

Kenya's Water Towers Protection and Climate Change Mitigation and Adaptation (WaTER) Programme

Component 4: Science to Inform Design of Community-Level Actions and Policy Decisions

PROMOTING THE USE OF IMPROVED BIOMASS TECHNOLOGIES IN MT. ELGON AND CHERANGANY HILLS ECOSYSTEMS



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Kenya Forestry Research Institute
(KEFRI)

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Executive Summary

This activity is a component of End Result (ER) area three of the project objective on integration of selected rehabilitation and conservation technologies for improved Natural Resource Management, Sustainable Land Management and Agricultural Water Management demonstrated in Mt. Elgon and Cherangany Hills Ecosystems. The main activity was on the promoting the use of improved biomass technologies and sustainable charcoal production and utilization technologies to reduce forest degradation.

Woodfuel remains a major source of biomass energy in Kenya with about 90% of Kenyan rural households using woodfuel either as firewood or charcoal. A survey on energy sources in the two ecosystems indicated that about 92% of the households use firewood while approximately 52 % use charcoal for cooking and lighting. Out of these, 62% sourced firewood from trees planted onfarm , while 45% sourced from the nearest gazetted forest. Additionally, majority of the households use the traditional three stones for cooking which consumes large quantities of fuelwood. These scenarios have direct contribution to forest degradation and as such, the project carried out training on the fabrication and use of various energy saving devices/ technologies (Kuni mbili, portable jikos, solar lamps, moto stoves, drum kilns, casamance kilns, earth kilns and metal kilns in both ecosystems. With the view to meet community needs and reduce dependence on forest for wood biomass, three alternative biomass technologies were prioritized for transfer: the “Kuni Mbili Jiko, solar lamps and moto stoves.

A total of 77 kuni mbili jikos were constructed while, 160 solar lamps and 80 portable jikos were issued to community members in Cherangany ecosystem targeting women and people living with disability in Kaisagat, Lelan, Kapolet,Kapsara,Kapsait,Kapcherop,Kapsowar and Kamasia sites. A total of 75 energy saving devices (kuni mbili and moto stoves) were issued to women with disability, widows, aged and vulnerable women in Bugaa, Kapsokwony, Kimobo, Nomorio, Koshok, Kibuk and Sambocho villages of Mt. Elgon forest ecosystem.

1.0 INTRODUCTION

1.1 BACKGROUND INFORMATION

Woodfuel remains a major form of biomass energy in Africa. It is projected that about 94% of African rural population and 73% of urban population use wood fuels as their primary source of energy; mostly used for cooking, heating and lighting the house. In Kenya, biomass remains the principle energy supply source at 68% which include; charcoal, agricultural waste and wood fuel with almost 90% of the rural population depending on firewood for cooking and heating the houses according to Energy and Regulatory commission. It is further, estimated that households in kenya consume about 6.5 tonnes of woodfuel per household per year through cooking, heating the house and lighting (Mugo, 2001).

Inadequate supply of the wood products including fuelwood has consequently led to overharvesting of on- farms trees and in the natural forest. The impact of wood fuel collection on forest has been controversial and its role in rural livelihoods and deforestation remains a subject of considerable debate among key government agencies and civil society organizations. Different strategies can however, be adopted to meet woodfuel requirement based on demand and supply dynamics; enhancing on-farm tree planting as part of supply oriented; use of alternative sources of energy other than wood and promotion of more efficient cooking stoves and charcoal conversion kilns as aprt of reducing demand (Githiomi and Oduor, 2012). Against this backdrop, Kenya Forest Research Institute (KEFRI) through the support of European Union under the Kenya’s Water Towers Protection and Climate Change Mitigation and Adaptation (WaTER Towers) programme promoted alternative biomass energy sources to reduce forest degradation as informed by a baseline study on energy sources in Cherangany and Mt. Elgon ecosystems (www.kefriwatertowers.org). Three alternative biomass technologies were priotized for transfer: “Kuni Mbili Jiko, solar lamps and moto stoves.

This activity was drawn from objective three, ER 3.4 of the project as summarized in table1;

Table 1: Work plan on promotion of alternative biomass energy sources

Objective 3: Integration of selected rehabilitation and conservation technologies for improved natural resource management demonstrated in Mt. Elgon and Cherangany Hills ecosystems			
Main Activity	Sub Activity	Methodology	Output
ER 3.4 Alternative Biomass Energy Sources promoted to reduce forest degradation	49. Promote use of improved biomass technologies and sustainable charcoal production	-Identification of appropriate biomass technologies -Transfer of technologies to the community members through training	-Report on number of community members trained on energy saving devices -Report on the number of adopted improved biomass technologies -Report on Number of households using improved biomass technologies

This report, therefore, presents the activities covered under sub-activity 49 to promote use of improved biomass technologies in Mt. Elgon and Cherangany ecosystems. The activity was implemented in two phases: Phase 1 involved training on effective energy conservation technologies while phase 2 entailed distribution of energy conservation devices (permanent and portable kuni mbili Jikos, moto stoves and solar lamps).

2.0 METHODS

2.1 OVERVIEW

This section presents the methodological approach applied in promoting and demonstrating the use of improved biomass technologies. It highlights the approach used to identify and select the appropriate alternative biomass technologies, identify and select training groups and the technology transfer process.

2.2 SELECTION OF APPROPRIATE ALTERNATIVE BIOMASS TECHNOLOGY

A baseline survey on energy sources was conducted in Mt. Elgon and Cherangany Ecosystems to determine and map out energy sources used by the communities in the project area as well as explore possible energy interventions in the two ecosystems. Results from the survey indicated that most households use firewood as a source of fuel; for cooking, warming the house and sometimes lighting. Furthermore, a few households utilized other alternative sources of energy such as kerosene, LPG among others. Based on these findings, technologies that will meet the communities' needs as well as reduce dependence on natural forest for wood biomass were prioritized. The technologies prioritized were the Kuni Mbili jikos, moto stoves and solar lamps.

