed that the modules had been mounted directly on roofs. It was explained to them that direct roof mounting is not advisable and some sort of module mount is necessary. The dealers were advised to explain this to all lantern / system buyers.

b) Lantern servicing

Lantern owners were asked if they were satisfied with the servicing so far. Most of them were happy that they could take their lanterns back for service or even get replacements!. This made them have faith in the lanterns.

c) Chargers

Lantern owners and the single dealer (American Solar Technologies) currently selling the lanterns observed that the AC charger heats up when being used and takes a fairly long time compared to the module to charge the lantern. It was explained to them that the Ac charger delivered 500 mA max, while the module gave about 700 mA.

d) Radio

At least one lantern owner admitted to having modified the radio to work with dry cells. This option had earlier been disabled in all radios to make sure that the lantern owners used the radios only with the lantern. All respondents (including dealers) agreed tat the quality of the radio was excellent.

Appendix 1 Lantern Focus Group Questionnaire (Oral)

1. Product Features

a) what features do you like most about the lantern?

b) Please give your comments on what you like / do not like about the lantern design giving reasons.

c) Dealers only: Bearing in mind the features of the lanterns, why do you think you can sell / not sell the lantern?

2. Preferred Light Usage

a) Do you think people would prefer a solar lantern to the sources of light they currently use? Why?

b) According to you , what would be the single most important reason for people to purchase solar lanterns?

3) Light Quality

a) What do you have to say about the color of light emitted by the light source.

b) Describe the difference between the light from a kerosene lamp and the solar lantern.

c) What is the effect of the light emitted by the source on your eyes (glare).

d) Would you prefer a 7W light for 4 hours or a 5 W light for 5.5 hours? What are the reasons for your choice?

e) What is the typical duration for which you require the lantern each night?

4. Cost

a) Dealers only: At what price do you think you would sell lantern why?

b) If you agree with the dealer, please explain your reason(s)

c) If you do not agree with the dealer, please explain.

5. Price Sensitivity

a) If the price of the lantern was to increase by Kes. 300, 500 and 900, would you still buy it?

b) Discuss the effects of this increment.

6. Warranty ,Expected Life And Spares.

a) Please discuss how you think the availability of spares will affect lantern sales.

b) What warranty period do you expect?

c) If you bought a solar lantern discuss how many years of service would you expect it to render?

7) Other Comments

What are your opinions on the following

e) Modules and module mounting

f) Lantern servicing

g) Chargers

h) Radio

Appendix Three

Machakos Focused Group Report March 9, 2000

1.0 Group Composition.

The focused group discussion was attended by 11 participants (9 men and 4 women) distributed as follows; 4 technicians,1 solar dealer, 2 shopkeepers, 4 farmers Of the group, only 1 individual had a purchased. The rest used Kerosene lanterns in their rural homes. The highest level of education within the group was O-level. Only 1 person within the group had purchased the ITC lantern.

It must be noted that the understanding and uptake of solar electricity low in this region

2.0 Lantern Features

Respondents were asked what features they liked / did not like most about the lantern giving reasons. The following responses were perceived:

Feature	Comments	
	Like	Not like
Portability	Portable. Can be used in several locations	
Shape / Aesthetics	The shape is nice	The body is small. Should be bigger.
Switch	The switch cannot be accidentally be switched ON or OFF	
Screen	The screen looks tough and has a good diffusing effect. Clear screen should be provided as an option	Screen is too small
Handle	strong enough to carry the weight.	
Charge status indicator		Status indicator cannot be seen when light is ON
Lantern Color	Ok, But should be provided in various colors	
Plastic Material		Stains become permanent and cannot be cleaned easily.
Weight	OK	
Robustness.	Lantern body is strong and robust	

The single dealer's opinions was sought as to why he thought he could sell / not sell the lantern. The dealer thought he would sell the lantern because of its favorable features(small , compact, portable) and affordability.

3.0 Preferred Light Usage.

All respondents agreed that they would preferred the lantern to Kerosene lamps .as none had an alternative power source. They said the lantern resembles the Kerosene lamp that they were used to in some ways, but is completely clean. Major reasons for preference included; better light output, cleaner lantern and portability.

The single lantern owner said the single most important reason he bought the lantern was because he needed an alternative to the Kerosene lamp that he has been using. Other reasons included, cheaper cleaner and 'easy to operate.

The dealer said that including the radio had made the deal very attractive.

4.0 Light Quality.

Sample lanterns were switched and the respondents' opinion on light quality and glare sought. The respondents did not experience any glare especially with the diffuser screen in place.

On the color of light emitted by the lantern, all respondents preferred the white light produced by the lamp, but complained of the light being too bright . A lower wattage lamp was recommended.

Also sought was the respondents' opinion on the intensity of light versus daily duration of service. Two options were given: a 5W light for 5.5 hours or a 7 W light for 4 hours. All respondents agreed to the latter. They however added that both lights should be made available.

