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## African Clean Energy Research Alliance (ACERA) Consortium Meeting

Project : DFID/Royal Society

Venue : Parliament Office, Dar es Salaam -Tanzania

Date : 30-2 August 2018

### Introduction:

The Africa Clean Energy Research Alliance (ACERA) is the consortium that includes Dar es Salaam Institute of Technology (DIT), University of Leeds-UK, University of Marien Ngouabi-Congo-Brazzaville and Makerere University-Uganda. The consortium is working on research project titled: "Solar Treatment of Biomass for Power Generation in Hybrid Renewable Energy", and it is being supported by Royal Society-DFID Africa Capacity Building Initiatives. The research tackles the problem of universal access to modern clean energy. Apart from supporting PhD training, it covers short-term trainings for building capacity to engineers/personnel, practitioners and students in renewable energy technologies.

In view of the above, DIT was conducted a four days training on "Business modeling/grant proposal writing to solicit funding in promoting Renewable Energy Technologies", with the relevant stakeholder in the renewable energy sector. The training taken place at Bunge offices, Dar es Salaam, from 30<sup>th</sup> July to 02<sup>nd</sup> August, 2018-time table presented in Table 2.

### **Day 1: Monday 30/08/2018**

This meeting was chaired by Dr. Karugaba and Head of Electrical Department, who welcomed the rest of the consortium PIs, Participants and the PhD students. Round table introductions were then made as per the details in Table.1. This was followed by opening training from guest speaker Prof. Amri from DIT

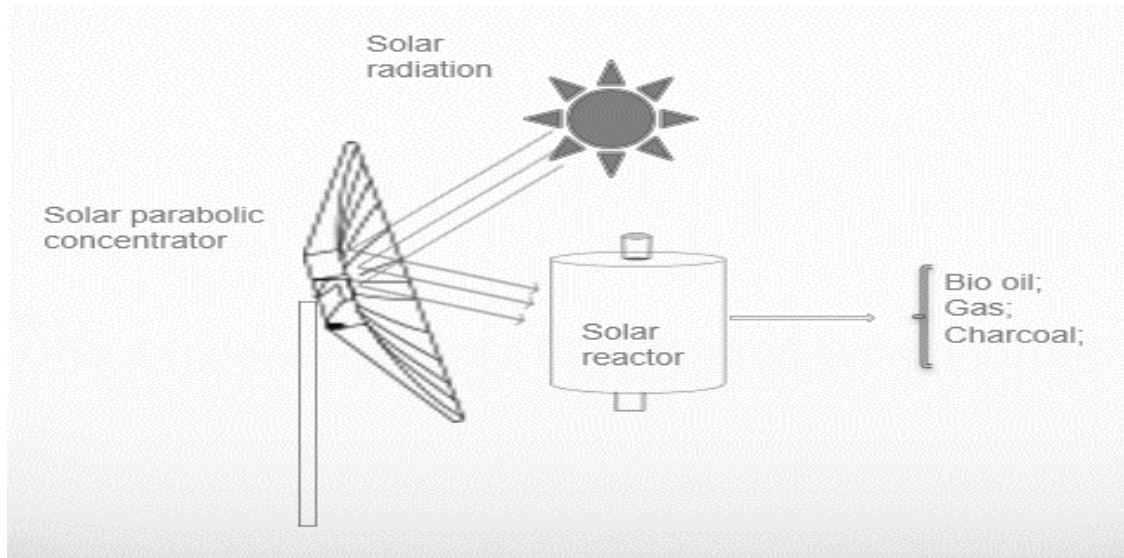
Dr. Karugamba Invited Prof.Jon as PI of ACERA project, he introduced aims of ACERA project and their partnership and then Dr. Consalva the Co-PI from DIT summarized research work of PhD students and then followed by the PhD progress presentations as follows:

#### **PhD students' presentation**

The three Ph.D. students provided an engaging presentation on three topics derived from the title of the main project: Solar treatment of biomass for power generation using carbon slurries in hybrid renewable energy systems.