The 'Kuni Mbili Jiko' and moto stove technologies were preferred due to the less amount of fuel used, reduced smoke and greenhouse gasses emission and their simple design makes them easy to build. Two designs of the 'Kuni Mbili Jiko' were chosen; the permanent and portable designs. Solar Lamp was also a prioritized technology to ensure that less wood fuel is used as a source of light in the homesteads. The technology will also improve livelihood of the households who use alternative sources of energy such as kerosene for lighting by eliminating the cost element.

2.3 IDENTIFICATION AND SELECTION OF TRAINING GROUPS AND BENEFICIARIES

The training and support with energy saving devices targeted communities within the project intervention sites identified and selected in a participatory manner with stakeholders during reconnaissance visit. The exercise targeted all groups and communities the project had engaged with, these include beneficiaries of; on-farm tree planting; nursery training, bamboo production and management; communities bordering rehabilitation sites and also a small group of non-beneficiaries.

Farmers who had benefited from the On-farm tree intensification and diversification interventions formed a large part of participants in the energy conservation training; this was because the activity's objectives were partly met through the On-farm component such as the establishment of woodlots (bio-energy trees). Farmers adjacent to the rehabilitation sites in natural forest were also included in the training because of their frequent interaction and dependence on the forest due to their close proximity to the forest.

The process of identifying and selecting beneficiaries of the energy conservation devices was done in a participatory manner jointly by the community members and KEFRI staff. The community members selected individuals to participate based on the above mentioned criteria whereas KEFRI randomly selected the remaining beneficiaries taking into cognizance special groups such as persons living with disabilities (PLWDs). Averagely, 10 individuals mostly women were trained on Kuni Mbili and 20 on Solar lamps per site across the 8 project sites (Appendix 2,3 and 4). Women were targeted because they are key users of fuel wood due to the prescribed gender roles; they do most of the cooking and are also involved in the collection of firewood.



Figure 1: From left is Chief Kamasia, KEFRI staff and trainees holding jiko liners received from KEFRI for Construction of Kuni Mbili jikos in Elgeyo Marakwet County

2.4 TECHNOLOGY TRANSFER PROCESS

2.4.1 KUNI MBILI JIKO

The first technology to be transferred was the “Kuni Mbili Jiko”. The community members were trained on-site on the construction and use of Kuni mbili Jiko (Appendix 1- training schedule). The trainees learnt new skills of constructing energy saving jiko, they developed a positive attitude towards the new technology and each owned a new form of jiko in their cooking areas at the end of the training. The process of the technology transfer is outlined below;

A. SKILL

Local trainers in the project area who were well conversed with the technology were engaged to undertake the training for enhanced adoption . The trainers were mostly extension people who worked, are working or have worked with non-profit making organizations or the government in the energy sector. The skills to make the jikos were transferred in a participatory manner using demonstration. The trainer demonstrated on the process of making the jiko in the first household and then trainees joined in the second household and later on constructed 3 other jikos by themselves to ascertain understanding. That makes a total of five Jikos, the other five trainees were provided with Jiko liners to construct their jikos by themselves. A follow up was done to assess the constructed jikos and their status of maintenance. A total of 10 farmers in each site gained the skill to build a “Kuni Mbili Jiko”.



Figure 2: Trainees who have mastered the skill constructing their jiko

B. FORM

The community adopted a slightly different form of Jiko from what they were used to. The materials used for making the “Kuni Mbili Jiko” were familiar to the community with an exception of the “Jiko Liner” they include; mud, water, bricks/stones, ash and the jiko liner. The Jiko is unique in that it has a small opening for feeding firewood, ventilation opening, a ring to direct flames to the sufuria and a base to hold firewood in place. The community accepted the new form of the technology since it was an improved form of their jikos.



Figure 3: A typical jiko used by the community and a completed improved kuni mbili jiko

C. ATTITUDE

The community had a positive attitude towards the new technology. Notably, some trainees destroyed their old Jikos to accommodate the new technologies in their homesteads.



Figure 4: A beneficiary destroying outdated technology to pave way for the new technology

2.4.2 PORTABLE 'KUNI MBILI JIKOS'

Here, the community was mobilized and enlightened on the use, maintenance and the advantages of the portable kuni mbili Jiko, and later on issued with the Jikos. Though construction of the Jiko was technical, with materials used being; iron sheets, cement and the Jiko liner; it presented in a less bulky form making it easy to move from place to place. Additionally, the jiko is efficient since it can be used for warming using the retained heat.



Figure 5: Chief kaisagat distributes jikos to community after receiving them from KEFRI



Figure 6: Capacity building of community members on energy conservation devices/ technologies in mt. Elgon ecosystem

2.4.3 SOLAR LAMPS

Distribution of the solar lamps was done with assistance from the community leaders. Thereafter, demonstrations on installations were conducted at household level. The Solar lamp had the following components: A small solar panel which absorbs solar energy; three bulbs with separate switches; a multi charger for cell phone charging; a battery which converts and stores electric energy. The battery has multiple slots where all the other components connect.

After community were shown how to connect the different components into a functional solar lamp, they were further enlightened on maintenance and usage of the technology for better and longer illumination.



Figure 7: Demonstration on how to connect components of the solar lamp in Kapsara-Trans Nzoia county by KEFRI officer

3.0 CHALLENGES AND CONCLUSION

3.1 CHALLENGES

1. Gate keepers own interest outweighed those of the project where they may present trainees whom are not representative of the community

2. It was difficult to meet the demands of the community members to supply them with energy saving devices due to the high cost of procuring them which was beyond the budgeted amount.
3. Trainees who were mostly women are tasked with a number of gender roles in the community made it difficult for them to turn up for training and or necessitated hastening training sessions.