An average daily duration of use of 4-5 hours was agreed upon by the respondents. However , radio users preferred up to 6 hours.

5.0 Cost

Respondents were asked to suggest a price at which they would buy the lantern with a module It was made clear to them that the current module is oversized for the lantern. 6 respondent suggested Ksh. 5,000, while 4 suggested Ksh. 6,000 . The dealer suggested Ksh. 6,500.

6.0 Price Sensitivity.

Starting with the agreed respondent price of Kes. 6,000, the respondents' sensitivity to price was tested. The price was increased by Kes.300 and the respondents' opinion on whether they would still buy the lantern was sought and discussed. follows:

With the Ksh. 300 price increase , respondents said that was the maximum they would be willing to pay.

7.0 Warranty ,Expected Life And Spares.

The effect of availability of spares on lantern sales was discussed. All respondents agreed that the availability and affordability of spares would be very important to them if they were to buy lanterns. Main components in question included lights and batteries.

Respondents agreed on a warranty period of 6 months to one year for parts and service at the price of Kes. 6,300

The expected service life of the lantern was put by the respondents at 3- 5 years.

8.0 Other comments

The issue of mode of payment for lanterns was raised by the respondents. It was made clear to them that this depended on the dealer since the lanterns were being sold on a commercial basis.

The Preferred names (excluding existing trade) include:

Ecolamp, Lighthouse, Midnightsun, Sunbright, Sunlite (a soap called Sunlight already exists) and Sunshine.

Respondents did not have any further comments of questions.

Appendix 1: Lantern Focus Group Questionnaire (Oral)

1. Product Features

a) what features do you like most about the lantern?

b) Please give your comments on what you like / do not like about the lantern design giving reasons.

c) Dealers only: Bearing in mind the features of the lanterns, why do you think you can sell / not sell the lantern?

2. Preferred Light Usage

a) Do you think people would prefer a solar lantern to the sources of light they currently use? Why?

b) According to you , what would be the single most important reason for people to purchase solar lanterns?

3) Light Quality

a) What do you have to say about the color of light emitted by the light source.

b) Describe the difference between the light from a kerosene lamp and the solar lantern.

c) What is the effect of the light emitted by the source on your eyes (glare).

d) Would you prefer a 7W light for 4 hours or a 5 W light for 5.5 hours? What are the reasons for your choice?

e) What is the typical duration for which you require the lantern each night?

4. Cost

a) Dealers only: At what price do you think you would sell lantern why?

b) If you agree with the dealer, please explain your reason(s)

c) If you do not agree with the dealer, please explain.

5. Price Sensitivity

a) If the price of the lantern was to increase by Kes. 300, 500 and 900, would you still buy it?

b) Discuss the effects of this increment.

6. Warranty ,Expected Life And Spares.

a) Please discuss how you think the availability of spares will affect lantern sales.

b) What warranty period do you expect?

c) If you bought a solar lantern discuss how many years of service would you expect it to render?

7) Other Comments

What are your opinions on the following

a) Modules and module mounting b) Lantern servicing c) Chargers d) Radio

Appendix Three

Name	Charles Muthee	Address	Kiti	Todays date	23/02/2000
Sex	Male	Age	48	Employemnt	Teacher
Education Level	Form 6	Energy status	Mains at house, none at farm		
ID Number of Lantern					
How long did it operate each day	4	Did this figure increase or decrease over time		Same	
If Yes, how long does it last now	0	If yes, how long did it operate when new		0	
What time do you start charging the panel	10:00:00	What time is the lantern usually fully charged		13:00:00	
How many =/ did you spend on lighting before per week	38				
How much do you spend now	30				
Who used the lantern most	Husband				
Which rooms was it used	Living, Kitchen, Bedroom	Which room was it used most		Living	
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening		22:00:00	
What do you use it for	Eating, Reading				
What was the main use	Eating, Reading				
Would you recommend a friend to buy a lantern	Very much	Will you buy another one if needed		Yes	
Were you satisfied with the lantern	Happy as have no problems				
Decribe how the lantern operates	Gree, Red and outputs all fine				
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	0	For how many hours a week do you use the radio		0	
How many times do you use the extension lamp	0	For how many hours do you use it a week		0	
What do you use the extension lamp for					
Worst things about lantern	Length of light period too short				
Best things and impact it has made	Economincal - even more than mains electricity. Good when there are power cuts. No smoke				
Improvements that could be made	Store enough charge for 2-3 days lighting requirements. More extension lights (hadn't used to one he had)				
7W or 5W bulb, and why	5W wants to stay up longer				
Price would pay for lantern	Wants to pay 5,000, but could afford 7,500				
			Data downloaded	No	

Name: Stephen Njenga | Address: Chania | Todays date:

Sex: Male | Age: 0 | Employemnt: Farmer

Education Level: | Energy status:

ID Number of Lantern: 0

How long did it operate each day: 0 | Did this figure increase or decrease over time:

If Yes, how long does it last now: 0 | If yes, how long did it operate when new: 0

What time do you start charging the panel: | What time is the lantern usually fully charged:

How many =/ did you spend on lighting before per week: 0

How much do you spend now: 0

Who used the lantern most:

Which rooms was it used: | Which room was it used most:

What time do you switch it on in the evening: | What time do you switch it off in the evening:

What do you use it for:

What was the main use:

Would you recommend a friend to buy a lantern: | Will you buy another one if needed:

Were you satisfied with the lantern:

Decribe how the lantern operates:

Do you use the hook to suspend the lantern:

How many times a week do you use the radio: 0 | For how many hours a week do you use the radio: 0

How many times do you use the extension lamp: 0 | For how many hours do you use it a week: 0

What do you use the extension lamp for:

Worst things about lantern:

Best things and impact it has made:

Improvements that could be made:

7W or 5W bulb, and why:

Price would pay for lantern:

Data downloaded:

Name: Margaret Wairimu | Address: Nakuru | Todays date:

Sex: Female | Age: 40 | Employemnt: Farmer

Education Level: | Energy status:

ID Number of Lantern: 0

How long did it operate each day: 0 | Did this figure increase or decrease over time:

If Yes, how long does it last now: 0 | If yes, how long did it operate when new: 0

What time do you start charging the panel: | What time is the lantern usually fully charged:

How many =/ did you spend on lighting before per week: 0

How much do you spend now: 0

Who used the lantern most:

Which rooms was it used: | Which room was it used most:

What time do you switch it on in the evening: | What time do you switch it off in the evening:

What do you use it for:

What was the main use:

Would you recommend a friend to buy a lantern: | Will you buy another one if needed:

Were you satisfied with the lantern:

Decribe how the lantern operates:

Do you use the hook to suspend the lantern:

How many times a week do you use the radio: 0 | For how many hours a week do you use the radio: 0

How many times do you use the extension lamp: 0 | For how many hours do you use it a week: 0

What do you use the extension lamp for:

Worst things about lantern:

Best things and impact it has made:

Improvements that could be made:

7W or 5W bulb, and why:

Price would pay for lantern:

Data downloaded:

Name	Benson Kimani	Address	Kiamunyi	Todays date	22/02/2000
Sex	Male	Age	43	Employemnt	Unemployed
Education Level	Standard 7	Energy status	None		
ID Number of Lantern	0				
How long did it operate each day	5	Did this figure increase or decrease over time	Same		
If Yes, how long does it last now	0	If yes, how long did it operate when new	0		
What time do you start charging the panel	07:00:00	What time is the lantern usually fully charged	13:00:00		
How many =/ did you spend on lighting before per week	180				
How much do you spend now	30				
Who used the lantern most	Wife, Children				
Which rooms was it used	Living, Bedroom	Which room was it used most	Living		
What time do you switch it on in the evening	18:30:00	What time do you switch it off in the evening	23:00:00		
What do you use it for	Eating, Reading, Study				
What was the main use	Living				
Would you recommend a friend to buy a lantern	Yes, get together a	Will you buy another one if needed	Yes		
Were you satisfied with the lantern	Yes when working. If not working, then wife complains				
Decribe how the lantern operates	Green - OK. Not too sure about flashing red light. Found switch confusing as radio could be on when lantern switched off				
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	15	For how many hours a week do you use the radio	20		
How many times do you use the extension lamp	0	For how many hours do you use it a week	0		
What do you use the extension lamp for					
Worst things about lantern	Switch - Radio/extension lamp can be on when lantern switched off.				
Best things and impact it has made	Economical. Can stay up for more hours without paying for more kerosene. Uses it to visit friends and listen to radio				
Improvements that could be made	On/Off for outlet socket, Outlet for TV, Bigger Radio cassette player				
7W or 5W bulb, and why	5W wants ligth for longer time				
Price would pay for lantern	Wants to pay 5,000, Could pay 6,000. At 7,500 would return the lantern				
				Data downloaded	No