#### **Mayala Tania (PhD student), Université Marien NGouabi, Brazzaville, Congo.**

Research Topic: Development of solar-driven thermochemical processes Tania's presentation highlighted the integration of Solar thermal heating technology with thermal chemical biomass conversion routes such as pyrolysis, gasification and hydrothermal conversion which represent an innovative solution for biomass processing in the regions with large solar flux. The student also identified the potential of the project as it can be scaled-up by the concentration of the solar energy on a large-scale using the different existing optical configurations such as trough, tower and dish system parabolic reflectors. From where the concentrated solar can then be directed using optic bundles to solar hoods that irradiates the reactor directly. The presentation also provided a local context that underscored the complexity and interconnectedness of the marine ecosystem and energy needs to be given that the feedstock identified (Algae and Ledermanniella) are mainly available on large scale from Congo River and biomass from wood around Congo region the layout shown in figure.1.



**Figure 1: The project lay out**

**ii. Opio Innocent miria (PhD student), Makerere University, Uganda**

Mr. Opio followed, by demonstrating how to explore the biochar obtained from Tania’s experiment to formulate biochar slurries as a novel biofuel for power generation in developing countries. He identified the key challenge to achieving this as the insufficient knowledge about the characteristic of parameters required for ternary blends of solids loadings for low viscosity has been identified as one of the obstacles. As well as limited demonstration whether it can work or not especially in medium to high-speed engines.

The presentation was broken into three specific parts. The first part identifies the biomass feedstock’s/species suitable for the biochar production. The second objective highlighted several processes that transform the bio-char into suitable sizes for char slurry formulation. The third part focused on how to create char slurry fuels that can effectively be handled by the engine and are stable, during storage, combustion and the power characteristics from the engine. The research was summarized in figure.2.

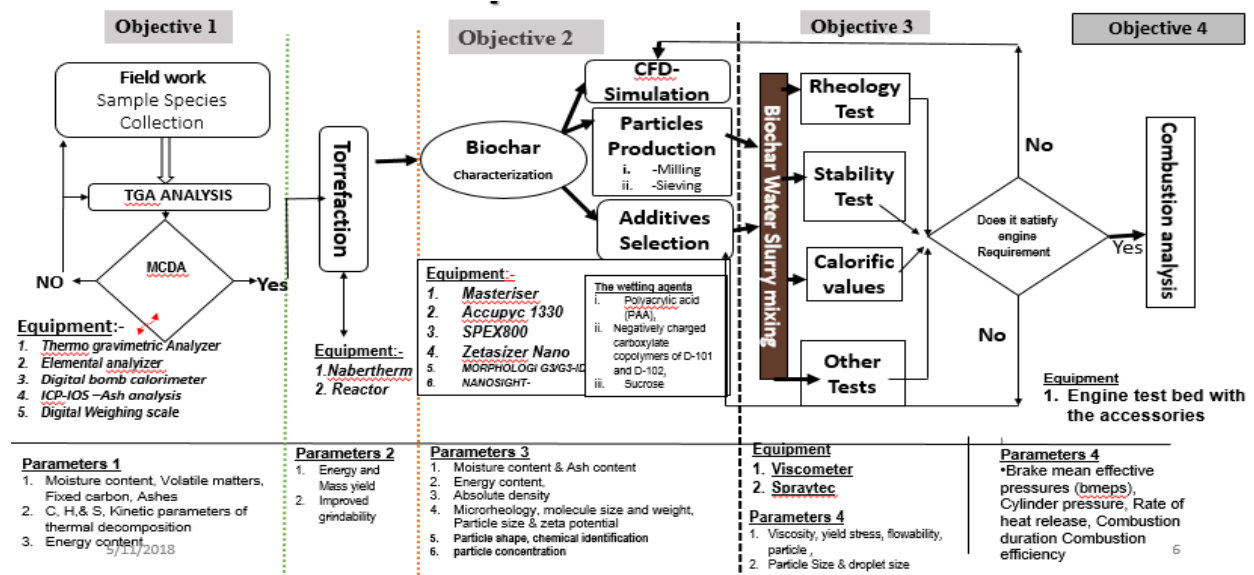
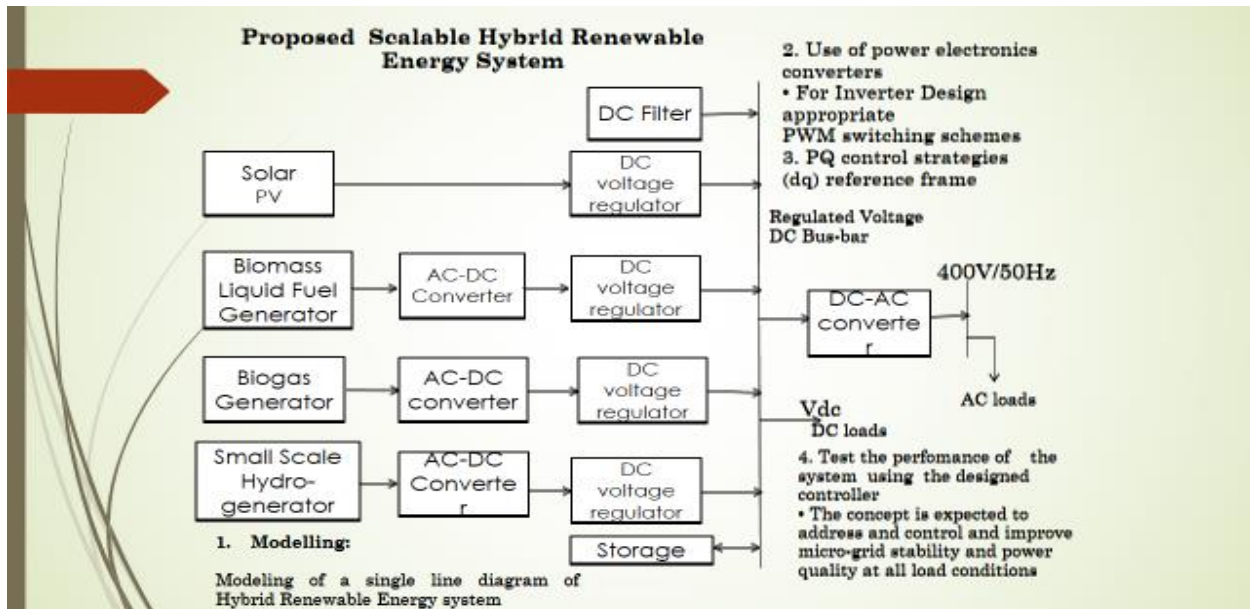