3.2 CONCLUSION

The transfer of the improved biomass technology was a success: with at least 77 households benefiting from energy conservation training and also knowledge on how to construct the 'Kuni Mbili Jiko'; another 160 households benefited from solar lamps and 80 benefited from the portable jikos in Cherangany ecosystem. In Mt. Elgon ecosystem, 75 households benefited with kuni mbili jikos and moto stoves.

The diffusion of the technologies is also high among the community; from preliminary feedback, the members of the community are interested in the technologies. Some community members have expressed interest on capacity building on jiko liner construction to diversify income and subsequently improve their livelihood as a community and also ensure that the technology is adopted widely.

APPENDICES

APPENDIX 1: TRAINING SCHEDULE ON CONSTRUCTION OF KUNI MBILI JIKO

Aim of the activity

The overall aim of the activity was: to promote use of improved biomass technology to reduce forest degradation and pressure to the ecosystem. The objectives of the training were;

- To improve utilization and access of sustainable energy and efficient energy devices
- To train on sustainable and diversified sources of energy
- To train on construction and utilization of energy efficient devices

Benefits of the “Kuni Mbili Jiko” technology

1. Requires less fuelwood for cooking
2. Produces less smoke which translates to less respiratory diseases and better health
3. Reduces emission of greenhouse gasses
4. Easy to build
5. Easy to use

Requirements for construction of Kuni Mbili Jiko

Materials	Quantity
Jiko Liner	1
Bricks/Stones	1 wheelbarrow
Mud	2 wheelbarrows
Water	20 litres
Ash	5 cups full
House hold tools to help in construction of the Kuni Mbili Jiko	
Equipment	Quantity
Spade	1
Wheelbarrow	1
Panga	1
Sufuria	1
Jembe	1

Steps followed in construction of the “Kuni Mbili Jiko”

Step	Activity	Rationale
1	Assemble all tools and materials	To ensure the process is continuous
2	Identify an ideal location for the Jiko	Close to a window for aeration
3	Mark the size of area to construct the Jiko	To determine the ideal size of the Jiko
4	Sprinkle water on the surface	To ensure the wet mud will attach to the ground
5	Submerge Jiko Liner in water for 10 minutes	To ensure mud attaches to the Jiko liner
6	Construct the base, using stones and mud on the marked area	To make a durable base
7	Add ash to the constructed base and compact	To bind the mud and prevent cracking
8	Place the Jiko liner on the base and put a sufuria half full of water on top	To balance the jiko liner
9	On the base remove a little mud on the side of the Jiko Liner	Leave space for ventilation and aeration during cooking
10	Line the jiko liner with mud	To act as insulation
11	Add stones and mud like the base was built until the height of jiko liner is reached	To ensure further insulation
12	Make a ring surrounding the jiko liner	To ensure flames are directed to the jiko
13	On the entrance of Kuni make bulge	To ensure that firewood is put at an angle for better combustion
14	Smoothen your Jiko to your preference	To beautify the technology

Maintenance

1. Avoid spilling water on the Jiko liner after cooking
2. Make sure you repair cracks regularly to avoid breakage of the Jiko walls

APPENDIX 2: LIST OF FARMERS TRAINED ON KUNI MBILI JIKO IN CHERANGANY HILLS

Kapolet Phase II (Kapsara)

Name	Id Number	Mobile No.	Remarks
1. Joseph Njoroge	10746212	0710522795	On-Farm beneficiary
2. Margaret Katumanga	0569917	0729218742	1 st time beneficiary
3. Edward Ndungu	12443530	0702650608	1 st time beneficiary
4. Joyce Wairimu	12442976	0732379432	On-Farm beneficiary
5. Susan Njoki	22534298	0703177856	On-Farm beneficiary
6. Rael Njeri	11757248	0725347049	On-Farm beneficiary
7. Janet Watengaro	9699982	0729814798	1 st time beneficiary
8. Agnes Minage	23455105	0703259133	1 st time beneficiary
9. Merceline Wanjiku	22394247	0712974646	On-Farm beneficiary
10. Rose Wahu	23199555	0701252463	1 st time beneficiary

Kapcherop (Kaptebengon)

Name	Id Number	Mobile No.	Remarks
1. Ann Kirop	20659380	0728718594	On-Farm beneficiary
2. Rose Murkomen	12679422	070272973	On-Farm beneficiary
3. Ben Komen	23752354	0716719544	On-Farm beneficiary
4. Pauline Kipkosgei	7061444	0717754555	1 st time beneficiary
5. Jane Lagat	11062390	0723442565	1 st time beneficiary
6. Paul Chemitei	11062505	0710197717	On-Farm beneficiary
7. Lydia Yego	27146092	0704835383	On-Farm beneficiary
8. Gladys Ruto	21163295	0710616332	1 st time beneficiary
9. Irene Kimaiyo	28154594	0717733328	On-Farm beneficiary
10. Irene Murkomen	31240775	0708029173	On-Farm beneficiary

Kaisagat

Name	Id Number	Mobile No.	Remarks
1. Cheporony Lisoreng	4693152	0726429919	Rehabilitation site (Lomuge)
2. Josephine Jerop	11867485	0700647330	Rehabilitation site (Lomuge)
3. Esther Ngariameter	9761150	0706519352	Rehabilitation site (Lomuge)
4. Chepsor Lomoton	31190054	0707893380	Rehabilitation site (Lomuge)
5. Margaret Sister	11758013	0702346409	Kapchila 1 st time beneficiary
6. Joan Chelagat	21770208	0795198158	On-Farm beneficiary
7. Milky Chepochepot	11712260	0718125045	Rehabilitation site (Lomuge)
8. Chepocheo Kodoleong	4093466	0722852854	On-Farm beneficiary
9. Pauline Sikuku	21925247	071444967	On-Farm beneficiary
10. Eliza Chemutai	7103768	0724260165	Kapchila 1 st time beneficiary
11. Chepkoileke Ariongomul		0700340111	Rehabilitation site (Lumuge)