Name	Samuel Gaturi Mwangi	Address	Akuisi/ Kiremba	Todays date	05/05/2000
Sex	Male	Age	50	Employemnt	Farmer
Education Level	Form 4	Energy status	None		
ID Number of Lantern	1				
How long did it operate each day	0	Did this figure increase or decrease over time			
If Yes, how long does it last now	0	If yes, how long did it operate when new	0		
What time do you start charging the panel	09:00:00	What time is the lantern usually fully charged			
How many =/ did you spend on lighting before per week	45				
How much do you spend now	45				
Who used the lantern most	The whole family				
Which rooms was it used	living room, bedroom, study room	Which room was it used most	living room		
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening	22:00:00		
What do you use it for	eating, studying, reading, radio				
What was the main use	studying				
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed	Yes		
Were you satisfied with the lantern	No, because it has never worked				
Decribe how the lantern operates	No, experience				
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	0	For how many hours a week do you use the radio	0		
How many times do you use the extension lamp	0	For how many hours do you use it a week	0		
What do you use the extension lamp for	Never used the extension lamp				
Worst things about lantern	Not charging through the panel				
Best things and impact it has made	No observations				
Improvements that could be made	Increase light hours to six hours, increase number of extension lamps to two				
7W or 5W bulb, and why	7W bulb to maintain bright light				
Price would pay for lantern	Between kshs 5000 - 6000				
				Data downloaded	

Name	Francis Gichia	Address	Our Lady of Victory Primary School	Todays date	12/05/2000
Sex	Male	Age	45	Employemnt	Teacher
Education Level	Graduate	Energy status	AC mains		
ID Number of Lantern	2				
How long did it operate each day	0	Did this figure increase or decrease over time	no		
If Yes, how long does it last now	0	If yes, how long did it operate when new	0		
What time do you start charging the panel	09:00:00	What time is the lantern usually fully charged			
How many =/ did you spend on lighting before per week	200				
How much do you spend now	200				
Who used the lantern most	School children				
Which rooms was it used	classroom	Which room was it used most	Classroom		
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening	22:00:00		
What do you use it for	Reading and writing				
What was the main use	Preps				
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed	Yes for other classroo		
Were you satisfied with the lantern	No, it is not working				
Decribe how the lantern operates	Has never worked				
Do you use the hook to suspend the lantern	Yes				
How many times a week do you use the radio	0	For how many hours a week do you use the radio	0		
How many times do you use the extension lamp	0	For how many hours do you use it a week	0		
What do you use the extension lamp for					
Worst things about lantern	Defective				
Best things and impact it has made	No impact				
Improvements that could be made	No experience				
7W or 5W bulb, and why	7W for the light to remain the same				
Price would pay for lantern	Maximum of kshs 7500				
				Data downloaded	

Name	Maragret Wanjiru	Address	Solai	Todays date	22/02/2000
Sex	Female	Age	0	Employemnt	Farmer
Education Level	Standard 5	Energy status	None		
ID Number of Lantern	2				
How long did it operate each day	4	Did this figure increase or decrease over time	Same		
If Yes, how long does it last now	0	If yes, how long did it operate when new	0		
What time do you start charging the panel	07:00:00	What time is the lantern usually fully charged	15:00:00		
How many =/ did you spend on lighting before per week	21				
How much do you spend now	7				
Who used the lantern most	Wife				
Which rooms was it used	Living	Which room was it used most	Living		
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening	22:30:00		
What do you use it for	Eating, Reading				
What was the main use	Living				
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed	Yes, if had money		
Were you satisfied with the lantern	Happy with the lantern				
Decribe how the lantern operates	Green - fine, Red light not working Arrows - fine				
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	10	For how many hours a week do you use the radio	20		
How many times do you use the extension lamp	0	For how many hours do you use it a week	0		
What do you use the extension lamp for					
Worst things about lantern	Nothing				
Best things and impact it has made	Economical - before, couldn't always afford enough kerosene for lantern, so now can stay up later. Her children can do more school work				
Improvements that could be made	Another extension lamp (Hadn't used hers though)				
7W or 5W bulb, and why	5W wants longer light for when has visitors				
Price would pay for lantern	Want to pay 5,000/=, Could pay up to 8,000 if available in installments				
Data downloaded	No				

Name	Stanley Kabue Waithaka	Address	Mailisaba	Todays date	16/05/2000
Sex	Male	Age	45	Employemnt	Agricultural Extension Officer
Education Level	'O' level	Energy status	AC mains in house		
ID Number of Lantern	3				
How long did it operate each day	3	Did this figure increase or decrease over time	Same		
If Yes, how long does it last now	0	If yes, how long did it operate when new	3		
What time do you start charging the panel	08:00:00	What time is the lantern usually fully charged	13:00:00		
How many =/ did you spend on lighting before per week	50				
How much do you spend now	50				
Who used the lantern most	All family members				
Which rooms was it used	bedroom, sitting room	Which room was it used most	bedroom		
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening	21:00:00		
What do you use it for	reading, radio, eating				
What was the main use	reading				
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed	Yes		
Were you satisfied with the lantern	Yes, has good light but goes off early				
Decribe how the lantern operates	Green when fully charged and red when power output on				
Do you use the hook to suspend the lantern	Yes				
How many times a week do you use the radio	2	For how many hours a week do you use the radio	8		
How many times do you use the extension lamp	0	For how many hours do you use it a week	0		
What do you use the extension lamp for					
Worst things about lantern	Goes off as earlier than four hours and no warning before going off				
Best things and impact it has made	Economical, good bright light				
Improvements that could be made	More hours of light				
7W or 5W bulb, and why	5W bulb to last the light longer				
Price would pay for lantern	Between kshs 4000 - 6000				
				Data downloaded	