Figure2: Project Layout

### iii. Mwaka Juma, PhD student from Dar es salaam Institute of Technology, Tanzania

Mwaka can use electricity produced by Opio using the carbon slurry and other sources like solar, micro hydro power etc integrated to form hybrid system can then be controlled in to a suitable form for supply to the consumers in an islanding mode especial in the rural area where by grid not connected. Mwaka elaborated more through her specific objectives (1) to develop a model representing a single line of hybrid renewable energy sources, (2) to develop a control algorithm for scalable hybrid renewable energy facility, (3) to evaluate the performance of the scalable hybrid renewable energy facility through simulation and (4), to build and test a prototype for experimental verification of the scalable hybrid renewable energy facility. The general concept is as illustrated in figure 3.



**Figure.3 Project methodology**

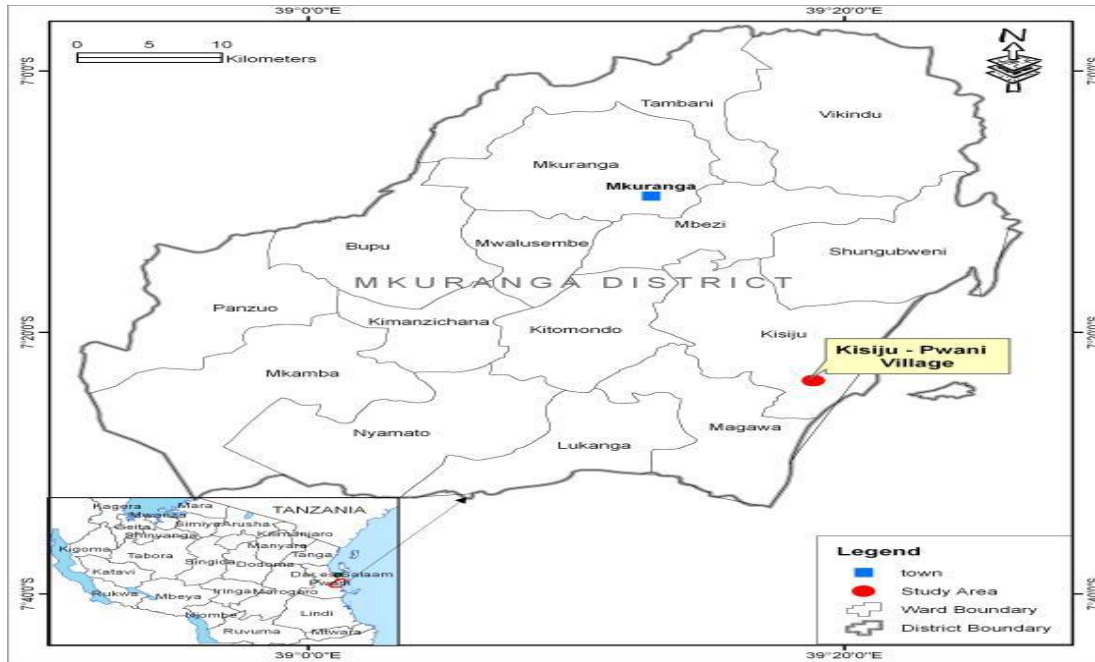
Objective No.1 was completed and Objective No.2 part 1, 80% of solar PV and battery storage was completed need some improvement to write technical paper.

### Discussion

Prof. Jon discussed the transfer of knowledge Between Leeds and Sub-Sahara Africa within the partners and how the samples can be tested in Leeds. It was advised to consider economic sustainability and highlighting the causes of voltage drop in the proposed designed system and measures taken to reduce it

### Renewable Energy (RE) based Microgrid

Prof. Bakari Presented his paper of Pilot mini grid site at Kisuju- Pwani village titled “Implementation Roadmap of a Photovoltaic based Mini-Grid for Electrification of Remote Areas of Tanzania: A case of Kisiju-Pwani Village as shown in figure.4.



**Figure.4 Kisiju-Pwani Village**

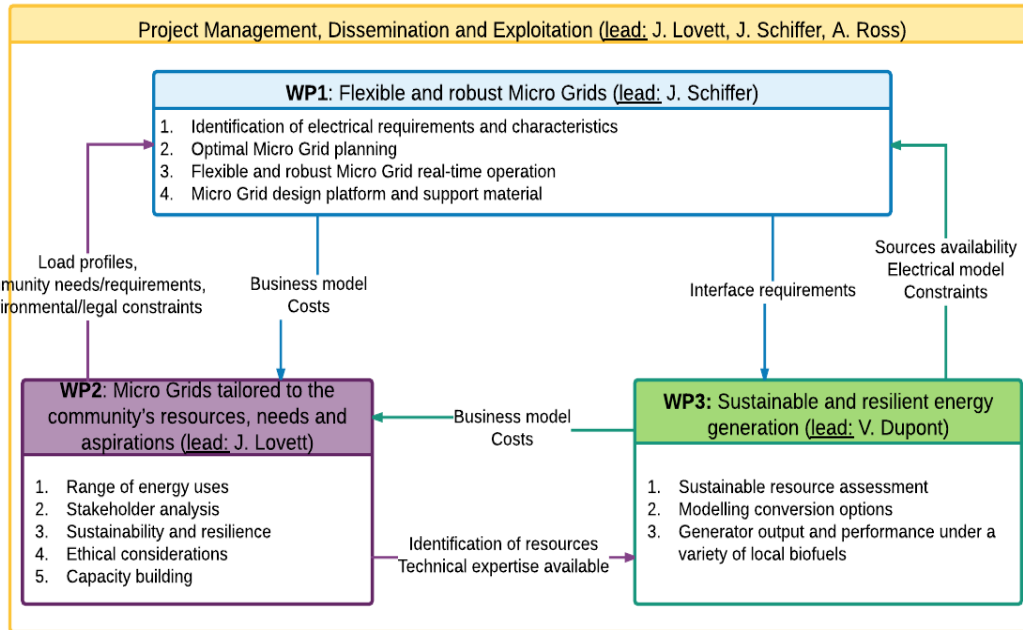
The village is situated along the shore of Indian Ocean, about 50 km south east of Mkuranga District headquarters, Pwani region. It has one primary school, two mosques, a village office, commercial households as well as domestic

The main objective of the project is to investigate the impact of availability of electricity in terms of socio-economic developments and sustainability of the Mini-Grid.