Lelan

Names	Id Numbers	Mobile No.	Remarks
1.Korii Ptiros lawi	31976906	0717804903	On-Farm beneficiary
2.Simon Lokol	9764420	0700369176	On-Farm beneficiary
3.Samuel Kakuko	26627539	0717843993	On-Farm beneficiary
4.Chepocheptoch	8320822	0716793259	On-Farm beneficiary
5.Dinah Lokondi	11529097	0729467391	1 st time beneficiary
6.Alice William	26316624	0720141646	On-Farm beneficiary
7.Chepochehend T	25866956	0732644015	On-Farm beneficiary
8.Samwel Kenyatta	11280331	0710179551	On-Farm beneficiary
9.Monica Chemutai	26031906	0792830088	1 st time beneficiary
10.Charles Rumoi	4109701	0727476861	1 st time beneficiary

Kapolet Phase 1(Sengwer)

Names	Id Numbers	Mobile No.	Remarks
1.Elizabeth C. Pogisho	26674796	07114509065	On-Farm beneficiary
2.Monica Kiplimo	31196712	0792829855	1 st time beneficiary
3.Hellen Chepkoech	31070793	0724761450	On-Farm beneficiary
4.Gladys Chemengich		0725429509	On-Farm beneficiary
5.Benina J. Mongot	26488583	0723697392	On-Farm beneficiary
6.Rophina Kemet	29620298	0792151797	On-Farm beneficiary
7.Alice C.Kemboi	20286354	0710851363	On-Farm beneficiary
8.Grace Chepchumba	20717422	0716889480	1 st time beneficiary
9.Dina Chepchumba	8238758	0715344094	1 st time beneficiary
10.Consondina Kipkemoi	4495063	0712507042	1 st time beneficiary

Kamasia

Names	Id Numbers	Mobile No.	Remarks
1.Selina Rotich	1282794	0710708389	On-Farm beneficiary
2. Lilian Mosop	25935110	0732591559	On-Farm beneficiary
3.Mercy Kimaiyo	262558514	0735035813	On-Farm beneficiary
4.Samuel Kimutai	26156596	0706375422	On-Farm beneficiary
5.Josephine Kaino	11864757	0735748858	On-Farm beneficiary
6.Janet Kibet	33333473	0733684440	On-Farm beneficiary
7.Lilian Jerotich	26453976	0732696527	On-Farm beneficiary
8.Benjamin Komen	11864799	0703496696	On-Farm beneficiary
9.Lydia Naibei	30244739	0735318232	On-Farm beneficiary
10.Vivian Cheruiyot	26295144	0736100951	On-Farm beneficiary

Kapsumai

Names	Id Numbers	Mobile No.	Remarks
1.Susan Kipserem	10705416	0717392285	Rehabilitation site (Matira)
2.Mary Cheserek	2307945	0703844288	Rehabilitation site (Matira)
3.Irene Cheruiyot	20657707	0728731979	Rehabilitation site (Matira)
4.Albina Kiplagat	20657592	0716716777	Rehabilitation site (Matira)
5.Gladys Chelangu	25439694	0702059282	Rehabilitation site (Matira)
6.Hellen Kurui	14485270	0714046573	On-Farm beneficiary
7.Anne Kimutai	15687567	0715030196	On-Farm beneficiary
8.Peris Mawany	20492098	0712645998	On-Farm beneficiary
9.Leah Korir	25753445	0724927456	On-Farm beneficiary
10.Elizabeth Yano	20492165	0795882255	On-Farm beneficiary

Kapsait

Names	Id Numbers	Mobile No.	Remarks
1.Nelson Chepkigeny	0242557	0716596467	On-Farm beneficiary
2.Amos Kipchumba	30051401	0725158960	On-Farm beneficiary
3.Rosa Kimaiyo	3538304	0722739220	Requested for portable
4.Naomi Kemei	231889	0728053043	1 st time beneficiary
5.Rosaline Chelagat	1056229	0715115556	1 st time beneficiary
6.Christine Chepkoech	-	0723537212	On-farm beneficiary

APPENDIX 3: LIST OF FARMERS BENEFITED FROM PORTABLE JIKOS IN CHERANGANY HILLS

Kaisagat

No	NAME	ID NUMBER	PHONE No	REMARKS
1	Mary Lodiangole	7690293	0792157751	On-farm Beneficiary
2	Roseline Cherpka	20173031	0732241668	Rehabilitation site (Lomuge)
3	Joyce Madangole	8298253	-	On-farm beneficiary
4	Chepochepos Joel	21496524	0712424364	Rehabilitation site (Lomuge)
5	Rosaline Simion	32024925	0703301854	Rehabilitation site (Lomuge)
6	Agnes Chepchumba	26812825	0710246062	Nursery training beneficiary
7	Margret Biwot	11758013	-	On-farm beneficiary
8	Esther Asiwareng	-	07922844053	On-farm beneficiary
9	Abraham Lomuton	23671148	0724652822	Rehabilitation site (Lomuge)
10	Wilson Liman	-	-	Rehabilitation site(Lomuge)

Lelan

No	NAME	ID NUMBER	PHONE No	REMARKS
1	Nancy Lemtudo	23878011	0700909491	1 st time beneficiary
2	Donata Leonard	32857182	0783307311	1 st time beneficiary
3	Christine simion	269225303	-	1 st time beneficiary
4	Daniel Nyelemwai	20274511	0728351957	1 st time beneficiary
5	Peter Kenapos	31358716	0729352015	1 st time beneficiary
6	Lucy Kamama	20191284	072937841	1 st time beneficiary
7	Margret Muriye	11281462	0714685811	1 st time beneficiary
8	Nicholas Anisomuk	2387958	0718789130	1 st time beneficiary
9	Francis Kampala	20857912	0720324660	1 st time beneficiary
10	Turi Acherer	24813321	0729161055	1 st time beneficiary