Name	John Njuguna	Address	Box 3975, Nakuru	Todays date	21/02/2000
Sex	Male	Age	57	Employemnt	Farmer
Education Level	Standard 8	Energy status	None		
ID Number of Lantern	4				
How long did it operate each day	4	Did this figure increase or decrease over time		Increase	
If Yes, how long does it last now	4	If yes, how long did it operate when new		2	
What time do you start charging the panel	06:00:00	What time is the lantern usually fully charged		14:00:00	
How many =/ did you spend on lighting before per week	63				
How much do you spend now	13				
Who used the lantern most	Whole Family				
Which rooms was it used	Living, Bedroom, Outside	Which room was it used most		Living	
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening		22:30:00	
What do you use it for	Eating, Reading				
What was the main use	Living				
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed		for mother + sons	
Were you satisfied with the lantern	Yes				
Decribe how the lantern operates	Arrows - fine, Green - fine, Red - not working. Switch a bit confusing				
Do you use the hook to suspend the lantern					
How many times a week do you use the radio	0	For how many hours a week do you use the radio		0	
How many times do you use the extension lamp	0	For how many hours do you use it a week		0	
What do you use the extension lamp for					
Worst things about lantern	If lantern broke, not sure where to get spare parts				
Best things and impact it has made	Lighting very bright and economical. For their church congregation now need one lantern, not many lamps. Checking on animals and helps children to read. Wife has bad eyesight, had to give up reading bible, but now can continue as light is so good				
Improvements that could be made	Easier access to battery, and better teaching of how it works				
7W or 5W bulb, and why	Prefers 7W bulb, as does wife				
Price would pay for lantern	Want it for 5,000/=, but would pay if it was 7,500				
			Data downloaded		

Name	Joeseph Mbugua	Address	Box 471 Kamini	Todays date	22/02/2000
Sex	Male	Age	54	Employemnt	Retired Taxi driver
Education Level	Standard 4	Energy status	Son next door has 20W SHS		
ID Number of Lantern	7				
How long did it operate each day	2	Did this figure increase or decrease over time	Same		
If Yes, how long does it last now	0	If yes, how long did it operate when new	0		
What time do you start charging the panel	08:00:00	What time is the lantern usually fully charged	10:30:00		
How many =/ did you spend on lighting before per week	38				
How much do you spend now					
Who used the lantern most	Husband				
Which rooms was it used	Living	Which room was it used most	Living		
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening	22:00:00		
What do you use it for	Eating, Visitors				
What was the main use					
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed	Yes		
Were you satisfied with the lantern	Even though not working well, still pleased with it.				
Decribe how the lantern operates	Green, Red and Outputs all OK				
Do you use the hook to suspend the lantern	Once				
How many times a week do you use the radio	0	For how many hours a week do you use the radio	0		
How many times do you use the extension lamp	5	For how many hours do you use it a week	2		
What do you use the extension lamp for	Bedroom lighting				
Worst things about lantern	Worried about spare parts. Lantern developed a fault so that it only last for about 10 mins before switching off, but will turn on again immediately. Hard to open				
Best things and impact it has made	Less time and effort to light than kerosene, Portable, but maybe too bright				
Improvements that could be made	A top shade to reflect light downwards, a diffuser because too bright/harsh. Easier opening of casing				
7W or 5W bulb, and why	7W wouldn't want light reduced..?				
Price would pay for lantern	Same price asa pressure lamp (1,200 ?) Could take back if was 7,500				
				Data downloaded	Yes

Name	Rebecca Wangari Ngutiu	Address	Bahati Thayu Farm	Todays date	06/04/2000
Sex	Female	Age	48	Employemnt	Teacher
Education Level	'O' level	Energy status	Lister (generator)		
ID Number of Lantern	10				
How long did it operate each day	1	Did this figure increase or decrease over time			
If Yes, how long does it last now	1	If yes, how long did it operate when new	0		
What time do you start charging the panel	08:00:00	What time is the lantern usually fully charged	18:00:00		
How many =/ did you spend on lighting before per week	100				
How much do you spend now	100				
Who used the lantern most	Self				
Which rooms was it used	Living room, bedroom	Which room was it used most	Bedroom		
What time do you switch it on in the evening	10:30:00	What time do you switch it off in the evening	11:30:00		
What do you use it for	Reading, radio				
What was the main use	Reading				
Would you recommend a friend to buy a lantern	Yes if there are im	Will you buy another one if needed	Yes if proved efficient		
Were you satisfied with the lantern	Not satisfied				
Decribe how the lantern operates	When charging there is a green light Power output when red shows				
Do you use the hook to suspend the lantern					
How many times a week do you use the radio	2	For how many hours a week do you use the radio	0		
How many times do you use the extension lamp	0	For how many hours do you use it a week	0		
What do you use the extension lamp for					
Worst things about lantern	Cannot be charged any longer				
Best things and impact it has made	Nothing				
Improvements that could be made					
7W or 5W bulb, and why	7W is quite okay				
Price would pay for lantern	Between kshs 5000 - 7000				
				Data downloaded	

