Norwegian Embassy

Capacity Building for Managing Climate Change (CABMACC) Programme

Annual Report
July 2016 – June 2017

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PREAMBLE: CABMACC PROGRAMME

Capacity Building for Managing Climate Change in Malawi (CABMACC) Programme is a five (5) year (2013 – 2018) Norwegian funded national programme coordinated at Lilongwe University of Agriculture and Natural Resources (LUANAR) in collaboration with the Norwegian University of Life Sciences. It is governed by national structures- Annual Meeting (AM), Programme Advisory Committee (PAC) and Research & Capacity Building Sub-committee (RCB).

The overall goal of the programme is to improve livelihoods and food security through innovative responses and enhanced capacity for adaptation to climate change in Malawi.

In order to achieve the above development goal, the immediate objectives (purposes) of the programme are to:

- Enhance capacity of the University in research and teaching for climate change mitigation and adaptation.
- Develop new knowledge, technologies and systems to enhance climate change adaptation and mitigation.
- Enhance capacity of the University and relevant key stakeholders in in climate change outreach and advocacy.

The following are the expected outputs of the programme

- Improved capacity of LUANAR and key stakeholders on climate change adaptation and mitigation
- Gender mainstreamed within teaching and research programmes
- HIV/AIDS issues mainstreamed into teaching and research programmes across LUANAR
- Improved information access, documentation and ICT services
- Innovative research, best bet practices and technologies developed on climate change adaptation and mitigation undertaken
- Capacity of key stakeholders enhanced for climate change adaptation and mitigation

ACKNOWLEDGEMENTS

Lilongwe University of Agriculture and Natural Resources (LUANAR) is highly grateful to the Government of the Royal Kingdom of Norway for the sustained development assistance to the university since 1998. The University appreciates inputs and the interest that the Embassy has shown during the implementation of Norwegian funded programme during the 2016/17 reporting year. This support is enabling the University to achieve some of its objectives as stipulated in the University Strategic Plan.

The University further appreciates the policy and organizational guidance and technical support provided by the Programme Advisory Committee (PAC) and the sub-committee on Research and Capacity Building (RCB) towards achievement of intended programme results. The continued technical and institutional guidance from the Programme Desk Officer at the Royal Norwegian Embassy (RNE), Dr Augustine Chikuni is also acknowledged with profound gratitude. The contribution from the University of Life Sciences coordinated by Professor Bishal Sitaula and individual Norwegian research collaborators and students is further recognized and appreciated.

Finally, LUANAR greatly appreciates the contribution of all the stakeholders participating in the successful implementation of the CABMACC programme including Malawian research teams, Government ministries and departments, NGOs, community stakeholders, staff from the implementing Extension Planning Areas (EPAs), Network for Enhanced Livelihoods (NEAL) Partners, students and staff from LUANAR.

ACROYNMS AND ABBREVIATIONS

AA	Academic and Administration
ACCA	Association of Chartered Certified Accountants
AAE	Agricultural and Applied Economics
BSc	Bachelors of Science or Bachelors' degree
CABMACC	Capacity Building for Managing Climate Change in Malawi
CARE	Christian Action Research and Education
CBO	Community Based Organisations
CoM	College of Medicine
CTS	Clerical and Technical Staff
DADO	District Agricultural Development Officer
DFID	Department for International Development
DoF	Department of Forestry
EAD	Environmental Affairs Department
EPA	Extension Planning Area
ERS	Extension and Rural Sociology
ESM	Environmental Sciences Management
FRIM	Forest Research Institute of Malawi
GIL	Global Internet Limited
GPA	General Performance Assessment
IDRC	International Development Research Council of Canada
ITTN	Information and Technology Transfer Nodes
LCM	Law Commission of Malawi
LUANAR	Lilongwe University of Agriculture and Natural Resources
MoGCDS	Ministry of Gender, Children, Disability and Social Welfare
NAC	National Aids Commission
NASFAM	National Smallholders Farmers' Association of Malawi
NEAL	Network for Enhances Livelihoods Partners
NMBU	Norwegian University of Life Sciences
NGO	Non-Governmental Organisations
NRC	Natural Resources College
OPAC	Online Public Access Catalogue
PAC	Programmes Advisory Committee
PD	Programme Document
PhD	Doctor of Philosophy
PI	Principal Investigator
RNE	Royal Norwegian Embassy
RUFORUM	Regional Universities Forum for Capacity Building in Agriculture
SRCB	Sub Committee on Research and Capacity Building
UNDP	United Nations Development Programme
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

The Capacity Building for Managing Climate Change (CABMACC) Programme has been implemented for three and half years since 2013. The programme that aims to build the capacity of university and key stakeholders is being coordinated by the Lilongwe University of Agriculture and Natural Resources and the University of Life Sciences in Norway with funding from the Royal Kingdom of Norway.