Kapolet

No	NAME	ID NUMBER	PHONE No	REMARKS
1	Salome Kiptoo	3530606	0702670832	Energy training
2	Lydia Njoki	11362548	0710509995	1 st time beneficiary
3	Grace Kipsaina	11757838	0717912470	1 st time beneficiary
4	Anne Cheruiyot	4638229	0710451171	1 st time beneficiary
5	Elizabeth Wekesa	0277405	0703660766	1 st time beneficiary
6	Hellen Mariach	8298104	0711745881	1 st time beneficiary
7	Jane Kimisto	35474	0701083527	Energy training
8	Everline Chelangat	26489786	0716888819	Energy training
9	Joan Chepchumba	25041005	0714144841	Tree nursery training
10	Linet Mateh	11580485	0723673811	Energy training

Kapsara

	NAME	ID NUMBER	PHONE No	REMARKS
1	Florida Weyanga	20109265	0727058353	1 st time beneficiary
2	Hellen Adhiambo	1048722	0725429118	1 st time beneficiary
3	Mebo Okutu	10005919	0707540062	Energy training
4	Mary chetambe	1178047	0712038694	1 st time beneficiary
5	John Gakuo	9177967	0726348572	Tree nursery taining
6	Sofia Nyambura	1049902	0726514691	1 st time beneficiary
7	Selina Nasimiyu	4724073	0714828276	1 st time beneficiary
8	Lydia Njeri	29839052	0724062751	Bioenergy training
9	Paul Kamero	0714204	0710119012	1 st time beneficiary
10	Loice Njuguna	11575237	0726144831	Bioenergy training

Kapsait

	NAME	ID NUMBER	PHONE No	REMARKS
1	Margaret Kiprop	2367075	0723152372	On-farm beneficiary
2	Jerotich Kiplagat	10705433	0710471663	1 st time beneficiary
3	Josephine Kangogo	20409868	0724719693	1 st time beneficiary
4	Erick Kimayo	8771294	0722967986	On-farm beneficiary
5	Elkanah Chirchir	23153774	0726744350	1 st time beneficiary
6	Nelson Cheпкиeng	022557	0716596467	On-farm beneficiary
7	Rosa Kimayo	-	0722739220	1 st time beneficiary
8	Isaac Chirchir	34702283	0703719258	1 st time beneficiary
9	John Kangogo	-	0735926643	1 st time beneficiary
10	Miriam Kulei	30799526	07069124669	1 st time beneficiary

Kapcherop

	NAME	ID NUMBER	PHONE No	REMARKS
1	Joseph Komen	21378152	0702078463	1 st time beneficiary
2	Albina Kaino	11339602	0721783968	1 st time beneficiary
3	Salome Jepkemoi	13146918	0724046009	1 st time beneficiary
4	Metrine Nasimiyu	31493786	0728930628	1 st time beneficiary
5	Anne Koskei	11864700	0711444091	1 st time beneficiary
6	Albina Yator	5531732	0713326177	1 st time beneficiary
7	Ann B. Keitany	9864848	0720732301	1 st time beneficiary
8	Joyce Cherop	12678961	0708305955	1 st time beneficiary
9	Alice Jemutai	4638131	-	1 st time beneficiary
10	Elizabeth Kemboi	-	-	1 st time beneficiary

Kapsowar

	NAME	ID NUMBER	PHONE No	REMARKS
1	Grace Komen	24380779	0728453902	Energy training
2	Hellen Kibet	23926847	0718017803	Rehabilitation site (Cheptongei)
3	Margret Kosgey	27295494	0702059239	Tree nursery training
4	Agnes cheptoo	20104661	0722934800	Energy training
5	Rael Koech	12679329	07166507171	Rehabilitation site (Cheptongei)
6	Rose Baliat	1279204	0736137088	Rehabilitation site (cheptongei)
7	Fatuma Kimutai	1119466	0720410600	On-farm beneficiary
8	John Kiptum	9958280	0721158412	1 st time beneficiary
9	Ben Boit	11682427	0705343641	1 st time beneficiary
10	Dominic Yator	08767667	0733285500	On-farm beneficiary

Kamasia

	NAME	ID NUMBER	PHONE No	REMARKS
1	Janet Yator	-	0710578627	1 st time beneficiary
2	Caroline Kimayo	25514064	0736013283	Rehabilitation site- (sinen)
3	Christine Kimutai	11864669	0735891411	Rehabilitation site site (Sinen)
4	Peris Kaino	1184664	0725277122	1 st time beneficiary
5	Josephine Kipkoi	23510084	0736468344	1 st time beneficiary
6	Alice Cheruiyot	22199424	0737588946	Rehabilitation site (Sinen)
7	Damaris Wainaina	10670380	0723030801	Rehabilitation site (Sinen)
8	Emilias Chepkurui	26157276	0734563700	1 st time beneficiary
9	Caroline Ngothe	10574602	-	1 st time beneficiary
10	Roda Cheboi	11864666	073578526	1 st time beneficiary