Name	Gladice Njambi	Address	Kariua	Todays date	22/02/2000
Sex	Female	Age	0	Employemnt	Farmer
Education Level	None	Energy status	None		
ID Number of Lantern	11				
How long did it operate each day	4	Did this figure increase or decrease over time	Increase		
If Yes, how long does it last now	4	If yes, how long did it operate when new	3		
What time do you start charging the panel	09:00:00	What time is the lantern usually fully charged	14:00:00		
How many =/ did you spend on lighting before per week	25				
How much do you spend now	6				
Who used the lantern most	Children				
Which rooms was it used	Living, Kitchen, Outside	Which room was it used most	Living		
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening	22:00:00		
What do you use it for	Eating, Reading, Study, Radio				
What was the main use	Study				
Would you recommend a friend to buy a lantern	Yes - even son	Will you buy another one if needed	Yes		
Were you satisfied with the lantern	Yes				
Decribe how the lantern operates	Green - OK, Red not too sure, son corrected mother. Outputs fine				
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	15	For how many hours a week do you use the radio	20		
How many times do you use the extension lamp	0	For how many hours do you use it a week	0		
What do you use the extension lamp for					
Worst things about lantern	Nothing (I noticed a small 3mm long crack in the upper casing by the outlet socket)				
Best things and impact it has made	Only had one hurricane lamp, so can now use that in kitchen, and lantern in Living room for children to study. Checking animals, Milking goat. Good because portable				
Improvements that could be made	Use with several lights at same time (Hadn't used extension lamp though). Give light for longer				
7W or 5W bulb, and why	7W Usually go to bed before discharged				
Price would pay for lantern	Want to pay 5,000, Could pay 5,500. Can take lantern back if it costs 8,000				
				Data downloaded	No

Name	Bernard G Meri	Address	Chania	Todays date	21/02/2000
Sex	Male	Age		Employemnt	Assistant chief administaror - Gov officer
Education Level	Form 2	Energy status	None		
ID Number of Lantern	13				
How long did it operate each day	4	Did this figure increase or decrease over time	Increase		
If Yes, how long does it last now	4	If yes, how long did it operate when new	2		
What time do you start charging the panel	08:00:00	What time is the lantern usually fully charged	13:00:00		
How many =/ did you spend on lighting before per week	64				
How much do you spend now	32				
Who used the lantern most	Husband/wife				
Which rooms was it used	Living room only	Which room was it used most	Living room		
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening	22:00:00		
What do you use it for	Eating, Reading				
What was the main use					
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed	Yes		
Were you satisfied with the lantern	Yes				
Decribe how the lantern operates	Green flash - charging. Solid green - fully charged, Red - operating. Understands arrows				
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	0	For how many hours a week do you use the radio	0		
How many times do you use the extension lamp	1	For how many hours do you use it a week	1		
What do you use the extension lamp for	Reading				
Worst things about lantern	If it switches itself off. Can't be switched on even in an emergency. Want radio to use dry cells. Like lantern to last longer when they have visitors				
Best things and impact it has made	Not blown by wind, economical, Less time to light, save time not buying kerosene. More than one person can read at a time				
Improvements that could be made	Prefer to be hung up. Battery shakes and turns off when hung upside down. Supply with voltmeter, or bettery tester to check state of charge				
7W or 5W bulb, and why					
Price would pay for lantern	Want it for 5,000/=. Would probably pay 8,000				
				Data downloaded	No

Name	Joyce Waithera	Address	Bahati Scheme	Todays date	28/04/2000
Sex	Female	Age	32	Employemnt	Farmer
Education Level	Standard 7	Energy status	None		
ID Number of Lantern	16				
How long did it operate each day	0	Did this figure increase or decrease over time			
If Yes, how long does it last now	0	If yes, how long did it operate when new	0		
What time do you start charging the panel	08:00:00	What time is the lantern usually fully charged			
How many =/ did you spend on lighting before per week	38				
How much do you spend now	38				
Who used the lantern most	Never used				
Which rooms was it used	none	Which room was it used most			
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening			
What do you use it for	Reading, security patrols, eating				
What was the main use	Reading				
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed	Yes		
Were you satisfied with the lantern	No, it never worked				
Decribe how the lantern operates	Green - charging or charged Red - output on or about to go off				
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	0	For how many hours a week do you use the radio	0		
How many times do you use the extension lamp	0	For how many hours do you use it a week	0		
What do you use the extension lamp for	Never used the extension lamp				
Worst things about lantern	Disappointing because it did not work				
Best things and impact it has made	Economical, brighter than kerosene lamp				
Improvements that could be made	Increase light hours to six hours				
7W or 5W bulb, and why	7W bulb to maintain brightness but need more light hours				
Price would pay for lantern	Between kshs 5000 - 7500				
				Data downloaded	