In the fourth year (July 2016 - June 2017) the programme has undertaken several interventions to address the targets and plans approved by the Annual Meeting of the Governments of Norway and Malawi. This report covers intervention targets, achievements and interventions implemented in the 2016/17 period. The report also covers a summary of the 2016/17 financial report, programme efficiency, major deviations, risks and achievements in relation to programme purpose.

(a) *Targeted Indicators for the reporting period*

i. Improving the capacity of LUANAR & Key Stakeholders

Under this output, the targets were to continue supporting seven (7) PhD, three (3) MSc, two (2) BSc, two (2) Chartered Institute of Management Accountants (CIMA) and two (2) members of staff for short course in finance project management. The programme planned to finalize two (2) transfer nodes, provision of scholarship for female students and conducting four (4) mentorship sessions. Finally, the programme was expected to facilitate the development of PhD and MSc programmes and guidelines for mainstreaming gender in teaching and learning.

The programme managed to support one (1) workshop on development of research agenda for the Faculty of Natural Resources Management, three (3) BSc (one graduated), one (1) MBBS, three (3) Masters students (all graduated), 11 PhD students (9 full scholarships & 2 partial scholarships, 1 graduated), supported two (2) members of staff CIMA. In addition, research projects are also supporting PhD, MSc and BSc students. The programme conducted one (1) write-shop on writing proposals,The programme provided scholarships to 67 female undergraduate students and provided support to two (2) transfer nodes in Phalombe and Rumphi districts.

ii. Gender Mainstreaming into Teaching & Research programmes

Under this output, 50 farmers were to be trained and one career talk conducted in secondary schools. One (1) short course on gender, health and climate change was also to be delivered.

The programme developed two (2) toolkits for promoting science among girls in secondary schools and training of frontline staff on gender and climate changes. In addition, two (2) manuals on training primary and secondary school teachers on gender and climate change, and training of lead farmers and extension workers on gender, health and climate change were developed. The programmed also trained 30 primary and secondary school teachers, and conducted one (1) short course training on gender, health and climate change for 32 extension workers.

iii. HIV/AIDS Issues Mainstreamed into Teaching & Research

For this output, the programme planned to support publication of one (1) resource book on HIV and AIDs in higher institutions of learning, and the establishment of a HIV and AIDs social learning forum and supporting studies for a member of staff at College of Medicine.

Under this output, the programme supported LUANAR Health Centre VCT services through long-term training of one (1) clinical staff. The programme also supported development of one (1) HIV/AIDS social learning forum. In addition, the programme supported development of a guidebook on HIV/AIDS for higher learning institutions (under review).

iv. Improved information access, documentation and ICT services

For this output, targeted publication of one (1) edition of Malawi Journal of Agriculture, Natural Resources and Development Studies (MAJANDS), one (1) resource book, subscription to e-journals and monthly payment of Internet connections.

The programme supported publication of first issue of MAJANDS (special edition under review), published resource book on Improving Livelihoods in Malawi: Case studies of Malawi, payment for subscription of library software to Library Corporation, procured two (2) high definition TVs for library message transmission and teaching, paid internet connection bills, and published one (1) resource book developed by the LUANAR library staff members known as Moodle. The programme has also under this output developed a 13 week radio programme on Climate Smart Agriculture (CSA)/Integrated Soil Fertility Management (ISFM) practices, and will also continue to support an MSc student in 2017 from NMBU.

v. Innovative research and technology

This output planned to continue support seven (7) research projects, two (2) PhD students research projects (those studying in Norway) and three (3) projects on indigenous crops and land races and renewable energy.