The Mini-Grid has been built to supply a school, a dispensary, village office, religious buildings, twenty street lights and a total of 68 residences. The village government was fully involved in the process of Mini-Grid implementation in order for the village to acquire full knowledge of the system in terms of management, finances and technical up keeping.

**ACERA Mini-grid Project University of Leeds**

Prof. Jon Presented new project management ACERA Mini-grid Project University of Leeds as shown in figure.5.



**Figure.5 Mini grid Project**

Electrical Engineering in Leeds look on how to integrate minigrid to Grid

Minigrid Project involve:

- Partners
- ACERA Consortium

Funder

- Engineering and Physical Science Research Council (EPSRC) provide pound 1.24millions.

## **ELECRIC POWER CHAIR**

Engineer Erasto Chiswanu, a young Innovator and DIT alumina presented his work on Electric wheel chair to help disabled peoples. He explained the design stages foe the chair starting with old electric chair when he was doing his bachelor degree and the new Electric chair designed and fabricated while working at Tanzania Electric Supply Company (TANESCO) as shown in figure 6 (a) & (b) respectively.



**Fig. 6 (a)Old Electric wheel chair**

**(b) New Electric Wheel chair**

Challenges faced includes the funding for producing more chairs as well as improving the current design of the power chair so that it can perform more operation and help large group of disabled person with various disabilities. Currently, electric wheel chairs from abroad, are very expensive and most disabled people cannot afford to buy them.

**Day 2: Tuesday 31/7 2018: Business Modelling and Fundable Proposals – Michael Onesimo**

Business model is the process how to make money for project or business you what to do.

Business modelling Includes:

- 1) Describes rationale of how an organization - creates, deliver and captures values
- 2) Explain what products/services-The business plans, manufacture and market. Also cost and Profit.
- 3) Create value of your business and your customers.
- 4) Modelling Tool: Business Canvas involve the following as shown in figure.7
  - a) Key partner
  - b) Key Activities
  - c) Value proposition
  - d) Customer’s relationships
  - e) Customers segments
  - f) Key resources