APPENDIX 4: LIST OF FARMERS BENEFITED FROM SOLAR LAMPS IN CHERANGANY HILLS

Kaisagat

No	NAME	ID NUMBER	PHONE No	REMARKS
1	Naomi Chepkurui	30010421	0719692298	Tree nursery training
2	Martha Wairimu	28918365	0726234839	Tree nursery training
3	Catherine Cherop	26548156	0710375975	Bamboo training
4	Evelyn Asiwareng	30366282	0702448983	On –farm beneficiary
5	Edward Muruny	23810002	0713689271	Bamboo training
6	Chepaiwat Liman	4098300	0773358738	On-farm beneficiary
7	Esther Ngariamolev	9761150	0706519352	Energy training beneficiary
8	Eliza Chematoi	7103768	0724260165	Energy training beneficiary
9	Agnes Ezekiel	30030477	07022526085	Tree nursery training
10	Leah Chesang	30776142	0725845617	Bamboo training
11	Milkah William	11712260	0718124045	Energy training
12	Chepsok Lomuton	31190054	0724652822	Energy training
13	Chepokokee Ariongomuk	2415193042	0700430111	Energy training
14	Paul Mohammed	31954946	0715824630	Rehabilitation site (Lomuge)
15	Felister Tingaa	8723003	0713928495	Rehabilitation site (Lomuge)
16	Joan Chelangat	21770208	0722852854	Tree nursery training
17	Susan Komoli	9761837	0726746621	Capacity building beneficiary
18	Monicah Chemiwa	12815813	0719304310	1 st time beneficiary
19	Riinongole Lokwalinya	8324820	0707601410	Special group (PWD)
20	Moses Timoi	20749939		Rehabilitation site (Lomuge)

Lelan

No	NAME	ID NUMBER	PHONE No	REMARKS
1	Joash Tolim	9151654	0712304647	1 st time beneficiary
2	Teresa Beyeny	9564742	0727905844	1 st time beneficiary
3	Maryclaire Marti	34023242	0702572697	1 st time beneficiary
4	Simion Lokal	9764420	0700369176	Energy training
5	Samuel Kerakwang	11280331	0710179551	Energy training
6	Matayo Komol	40920641	0711109457	1 st time beneficiary
7	Crowly Simbal	26611445	0725544508	1 st time beneficiary
8	Peter Madio	21133942	0708781364	Energy training
9	Randly Kibet	329184210	0706796447	1 st time training
10	Cornelius Lakira	26582265	0728835526	1 st time training
11	Chebokijo Anisomk	23878958	0718789130	Energy training
12	Chemaywa Poulo	11757069	0704237046	1 st time beneficiary
13	Jeniffer Chepyatich	208121102	0723940289	1 st time beneficiary
14	Charles Rumot	410701	0727476861	1 st time beneficiary
15	Pius Lorupe	25406639	0727476861	1 st time beneficiary
16	Cosmas Barasa	40918979	0729416173	Energy training
17	Pricillah Korir	4091897	0704201669	On- farm beneficiary
18	Teresa Chepochechendo	25866956	0732644015	On farm beneficiary
19	Kiprotich Lowaka	13011203		Energy training
20	Joel Katiénya	7063997		On farm training

Kapolet

	NAME	ID NUMBER	PHONE No	REMARKS
1	Elizabeth Poghisho	26674796	0711745881	Energy training
2	Monicah Kiplimo	31196712	0792829855	Energy training
3	Hellen Chepkoech	31070793	0724761450	Energy training
4	Gladys Chemengich	0278469	0725429509	Energy training
5	Penina Mongot	26488583	0723697392	Energy training
6	Rofina kemet	7373438	0792151797	Energy training
7	Alice kemboi	202286354	0797351709	Special group (PWD)
8	Grace Chepchumba	20717422	0716889480	Energy training
9	Dina Chepchumba	8238758	0791168421	On-farm beneficiary
10	Concentina Kipkemboi	4495063	0712507421	Energy training
11	Evelyne chelangat	27069434	0714511816	Energy training
12	Elder wamoto	13007707	0729254280	On farm beneficiary
13	Briska Makut		0704465595	Energy training
14	Jane Chelamai	21461040	0713575936	On-farm beneficiary
15	Yovan Cherop	4091219	0716083439	Invasive species demo
16	Climent korir	28067710	0704741039	Scout
17	Reuben Rumui	21461040	0720721194	Rehabilitation site
18	Sarah chepkemoi	201709250	0718646526	1 st time beneficiary
19	Christopher Bett	20267436		Energy training
20	Wasmala Kiprono	26846872		Energy training

Kapsara

	NAME	ID NUMBER	PHONE No	REMARKS
1	Margret Namalwa	1048774	0705713842	Energy training
2	Patricia Muteti	2022041214	0723687082	On-farm beneficiary
3	Janet Bosibori	9699982	07298147978	Energy training
4	Esther waithera	3817432	0700411598	Special group (PWD)
5	Njoroge wagithinji	10746212	0710522795	On –farm beneficiary
6	Teresia Wangoi	284010068	0719196628	Tree nursery training
7	Ann Nasimiyu	1060099	0700636475	Tree nursery training
8	Margret wafula	1048774	07057138426	Tree nursery training
9	Philomena njenga	4254362	0706165040	1 st time beneficiary
10	Teresa Thambu	201763414	0723812529	Tree nursery training
11	Lucy macharia	1061844	0706377426	1 st time beneficiary
12	Mercy Okaya	30644649	0792400534	1 st time beneficiary
13	Ruth Njeri	27071182	0715269690	1 st time beneficiary
14	Nelson Mulongo	23399226	071481509	1 st time beneficiary
15	Peter Kamau	10016421	0725180960	1 st time beneficiary
16	Francis Ndungu	13414764	0723731580	Scout
17	Jephter Juma	4721977	0727259390	Tree nursery training
18	Jane Emase	26372214	0711469378	1 st time beneficiary
19	John Gakuo	9177967	0726348572	Bamboo training
20	Naomi Njeri	5974507		On farm training