Under this output, the programme is continuing supporting seven (7) research projects of which four (4) are being implemented with Norwegian partners, one (1) renewable energy project, 10 research projects in other areas by students, two (2) research by PhD students at NMBU, and conducted one (1) training on indigenous crops and land races. Specific outputs are indicated in the main document.

vi. Capacity of key stakeholders enhanced for climate change adaptation

Under this output, the programme planned to support training for policy makers, production and airing of six (6) TV and five (5) radio programmes, management of CABMACC website and support production of IEC materials.

Under this output the programme supported 10 news items, 22 special programmes (Zokonda Amayi), three (3) visits to Zokonda Amayi groups, conducted one (1) workshop for policy makers, produced one (1) newsletter and one (1) CABMACC Annual report distributed at RUFORUM AGM. The programme initiated the redevelopment of the CABMACC website.

(c) Summary of the use of funds

During the reporting period, the total amount of NOK10,842,178 (US$1,306,286) was available representing 76% of the annual budget. The total amount included NOK5,000,000 (US$595,308.97) from the Embassy, balance brought forward from 2015/16 financial year and interest gained from both foreign denominated and local accounts of NOK5,837,053 (US$710,360).

During the reporting period, the cost of implementing activities was NOK9,214,046 (US$1,110,126) representing 65% of the 2016/17 financial year budget and 85% of funds available.

Table 1: Summary of income and expenditure (July 2016- June 2017)

INCOME	MK	NOK	US $
Balance b/d	423,327,660	5,882,725	708,762
Grants from Norwegian Embassy	433,267,082	4,941,064	595,309
Interest Receivable	1,341,524	15,465	1,863
Exchange Gain	71,437,985	-	-
Other income	253,650	2,924	352
Total Income	**929,627,901**	**10,842,178**	**1,306,286**

EXPENDITURE	MK	NOK	US $
Improving the capacity of LUANAR & Key Stakeholders	154,135,470	1,776,839	214,077
Gender Mainstreaming into Teaching & Research programmes	22,349,749	257,643	31,041
HIV/AIDS Issues Mainstreamed into Teaching & Research	12,835,608	147,966	17,827
Improved Information Access, Documentation & ICT Services	63,049,552	726,821	87,569
Innovative Research & Technology Development in CC Adaptation	261,404,273	3,013,410	363,061
Commissioned Research	16,533,958	190,600	22,715
Post Graduate Research Grants	17,794,877	205,135	24,715
Capacity of key Stakeholders Enhanced for CC Adaptation	53,635,062	618,293	74,493
Programme Monitoring & Evaluation	30,805,094	355,144	42,785
Programme Implementation & Coordination	166,746,751	1,922,223	231,583
Total Expenditure	**799,290,392**	**9,214,046**	**1,110,126**
Excess of Receipts over Expenditure	**130,337,509**	**1,628,132**	**196,160**

(d) Assessment of the efficiency of the programme

Objective 1 (Enhanced capacity by the university towards merging local and global climate change perspectives) has not faced critical challenges in terms of efficiency. The programme has supported more staff members than originally planned as most of their studies are undertaken within Africa (planned 7 PhD, actual 14 supported; planned 6 BSc, actual 15 supported). The programme is only supporting students' tuition hence enabling to support more female students (58 in Year 3 versus 67 in Year 4 against the planned 25 each year).

Objective 2 (increased knowledge, technology and systems for climate change, adaptation and mitigation) – almost 60% of the research projects have spent above 50% of their budgets and have produced new knowledge and technologies (prototype) within their budgets although the technologies are yet to be tested and validated.

Objective 3 (increased capacity on advocacy, outreach, networking and mainstreaming of climate change within national policies and plans) has had high costs due to increased number of participants than planned (planned 30 versus actual 44 members of parliament) while training for teachers and front line staff were within their planned budgets.

(e) Major deviations from plans

Under the curriculum review the programme supported the Faculty of Natural Resources Management at Bunda campus to develop a strategic plan and research agenda. Instead of providing support directly to lead farmers the programme engaged experiential lead farmer trainers who were deployed to 11 EPAs to support the lead farmers.

(f) Assessment problems and risks

Currently the programme has documented a reduction in the risk related to poor coordination on climate change at national level. The programme initiated the development of the National Resilience Plan with support of Department of the Risk Reduction Management, Department of Environmental Affairs, Office of the Vice President and the donor community. On financial management, the university established the office of the internal audit and purchases related to the programme are guided by the procurement act. To guard against devaluation, the university operates foreign currency denominated accounts (FCDA) to cushion depreciation of the Malawi Kwacha. Through the support of the training programme, staff turnover has been retained. Deliberate efforts were made to support both MSc and PhD faculty (approximately 30% of all trained).