Name	Dorcas Muthoni	Address	Engashura	Todays date	22/04/2000
Sex	Female	Age	36	Employemnt	Teacher
Education Level	Form 6	Energy status	45W SHS solar		
ID Number of Lantern	17				
How long did it operate each day	4	Did this figure increase or decrease over time			Decrease
If Yes, how long does it last now	0	If yes, how long did it operate when new			0
What time do you start charging the panel	09:00:00	What time is the lantern usually fully charged			13:00:00
How many =/ did you spend on lighting before per week	60				
How much do you spend now	0				
Who used the lantern most	Mother, children				
Which rooms was it used	living room, kitchen, bedroom	Which room was it used most			living room
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening			22:00:00
What do you use it for	Reading, eating, cooking				
What was the main use	Reading				
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed			Yes
Were you satisfied with the lantern	Yes, on the first day, but could not light up the following day				
Decribe how the lantern operates	Green light shows fully charged Intermittent green light shows it is charging Red light shows power output is on				
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	0	For how many hours a week do you use the radio			0
How many times do you use the extension lamp	0	For how many hours do you use it a week			0
What do you use the extension lamp for					
Worst things about lantern	Difficult to tell level of charge, not possible to predict length of light				
Best things and impact it has made	Children read better and more economical therefore no running costs				
Improvements that could be made	Warning signal before going off				
7W or 5W bulb, and why	7W bulb to maintain same brightness and same hours of light				
Price would pay for lantern	Between kshs 5000 - 7000				
				Data downloaded	

Name	John Gituma	Address	Box 1516 Meru	Todays date	
Sex	Male	Age	47	Employemnt	Teacher
Education Level	O-level	Energy status	Solar		
ID Number of Lantern	18				
How long did it operate each day	4	Did this figure increase or decrease over time		Same	
If Yes, how long does it last now	0	If yes, how long did it operate when new		0	
What time do you start charging the panel	07:00:00	What time is the lantern usually fully charged		12:00:00	
How many =/ did you spend on lighting before per week	0				
How much do you spend now	0				
Who used the lantern most	Wife				
Which rooms was it used		Which room was it used most		Kitchen	
What time do you switch it on in the evening	18:00:00	What time do you switch it off in the evening		22:00:00	
What do you use it for					
What was the main use	Cooking				
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed		No	
Were you satisfied with the lantern	Yes				
Decribe how the lantern operates					
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	2	For how many hours a week do you use the radio		1	
How many times do you use the extension lamp	6	For how many hours do you use it a week		1	
What do you use the extension lamp for	Reading bible				
Worst things about lantern	Should last 5 hours				
Best things and impact it has made	Portable, Good quality, Clean- no soot, Better light				
Improvements that could be made	Bigger battery, charge another battery				
7W or 5W bulb, and why	5W				
Price would pay for lantern	7,500				
			Data downloaded	No	

Name	Geoffrey Muthamia	Address	Mukongorone School, Box 1050, Meru	Todays date	
Sex	Male	Age	36	Employemnt	Teacher
Education Level	O level	Energy status	Solar		
ID Number of Lantern	20				
How long did it operate each day	4	Did this figure increase or decrease over time	No		
If Yes, how long does it last now	0	If yes, how long did it operate when new	0		
What time do you start charging the panel	07:00:00	What time is the lantern usually fully charged	12:00:00		
How many =/ did you spend on lighting before per week	250				
How much do you spend now	0				
Who used the lantern most	Husband and Children				
Which rooms was it used		Which room was it used most			
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening	22:00:00		
What do you use it for	Reading, Milking				
What was the main use					
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed	Yes, without panel		
Were you satisfied with the lantern	Yes				
Decribe how the lantern operates					
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	0	For how many hours a week do you use the radio	0		
How many times do you use the extension lamp	7	For how many hours do you use it a week	1		
What do you use the extension lamp for	Bedroom preparation				
Worst things about lantern					
Best things and impact it has made					
Improvements that could be made	Brighter extension lamp, panel to charge other appliances				
7W or 5W bulb, and why	7W				
Price would pay for lantern	7,000				
				Data downloaded	