- g) Channel
- h) Cost structure
- i) Revenue Stream

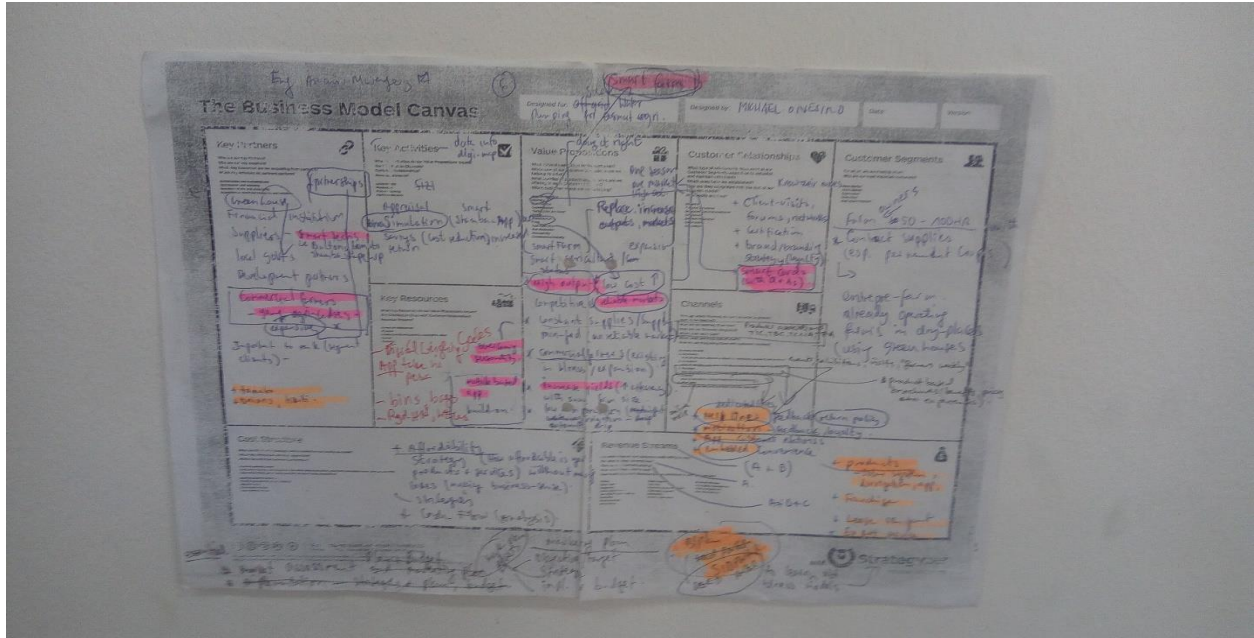


Figure.7 Business Canvas

The whole idea and main components of business model have been explained in figure. 8



Figure.8 Business model

## Activities

After description participants prepared business model. Four groups for different business idea such as Cook stoves, Solar Micro grid for Island, Poultry Production Farming and Bio-gas were formed.

Each Group Identified key points on Business canvas and also made priority of an activities as shown in red dots. After that each member around on business models that had been be created by different groups to put on comments as identified by small paper in figure. 9– 12.



**Figure.9, Poultry Production**



**Figure. 10 Solar Micro grid for Island**



**Figure.11 Cook stoves**



**Figure.12: Bio-gas**

### **Proposal funding**

Mr Michael continued to Proposal funding he started on how to create trust because is very important for getting fund.

Why People give? - Because can trust you

Why do people invest – Need profit

What do investor expect? - Social profit.

Where do you get fund? - Family, Friend and Others.

What do investor look in your Proposal-Financial model/Profitability

Essential Part of Investor want to see on your proposal.

- a) References
- b) Partnership

- c) Networks
- d) Board members

What would you do during payback period?

What would you do after receiving funds - Annual Report.

What would you do before approaching investor- should create value of your business and should be prepared that you have? Those elements have been presented on figure.13.

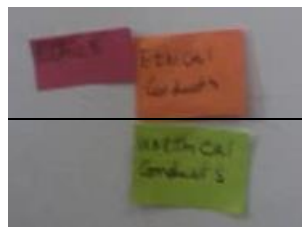


**Figure.13 Proposal funding**

On proposal funding you should create Partnership, Networks and also mobilizing resources, give professional people to read, what has been written in your proposal.

**Ethics**

With corruption you cannot get fund, so need to know your background and who is a board member?



**Figure.14 Ethics**

### **Day 3: Wednesday 1/08 2018: Field Visit in Kisiju**

Visit sight to Kisiju-Pwani to see Solar Minigrid about 200km from Dar es Salaam City centre was made.

The PV Power Station have Solar photovoltaic array of 8,600Wp from 32 pieces of PV panels rated 8 Amps, 270Wp and 24V. Control Room consists of battery storage, Regulators and Inverter.

Electrical storage batteries with a total storage capacity of 4,800 Ah at nominal system voltage of 48V DC.

(a) Charge controllers at 48V, 140A DC.

(b) A 48 V DC and contact 400 Amps DC relay;

(c) Sine wave inverter for AC loads rated at 230V AC and 12,000W; as shown in fig



**Figure.15 Solar-PV station**

Participants visited customer connection terminals, near every street light have connection box nearby of four customer having four circuit breaker (MCB). They have underground distribution network. There are 20 street lights installed along the main street and paths using galvanized iron poles with light fixtures as shown in Figure 16.



**Figure 16: An example of a street light along the village road.**

**Day 4: Thursday 2/8/2018: Gender Mr. Mhina**

Introduction started with experiences of his home and his family how ladies involved in home activities compared to Gentleman that why he got interest to Gender issue. He explained how he got involved in Gender Planning method in Sweden and water sanitation around Lake Victoria.

He was interested in knowing who among the participant was involved in Gender Issue?

Prf. Jon involved to in Gender planning in his project funded by World Bank also ACERA project secured in gender balance.

Hannah Birch and Sherfird also involved in women dealing with Business

Dr.Nabuma is involved in gender - to encourage Women to join post graduate studies.