Currently the programme is facing new and emerging risks such as; low exchange rates between the NOK and USD, intermittent power supply by ESCOM and extreme weather conditions.

(g) Feedback from Monitoring and Evaluation project Visits

Through the Research and Capacity Building Subcommittee of the Programme Advisory Committee, all the seven (7) CABMACC funded projects were visited for routine monitoring and evaluation. It was noted that most of the projects were now approaching the final year and were on course. However, most of the projects were not yet validated and disseminated their technologies. In addition, while most projects had achieved outputs as laid down in the project proposals, there was need for the projects to clearly indicate the actual impact on ground to the target clientele.

(h) Mid-term Evaluation

The CABMACC Programme underwent a mid-term evaluation towards the end of 2016. The MTR indicated that the CABMACC Programme is highly relevant to current issues and Malawi programmes and policies related to food and climate change but falls short of updates in the sector with respect to climate change. While most projects have progressed on their activities, there were apparent delays with regarding to technology development, testing, validation and dissemination.

Outreach to small numbers vs population was also mentioned as a shortfall of the programme. The programmes also experienced low absorption rate for some projects. The MTR also pointed out the need to entrust other partners with upscaling of programme activities for sustainability.

(i) Achievements in relation to purpose and programme goals

The programme has recorded several achievements in the past four years. During this period, achievements included capacity building (completion of studies of staff members, write-shop for proposal writing skills), publication (LUANAR journal, journal articles, resource book, toolkits, training manuals, gender policy), and advocacy and outreach (training of members of parliament, primary and secondary school teachers, extension workers and lead farmers) . In relation to the CABMACC Programme Goal; 'to improve livelihoods and food security through innovative responses and enhanced capacity for adaptation to climate change in Malawi'; the following are selected achievements registered by the programme.

Table 2: Selected achievements registered by the Research Projects

SEED-Fish Project	The project has assisted fish processors to reduce reliance on wood fuel for processing fish by adopting solar-based and wood reducing smoking kilns and environmentally friendly fish processing technologies. These technologies have also helped processors to produce clean and high quality fish products with high market value thereby increasing income.
Livestock Chain project	The project helped Livestock farmers in Bolero to construct an 80 meter solar powered borehole to address the problem of water shortage caused by climate change induced drought. Livestock now can fetch cleaner water within close reach which is also safe from predators. Reduced distances to access water points also implies that animals preserve and use nutrients for more productive purposes such as milk production.
Intergraded Soil Fertility Management Project	The project has managed to build capacity of 396 farmers and extension staff to better understanding principles and application of Climate Smart technologies for water conservation and enhanced yields through integration of legumes such as pigeon peas using Grain Legume Rotation Learning Centres.
Biomass Inventory	The project introduced intercropping of legumes such as pigeon pea with maize among target farmers. Farmers reported that soil moisture lasted for longer periods and maize yields were high in plots where maize was intercropped with legumes; suggesting a climate smart agricultural intervention.

Development and Evaluation of Low-cost Solar Water Heaters by Priscilla Sesani, BSc student	Results of this study have shown that locally constructed solar water heaters can reduce cost of heating water by up to 89% and 77% to MK1.09 or MK1.80 per litre versus MK9.80 and MK4.80 per litre for electric geysers and commercial solar water heaters respectively.
Development and Evaluation of a Solar Parabolic Trough Power Plant	Preliminary results show that a locally produced solar parabolic trough power plant can produce up to 0.64kWh per day which can power 9-watt LED bulbs for 4 hours with 95% efficiency at MK168.45/kWh. This power plant can replace use of paraffin lamps up to 61.3litres thereby preventing CO_2 emission of 158kg per day. This climate smart and safer technology can replace use of paraffin in rural areas and schools.
Malawi Green Credit Scheme Project	CABMACC in collaboration with Tearfund initiated development of Green Credit Standards with the aim of engaging Malawi's citizens in the conservation and management of natural resources and the environment through green credit awards which will be awarded for verifiable actions that reduce degradation of the natural resources and the environment.