Kapsait

	NAME	ID NUMBER	PHONE No	REMARKS
1	Priscah Kimosop	3538392	0724007179	1 st time beneficiary
2	Naomy Kemei	24361889	0726053043	Bioenergy training
3	Nancy Kosgei	3538519	0726356256	1 st time beneficiary
4	Roselyne Kimayo	1056229	0715115556	1 st time beneficiary
5	Jane Wafula	9176070	0702230946	Bioenergy training
6	Emily Kiprop	4639630	0702939152	Tree nursery training
7	Veronica Kiptoo	12827224	0719346235	1 st time beneficiary
8	Justus Kiprotich	24955799	073429950	1 st time beneficiary
9	Amos Kipchumba	30051401	0725158960	1 st time beneficiary
10	Peris Kiptoo	3538376	0721432390	Bamboo training
11	Josephine Keter	25316815	0702294601	1 st time training
12	Pamela Kiplagat	22345659	0723810741	Tree nursery training
13	Jane Kimayo	4494606	0717096398	1 st time beneficiary
14	Jemeli Yator	30514499	0720941582	1 st time beneficiary
15	Christine Kimayo	-	0723537242	1 st time beneficiary
16	Jemwetch Murkomen	12679422	0702729773	1 st time beneficiary
17	Korir Recho	7488084		1 st time Beneficiary
18	Evelyn Chemtai	3857678		1 st time beneficiary
19	Risper Soi	0734258		1 st time beneficiary
20	Robert Nekela	3866088		1 st time beneficiary

Kapcherop

	NAME	ID NUMBER	PHONE No	REMARKS
1	Lydia Yego	27146092	0704835383	On farm beneficiary
2	Ben Komen	23752354	0716717544	On farm beneficiary
3	Paul Chemitei	11062505	0710197715	On farm beneficiary
4	Anna Kiprop	20659380	0728718594	Energy training
5	Thomas Yego	12827204	0702038020	1 st time beneficiary
6	Irene Murkomen	227698875	0708029173	Energy training
7	Irene Kimayo	28154594	0717733328	Energy training
8	Komen Chebet	21378152	0702078463	Special group (PWD)
9	Paulina Kosgei	7061444	0717754550	1 ST time beneficiary
10	Jane Lagat	11062390	0723442565	1 st time beneficiary
11	Rosa Kiprotich	201787939	0714458698	1 st time beneficiary
12	Gladys Rutto	21163295	0710616332	1 st time beneficiary
13	Daisy Kimtai	32601291	0716631483	Energy training
14	Gladys Kemboi	24286497	0711165422	1 st time beneficiary
15	Selly Rotich	3534604	0703750752	1 st time beneficiary
16	Carrington Kibet	11863459	0726669745	1 st time beneficiary
17	Kiplimo Kimeli	9864860	0702301249	Special group (PWD)
18	Jackline Chesang	14485073	0725298720	1 st time beneficiary
19	David Selatei	7063733		1 st time beneficiary
20	Josephine Kimayo	20342721		1 st time beneficiary

Kapsowar

	NAME	ID NUMBER	PHONE No	REMARKS
1	Christine Bowen	14485178	0716781511	Energy training
2	Salome Bowen	23143183	0713331226	Energy training
3	Jeniffer Mayo	1281260	0725989371	Energy training
4	Julia Siloi	12641870	0734275751	Rehabilitation site (cheptongei)
5	Florah Mosop	9328540	0707160025	Rehabilitation site (cheptongei)
6	Susan Kibiwot	8032505	0701539361	Rehabilitation site (cheptongei)
7	Nicholas Kipchumba	20057641	0724649427	Energy training
8	Joseph Silvano	4303491	0731138503	Energy training
9	Raphael Cheserek	5284599	0724641632	Rehabilitation site(Cheptongei)
10	John Kwambai	1278441	0729398977	Energy training
11	Stephen Sirma	4503529	0733614765	Rehabilitation site (Cheptongei)
12	Jackson Kipruto	21033353	0727537321	On-farm beneficiary
13	Thomas Komen	12682637	0721397700	Rehabilitation site (Cheptongei)
14	Wilson Maiyo	24631896	0717961665	Rehabilitation site (cheptongei)
15	Salina Chelimo	12830184	0791749115	Special group (PWD)
16	Joseph Kosgei	12682427	0723224774	Coordinator
17	Alpha Paul	3488896	0716716777	Energy training
18	Hellen Kirui	14485270	0714046573	1 st time beneficiary
19	Paul Chelimo	0876767	0735960793	Chairman WRUA
20	Joseph Kauria	1752141		1 st time beneficiary

Kamasia

	NAME	ID NUMBER	PHONE No	REMARKS
1	Philemon Yego	23422906	0734642606	1 st time beneficiary
2	Dickson Chemweno	30572033	0725635082	Rehabilitation site (Sinen)
3	William Kipkoi	2006001	0736067426	1 st time beneficiary
4	Willy Yator	20847126	0714913853	On-farm beneficiary
5	Stephen K Suter	23715374	0734669756	On-farm Beneficiary
6	Damaris Wainaina	10670380	0723303080	1 st time beneficiary
7	Emilias Chepkurui	26157276	0734563700	1 st time beneficiary
8	Ben Yego	3540988	0735649106	On farm planting beneficiary
9	Ben Kibiwott	-	0788133736	1 st time beneficiary
10	Philemon Kirui	23506198	0724448628	1 st time beneficiary
11	Benjamin Kibor	5531567	0720911142	On farm planting
12	James K. Kanda	20638317	0731583060	Rehabilitation site beneficiary
13	Samwel K. Cheptuya	6208479	0725599861	1 st time beneficiary
14	Joel K. Biwott	11864534	0716440673	1 st time beneficiary
15	Salina J Rotich	1282794	0710708387	1 st time beneficiary
16	Francia K Chelimo	3816789	0714481990	1 st time beneficiary
17	Richard Tanui	-	0706449864	Special group (PWD)
18	Josphine Toroitich	-	0735748858	Bio-Energy training
19	Susan Chesire	22957887	0724022744	Rehabilitation site beneficiary
20	Ishmael Chebet	24867181	0790452802	Rehabilitation site beneficiary