Name	Reuben	Address	Meru Safari Hotel, Box 6, Meru	Todays date	
Sex	Male	Age	35	Employemnt	Driver
Education Level	O level	Energy status	Solar		
ID Number of Lantern	21				
How long did it operate each day	4	Did this figure increase or decrease over time			
If Yes, how long does it last now	0	If yes, how long did it operate when new	0		
What time do you start charging the panel	07:00:00	What time is the lantern usually fully charged	12:00:00		
How many =/ did you spend on lighting before per week	0				
How much do you spend now	0				
Who used the lantern most	Husband				
Which rooms was it used	Living and Bedroom	Which room was it used most			
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening	22:00:00		
What do you use it for					
What was the main use	Sitting				
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed	Yes, without panel		
Were you satisfied with the lantern	Yes				
Decribe how the lantern operates					
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	0	For how many hours a week do you use the radio	0		
How many times do you use the extension lamp	0	For how many hours do you use it a week	0		
What do you use the extension lamp for					
Worst things about lantern					
Best things and impact it has made	Saves on gas				
Improvements that could be made	Brighter extension lamp				
7W or 5W bulb, and why	5W				
Price would pay for lantern	10,000				
				Data downloaded	

Name	Alex Mutua	Address	Box 664 Machakos	Todays date	
Sex	Male	Age	25	Employemnt	Shopkeeper
Education Level	O level	Energy status	Solar		
ID Number of Lantern	25				
How long did it operate each day	2	Did this figure increase or decrease over time			Decrease
If Yes, how long does it last now	2	If yes, how long did it operate when new			2
What time do you start charging the panel	07:00:00	What time is the lantern usually fully charged			
How many =/ did you spend on lighting before per week	330				
How much do you spend now	0				
Who used the lantern most	Wife and Child				
Which rooms was it used		Which room was it used most			Living room
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening			22:00:00
What do you use it for	Reading, eating				
What was the main use					
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed			Yes
Were you satisfied with the lantern	Yes				
Decribe how the lantern operates					
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	1	For how many hours a week do you use the radio			2
How many times do you use the extension lamp	7	For how many hours do you use it a week			0
What do you use the extension lamp for	Bedroom				
Worst things about lantern	Short duration				
Best things and impact it has made					
Improvements that could be made					
7W or 5W bulb, and why	7W				
Price would pay for lantern	7,500				
			Data downloaded		

Name	Leonard Maingi	Address	Box 1988, Machakos	Todays date	
Sex	Male	Age	37	Employemnt	Teacher
Education Level	O level	Energy status	Kerosene		
ID Number of Lantern	28				
How long did it operate each day	4	Did this figure increase or decrease over time			
If Yes, how long does it last now	0	If yes, how long did it operate when new	0		
What time do you start charging the panel	07:00:00	What time is the lantern usually fully charged			
How many =/ did you spend on lighting before per week	0				
How much do you spend now	0				
Who used the lantern most	Husband				
Which rooms was it used		Which room was it used most	Living room		
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening	22:00:00		
What do you use it for	Reading , Eating				
What was the main use					
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed	Yes		
Were you satisfied with the lantern	Yes				
Decribe how the lantern operates					
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	2	For how many hours a week do you use the radio	2		
How many times do you use the extension lamp	0	For how many hours do you use it a week	0		
What do you use the extension lamp for					
Worst things about lantern					
Best things and impact it has made	Savings on kerosene				
Improvements that could be made	Brighter extension lamp				
7W or 5W bulb, and why	5W				
Price would pay for lantern	10,000				
				Data downloaded	

Name	Mr Kavoi	Address	Masaku county council	Todays date	
Sex	Male	Age	43	Employemnt	Clerk
Education Level	University	Energy status	Solar		
ID Number of Lantern	29				
How long did it operate each day	2	Did this figure increase or decrease over time			Decrease
If Yes, how long does it last now	2	If yes, how long did it operate when new			3
What time do you start charging the panel	07:00:00	What time is the lantern usually fully charged			
How many =/ did you spend on lighting before per week	0				
How much do you spend now	0				
Who used the lantern most	Wife				
Which rooms was it used		Which room was it used most			Living room
What time do you switch it on in the evening	19:00:00	What time do you switch it off in the evening			21:00:00
What do you use it for	Reading, to charge mobile phone				
What was the main use					
Would you recommend a friend to buy a lantern	Yes	Will you buy another one if needed			Yes
Were you satisfied with the lantern	Yes				
Decribe how the lantern operates					
Do you use the hook to suspend the lantern	No				
How many times a week do you use the radio	0	For how many hours a week do you use the radio			0
How many times do you use the extension lamp	0	For how many hours do you use it a week			0
What do you use the extension lamp for					
Worst things about lantern					
Best things and impact it has made	Only option available				
Improvements that could be made	Longer duration of light				
7W or 5W bulb, and why	5W				
Price would pay for lantern	4000				
Data downloaded					