(h) Conclusion

The programme is on course to achieve most of its planned activities. Supporting training of staff members has been smooth with most of staff completing their studies on-time without major challenges. Those supported under MSc have graduated. The programme has also been able to mainstream gender and climate change into teaching, learning and research projects. In addition, the programme partnered with several stakeholders including Norwegian University of Life Science (NMBU), Malawi Broadcasting Corporation, College of Medicine, Farm Radio, Department of Climate Change and Meteorological Services, District departments and students to raise climate change awareness, build the capacity of key stakeholders at national level. The programme has developed some technologies that will help poor and vulnerable households and communities to adapt to and mitigate effects of climate change. In addition, technologies such as improved solar fish driers has led to increased income thereby contributing to livelihoods of the programme's target clientele.

The main challenge is the testing, validation, dissemination and consequently adoption of the developed technologies by intended beneficiaries.

1.0 Introduction

The Capacity Building for Managing Climate Change (CABMACC) Programme is a five-year national programme, now in its fourth year of implementation (July 2016 to June 2017), coordinated by LUANAR in partnership with the Norwegian University of Life Sciences (NMBU) as part of the Norwegian Government support to the Agricultural Sector in Malawi.

This is an Annual Progress Report for the CABMACC Programme for the period of July 2016 to June 2017. The aim of this report is to provide an overview of what has been achieved during the reporting period and some cumulative outputs including isolated key indicators, impact and lessons learnt.

Within the reporting period, the programme supported/facilitated the following activities:

(i) continuing supporting members of staff pursuing various degree programme;
(ii) supporting economically disadvantaged undergraduate female students;
(iii) supporting publication of Information, Education and Communication materials;
(iv) supporting internet connectivity;
(v) facilitating implementation of district and community interventions;
(vi) supporting HIV and AIDS related activities;
(vii) building the capacity of other stakeholders such as teachers, extension workers, parliamentarians, NGO officials;
(viii) supporting research projects; and
(ix) supporting teaching and learning resources. In addition, the programme further facilitated research mentorship sessions for provision of research grants to students supported members of staff to attend international training workshops and conferences.

The report has also covers financial inflows and expenses for the reporting period. The report also outlines some of the risks and suggestions to mitigate the risks as outlined in the programme document and emerging risks identified during the reporting period.

The report has also provided a summary of the mid-term evaluation findings and suggested strategies to address some of the observations.

2.0 Targeted Indicators for the Reporting Period

With reference to the programme document, the targeted indicators for each output are included:

2.1 Output 1: Improved capacity of LUANAR and key stakeholders on climate change adaptation and mitigation

The programme has been supporting LUANAR members of staff on long term as well as short term training programmes since July 2013. In 2016/17 financial year the programme has planned to continue supporting members of staff mainly those on long term training to finish their studies before the end of the programme in order to enhance their capacity in their various fields. The programme targeted seven (7) members of staff on full funding to be trained at PhD level. As at the reporting period, 12 have been supported and one (1) has completed. The overachievement of the target on support of PhD students is due to partial funding of four (4) members of staff. Most of the remaining members of staff are in their final year of study. The indicators for this output include:

- One curriculum review workshop
- Two meetings to develop PhD & MSc programmes
- On-going support for three (3) MSc students
- On-going support for nine (9) PhD students
- Four (4) mentoring sessions
- Support two (2) members of staff (CIMA)
- Support of two (2) members on project management in finance
- Develop guidelines for mainstreaming gender into teaching, research and outreach programmes
- On-going provision of scholarship to 50 female undergraduate students
- Support additional female students with scholarships
- Finalisation of three (3) transfer nodes among rural areas (Phalombe, Nkhota-kota and Rumphi)

2.2 Output 2: Gender mainstreamed within teaching and research programmes

- Conduct training to 50 teachers
- One round career talk in various secondary schools
- One short-course training on gender and climate change for extension workers

2.3 HIV/AIDS issues mainstreamed into teaching and research programmes across LUANAR

- Publishing HIV/AIDS guidebook
- Support VCT services at LUANAR Health Centre and ongoing support for MBBS training
- Support social learning forum

2.4 Improved information access, documentation and ICT services

- On-going maintenance monthly bills for internet
- On-going procurement of books and subscription of e-journals
- Establishment and maintaining of e-learning systems
- Publish resource textbooks
- On-going production of university journal

2.5 Innovative research, best bet practices and technologies developed on climate change adaptation and mitigation undertaken