Kabigo- NGO that deals with water fetching, activities which can cause Mortality death. The He perception that have social bias like Traditional women ~~can~~ doing all house hold activities, explained how this can be minimized by teaching man and women that everyone can participate in house hold activities, that household activities do not rely on biological features.

Culture: can force people to do something which they do not want to do.

## **Gender Analysis & Planning Framework Governs and Owner**

- 1) Who is doing what? Is Gender Role Analysis.
  - a) Reproductive – Biological law Man just can produce sperm  
But women ~~can should~~ starts at sexual intercourse up to end.
  - b) Production – Women can take care children's and also can exchange value.
  - c) Community management Activities- Free labour water services and power supply
- 2) Who has ~~are~~ control to what resources – Situational Analysis
- 3) Practical Gender needs – need to change
- 4) Gender gaps involved Technical, Structure-Location, Culture, Social and Political
- 5) Policy Analysis.

Activist – Women should be empowered on the following:

1. Welfare
2. Factor of Production
3. Conscientisation-understanding
4. Participation
5. Control.

## **Conclusion**

The four days intensive training was developed to provide practical learning experiences as well as networking platform for project engineers, entrepreneurs /business managers in Tanzania who are working towards renewable energy development projects.



**Table1: List of ACERA meeting participants**

S/N	Names	Position	Address
1	Dr Consalva Msigwa	Co-PI	DIT, Tanzania
2	Prof Jon Lovett	Main PI	University of Leeds, UK
3	Mary Suzan Abbo	Co-PI	CREEC-Makerere University , Uganda
4	Prof.Bakari.M.M.Mwinyiwiwa	Supervisor	University of Dar es Salaam, Tanzania
5	Dr Betty Nabuuma	Supervisor	Makerere University , Uganda
6	Mwaka Juma	PhD student	University of Dar es Salaam, Tanzania
7	Opio Innocent Miria	PhD student	Makerere University , Uganda
8	Tania Mayala	PhD student	Marien Ngouabi University, Congo
9	Hannah.Birch	PhD student	University of Leeds, UK
10	Hannah.Sherwood	PhD student	University of Leeds, UK
11	Flavia Jambo	Public Relation	CREE-Makerere University , Uganda
12	Angela Nabagesera	Accountant `	CREE-Makerere University , Uganda

**Table2: List of Participants outside ACERA**

S/N	Names	Position	Address
1	Festo M. Ndonde	Technical Executive Officer	Wananchi Power Provider Ltd, Tanzania
2	Alphonse M. Lema	Consultant	SEANELC Tanzania Ltd
3	Edgar Mkosamali	Consultant	Master Plan LTD, Tanzania
4	Dr. A. T. Mushi	Lecturer	CoET - UDSM
5	Dr. J. Justo	Lecturer	CoET-UDSM
6	Dr. F. Mwasilu	Lecturer	CoET-UDSM
7	Mr. Maneno Mkwai	Technician	CoET-UDSM
8	Jamila Daud	Technician	Freelance-DSM
9	Robert Wang'oe	Technician	Jumeme Ltd,Ukerewe-Mwanza,Tanzania
10	Juvent Magogo	Consultant	Mkonge Energy Systems, Tanga Tanzania
11	Grace Harson	Consultant	Ensol (T) Ltd,Dar es Salaam Tanzania
12	Nassoro S. Nassoro	Technician	DIT Dar es Salaam Tanzania
13	Mawazo John	Tutorial Assistant	DIT Dar es Salaam Tanzania
14	Adam H. Liwondo	Assistance Lecturer	DIT Dar es Salaam Tanzania
15	Daud J. Bahebe	Instructor II	DIT Dar es Salaam Tanzania
16	Ms.Halima H. Libani	Assistance Lecturer	DIT Dar es Salaam Tanzania
17	Dina P.Msangi	Instructor II	DIT Dar es Salaam Tanzania
18	Dr. Nyali E.	Lecturer	DIT Dar es Salaam Tanzania
19	Mr. Katani Augustino	Assistant Lecturer	DIT Dar es Salaam Tanzania
20	Dr. Karugaba	Lecturer	DIT Dar es Salaam Tanzania
21	Erasto Chiswanu	Engineer	DIT Dar es Salaam Tanzania