APPENDIX 5: LIST OF FARMERS BENEFITED FROM ENERGY SAVING DEVICES IN MT. ELGON

Kaboywo

NO.	NAME	ID NUMBER	MOBILE NUMBER	VILLAGE
1.	Risper Cherotich	11144404	0700881432	Kisungen
2.	Sephrin Chemtai	30018536	0798774397	Kipyeto
3.	Elizabeth Chesir	2369760283	0729207075	Nomorio
4.	Teresa Chepmolen	120096	0701142272	Bondeni
5.	Phelister Wambui	117810845	0775714840	Kongit
6.	Teina Chemtai Limin	2085983	0701078362	Kaboywo
7.	Caro Ndiwa	11158619	0702082998	Chemoremo
8.	Geofrey Barasa	6500348	0720368490	Bugaa
9.	Lucy Ndiema	8319940	0701078362	Kapsokwony
10.	Joyce Mungou	10718812	0711291929	Bugaa
11.	Mercyline Cherotich	13153835	0725914097	Bondeni
12.	Debora Cheruto	30436779	0712796131	Bondeni
13.	Nelly Chemosong	25859157	0717865117	Bondeni
14.	Sella Chemtai Sitai	26065242	0704778900	Chelilder
15.	Sciulastica Tanger	11021451	0725807894	Chemoremo
16.	Emmily Chematui	20798428	0707258205	Chemoremo
17.	Pamela Chematui	35159323	0700677371	Chmoremo
18.	Judith Chemtai	13153860	0700677371	Chemoremo
19.	Caroline Belet	24112678	0712796131	Chemoremo
20.	Sarah Cherop Kaina	33917800	0701279967	Kongit
21.	Judith Ndiema	2094382	0725387500	Kongit
22.	Sophi Ptala	23028582	0702517384	Marsirtarit
23.	Philis Chesang'	20804566	0701287297	Murmoo
24.	Samgul Chebet	32543606	0717320695	Labaa
25.	Selestine Chepkwemoi	20927846	0708799210	Chemworemo
26.	Selina Chebeni	2094063	0700677371	Chemworemo
27.	Cecilia Tangusan	20695954	0706097912	Chemoremo
28.	Dorine C. Siywoo	35278907	0718185430	Chemworemo
29.	Joseline Mbuya	31919431	0727708246	Kongit
30.	Winrose C. Kutai	9513416	0726774260	Chemworemo
31.	Nancy Chepkwemoi	26360282	0704651054	Chemworemo
32.	Joan Chesutek	10431777	0718582634	Marsirtarit
33.	Beatrice Temko	11784794	0707302368	Bondeni
34.	Pauline Chematui	32875930	0701481968	Kaboywo
35.	Winy Temoi	20066806	0706097912	Labaa
36.	Phanice Chemtai	27324916	0722712179	Bondeni
37.	Elizabeth Wambua	20015538	0725982571	Bondeni
38.	Philis Chemtai	26373217	0719327522	Bondeni
39.	Teresa C. Masai	26402744	0711493825	Bondeni
40.	Pauline C. Ndiema	28008181	0712940285	Bondeni
41.	Mary Chepkis	20904800	0728346535	Bondeni
42.	Chistine Titoi	7584250	0713619472	Bondeni

Kaberwa

NO.	Name	ID NUMBER	MOBILE NUMBER	Village
1.	Stella Mutonyi	26580506	0711291929	Tilibay
2.	Nancy Chepkesis	27397394	0710289321	Bugaa
3.	Irene Cherop Simotwo	26487866	0713771830	Kaboywo
4.	Juliana Cherorich	7103742	0727546868	Bugaa
5.	Scholastic Mulongo	24670328	0711291929	Bugaa
6.	Emily C. Ndiema	10719682	0714043826	Bugaa
7.	Alice Kwalia	9682886	0705995576	Kibagenge
8.	Bekina Bera	7600410	0711291929	Bugaa
9.	Selly Kibitok	12442672	0708211557	Bugaa
10.	Ruth Kisa	11787193	0719830604	Tastai
11.	Mary Chemweet	1036125	0713676371	Bugaa
12.	Bridgit Chesang	20023664	0702332561	Tastai
13.	Susy Chepleng'	1038938	0701812660	Talilbay
14.	Ann Stephen	27278738	0714088186	Bamboo
15.	Mary Tawarawi	7582150	0714043826	Bamboo
16.	Ritah Nafula	1036739	0710289321	Bamboo
17.	Esther Kiboi	2085718	0710289321	Tastai
18.	Lydia Bera	24830696	0701812660	Tastai
19.	Everlyn Chesebe	1037205	0708316191	Bugaa
20.	Rose Yoko Bera	1039919	0701812660	Tastay
21.	Lydia Kiptoch	21232952	0728326922	Tastay
22.	Joina Chemngama	31460904	0717666745	Tastai
23.	Annah Otembo Masai	7582966	0704658000	Kongit
24.	Christine Cheruto	11784908	0720324517	Chemworemo
25.	Teresa Chemokos	1291628	0704917149	Chemworemo
26.	Rosy Kisa Chemos	1037452	0796900448	Kongit
27.	Edith Kamonya	29887912	0797424373	Kongit
28.	Teresia S. Chepnoen	120096	0701142272	Bondeni
29.	Selly Chebet Patrick	23398677	0704352140	Kaboywo
30.	Gladys Chepkingat	2085970	0791586870	Kongit
31.	Miriam Chemutai	11784871	0708213530	Kongit
32.	Annette Busenolea	13649332	0700677371	Chemoremo
33.	Hellen Chepkwemoi		0791059168	Chemworemo