- On-going support for seven (7) research projects
- On-going support for four (4) research projects with Norwegian partners
- On-going support for one (1) renewable energy project
- On-going support of research projects in other areas
- On-going support of two (2) PhD students at Norwegian University of Life Sciences
- On-going support of three (3) trainings of indigenous crops and land races

2.6 Capacity of key stakeholders enhanced for climate change adaptation and mitigation

- On-going support of development of IEC materials
- Conduct three (3) short courses for policy makers
- Production of Annual newsletter
- Support five (5) radio campaigns and six (6) TV programmes
- Support three (3) meetings for development of knowledge management systems for policy processes
- Train 50 lead farmers
- On-going support of CABMACC website

Programme management and coordination

- Hold two (2) PAC meeting and four (4) PAC Subcommittee meetings
- Support staff to attend four (4) international conferences
- Support monthly travel, communication, vehicle and equipment maintenance
- Timely procurement of stationery and office supplies
- Timely payment of office utilities
- Support timely annual audits
- Support programme staff through salaries and benefits
- Support Norwegian partners for effective collaboration

3.0 Description of actual outputs compared to planned outputs for the year

The programme is being implemented to achieve six (6) outputs. It is expected that through these outputs, Malawi will be able to address problems associated with climate change for improved adaptation and other mitigation needs. During the reporting period the following activities have been undertaken on each of the six (6) outputs.

3.1 Output 1: Improved capacity of LUANAR and key stakeholders on climate change adaptation and mitigation

Achievements for output 1 against the targets are provided in Table 2. The table has shown that the programme has achieved several activities under output 1. Noteworthy, this capacity building is particularly important because LUANAR has expanded tremendously since it is now a stand-alone university. This autonomy is a development which emanated from the Norwegian-funded Bunda Capacity Building Programme (BCDP).

Table 3: Achievements for Output 1

Planned activities	Indicator	Target/Achieved		Comments
		Annual target	Achieved	
2 curriculum reviews supported/ developed	No. of curriculum review workshop supported	2	0	Instead supporting curriculum review, research agenda and strategic plan for Faculty of Natural Resources Management was supported
Two meetings to develop PhD & MSc programmes	No. of meetings to develop PhD & MSc programmes	2	0	Instead of developing the programmes, development of postgraduate handbook was developed
Ongoing support for three (3) MSc students	No. of MSc students supported	3	3	All students have graduated
Ongoing support for seven (7) PhD students	No. of PhD students supported	7	11	All students are in their final year and expected to complete between December 2017 and May 2018
Four (4) mentoring sessions	No. of mentoring sessions funded	4	2	This involved seven (7) BSc supported students and writeshop for Faculty of NRM
Support two (2) members of staff (CIMA)	No. of members of staff (CIMA) supported	2	2	On-going
Ongoing support for two (2) members of staff	No. of bachelors students supported	2	2	On-going

for bachelor's degree				
Support of two (2) members on project management in finance	No. of members on project management in finance supported	2	0	Training to be conducted within May-June 2017
Ongoing provision of scholarship to 50 female undergraduate students	No. of female students supported	50	67	Tuition fees only is supported hence the increased number of beneficiaries
Ongoing support for one (1) member of Library staff	No. of Library staff supported	1	1	Graduated and promoted to Assistant Librarian
Finalization of three (3) transfer nodes among rural areas (Phalombe, Nkhota-kota and Rumphi)	No. of transfer - nodes finalized	3	1	Nkhotakota has been completed and equipped while Rumphi and Phalombe are yet to be finalised

One curriculum review workshop

The results show that the programme did not facilitate directly the review or development of any curriculum. But the budget line was used for supporting the Faculty of Natural Resources (FNR) to draft the strategic plan, research agenda and write shop. This was the case because most of the programmes offered by the faculty have just been initiated at university level. The strategic plan and research agenda was developed through a workshop and stakeholder consultations including National Commission for Science and Technology (NCST). The research agenda has several themes that have been included as Annex 1.In addition, the programme supported members of staff from the Faculty of Natural Resources to participate in the Southern African Regional Universities Association (SARUA) training for MSc in Climate Change and Sustainable Development. The training was held in Harare from November 6-11, 2016. The overarching intention of the uptake of the regional curriculum is to increase climate change capacity, with trans-disciplinary approach in the southern African region.