22	Innocent Rupia	Technician	DIT Dar es Salaam Tanzania
23	Elifuraha Mmary	Assistance Lecturer	DIT Dar es Salaam Tanzania
24	Ikangira Busweru	Technician	DIT Alumni Tanzania
25	Ntindimo Mabeja	Technician	DIT alumni Tanzania
26	Mrumbas Nyambega	Technician	DIT alumni Tanzania
27	Dr. G. Moshi	Lecturer	DIT Tanzania
28	Ms. Agnes Nakiganda	PhD student	UoL UK
29	Eng. Zuberi Chambali	Engineer	DIT Alumni Tanzania
30	Evans Kabingo	Engineer	DIT Tanzania
31	Martin Ntindimo	Assistant Lecturer	DIT Tanzania
32	Eliya Mangomango	Technician	DIT Alumni Tanzania
33	Ms. Fausta Francis	Managing Director	Freelance Tanzania
34	Denis Saleko	Consultant	TAREA Office, Dar es Salaam Tanzania
35	Ms. Asha Juma Mohamed	Assistance Lecturer	DIT Tanzania

### Tentative: Time- Table

**1<sup>st</sup> Day: Monday 30<sup>th</sup> July to Thursday 02 August 2018**

Monday 30 <sup>th</sup> July 2018		
09:00- 09:15	Registration	
09:15- 10:00	Welcome session: <ul style="list-style-type: none"> <li>• Welcome by organisers</li> <li>• Welcoming remarks</li> <li>• Keynote Speech</li> <li>• Vote of thanks</li> <li>• Group photo</li> </ul>	Co-PI ACERA DIT PI-ACERA-UK Principal DIT HoD EE ALL
10:00 – 10:30	Tea/Coffee break	

	<b>Solar Treatment of Biomass for Power generation using carbon slurries in hybrid renewable energy systems</b>	
10:30–10:40	Solar treatment of biomass for energy storage	PhD student: <b>Tania Mayalla-</b> Universite Marien Nguabi -
10:40 – 11:50	Novel Power Generation from Bio-slurries	PhD student: <b>Opio Miria</b> – Makerere University
11:50 – 12:00	Development of Microgrid model for Scalable Hybrid Renewable Energy for power generation	PhD student: <b>Mwaka Ismail Juma - DIT</b>
12.00-12.40	RE based Microgrid	Prof. B.M.Mwinyiwiwa
12:40 – 13:00	Q&A Discussion	All
13:00 – 14:00	Lunch	All
	<b>INNOVATIONS</b>	
14:00 – 14:15:	Microgrid Project	1. Prof. Jon
14:15- 15:00	Electrical Power Chair <ul style="list-style-type: none"> <li>• Old version wheel chair</li> <li>• Modified wheel chair</li> </ul>	Eng. Erasto Chiswanu
15: 00 – 15:20	Q & A Discussion	
15:20 – 15: 30	Closing session-Tea/Coffee	
15:30- 16: 30	PhD peer training	

**Day 2: 31<sup>st</sup> July, 2018: Business Modelling and Fundable Proposals – Michael Onesimo**

9:00 -10:30	Introduction of business modelling	Michael Onesimo, Business develop Consultant, Karakana Social Venture
10:30 – 11:00	Health break	
11:50 – 13:00	Business modelling	Michael Onesimo, Business develop Consultant, Karakana Social Venture
13 – 14.00	Health break	All
14:40 – 15:00	Grant Proposal Writing and Business Ethics	All
15:00 – 15:30	Closing session	All
	PhD student peer training/ ACERA meeting	

**Day 3: Wednesday, 1<sup>st</sup> August, 2018: Field Visit in Kisiju**

	Wednesday 01 – 08 – 2018
08:00 a.m	SIGHT VISIT : KISIJU - SOLAR PV POWER PLANT( Departing time : 08:00 a.m

**Day 4: 2<sup>nd</sup> August 2018: Gender – Mhina**

8:30–10:40	Gender	Co-Hosted session, Mhina
10:40 – 11:50	Health Break	All
11:50 – 12:00	Gender	Mhina, TGNP
12:40 – 13:00	Gender, Business and Ethics	
13:00 – 14:00	Lunch	All

14:00 – 15:00	Gender, Business and Ethics	Mhina, TGNP,
15:00 - 1600	Closing ceremony	All