Development of PhD & MSc programmes

Funding for developing MSc and PhD programmes has been used to support the publication of a Hand Book for Postgraduate students since there are no new postgraduate programmes that are being created. The funds were used through the Office of Dean for Postgraduate Studies, the hand book is waiting for approval by Senate.

Support for MSc and PhD students

In the reporting period, the programme supported three (3) members of staff at MSc level as planned and all have graduated. One of the graduates has been appointed as a Warden for female students. The programme is further supporting nine (9) PhD beneficiaries.

Mentoring sessions

The programmes organized three-day mentorship training for 17 students. The mentorship that was facilitated by the Directorate of Research and Outreach (DRO) covering several areas including research proposal writing, data collection and analysis. During the training, the students presented their research areas and senior researchers including their supervisors were able to provide comments and insights for improvement.

Support to members of staff for (CIMA) & bachelor's degrees

Two (2) members of staff from the Finance department are studying CIMA. At bachelor's level, the programme is supporting two (2) members of staff from Administration who are pursuing Bachelor in Business Administration and Bachelor in Information Technology and expected to complete by June 2017.

Support for short courses

In the reporting period, the programme plans to support two (2) members from the finance section to attend a short course on finance project management to be held between May and June 2017. The programme supported one (1) library member of staff at bachelors' degree in Computer Science who has graduated and is been promoted to Assistant Librarian.

The programme further supported three (3) members of staff to attend the Champions Workshop for Institutional Strengthening Programme funded by UKAID. The workshop was held in Nairobi, Kenya. This workshop will allow LUANAR to build the capacity of its members on research. Based on this workshop, LUANAR has developed a draft action plan that will enhance research capacity. The action plan has been included as Annex 2.

Support to female undergraduate students

The programme has supported 67 female students who are continuing with their studies. These have been supported with tuition fees only hence the increase in number of beneficiaries. The increase in number of economically challenged female students have influenced the decision to consider supporting the students with tuition fees only which is critical to allow the student be registered in each academic year.

Figure 1: Some of the 2016/17 CABMACC Scholarship beneficiaries

One of the beneficiaries, Ms Tabeni Kachitsa – Year 4 student in Biotechnology said "*the CABMACC Scholarship has really relieved me, as girl student, from the worries of how and where to get my tuition fees. Rather, the scholarship has motivated and made me concentrate on my education. In my case, I was on the verge of withdrawing from school because my parents cannot afford to raise the current fees of Mk362,500. In addition, the scholarship has provided a way from being degraded or influencing those struggling for fees like me to indulge in unwanted behaviour in order to get money for fees. I am really thankful to CABMACC Programme.*"

Support for transfer notes

Rehabilitation works at Nkhota-kota Transfer Node at Linga EPA has been completed, furnished with 10 tables and 15 chairs and is being used by the District Assembly. It is expected that the node will sustain itself since it can be hired to other users on commercial basis.

Figure 2: Information transfer node in Nkhota-kota

In Phalombe, the programme has supported the renovation of the whole Naminjiwa EPA building including replacing of the roof, fixing of ceiling boards, doors and

security bars, furnished with 15 chairs and 10 tables. Due to space limitations, the node is only being used as a library for information sharing.

In Rumphi, Bolero EPA, the renovation works are still in progress. The works include improving the drainage system, fixing book shelves, repainting the roof, replacing ceiling boards, and doors, and painting the whole building. The programme has enhanced the security of the place by installing security bars and locks. Within the reporting period, 15 chairs were provided.

3.2 Output 2: Gender mainstreamed within teaching and research programmes.

Table 3 shows planned activities against achievements on output 2. Several activities were ear marked for the promotion of gender into teaching and research programmes. The programme with co-funding from UNDP, enabled the University to engage a consultant to develop a Gender Policy that is awaiting approval from the University Council.

Table 4: Achievements for output 2

Planned activities	Indicator	Target/Achieved	
		Annual target	Achieved
Develop guidelines for mainstreaming gender into teaching, research and outreach programmes	Guidelines/ toolkit/manual developed	1	1
Conduct training to 50 teachers	No. of teachers trained	50	30
One round career talk in various secondary schools	No. of career talks conducted	1	0
One short-course training on gender and climate change for extension workers	No. of trainings conducted	1	1

Teachers training

Three (3) experts from LUANAR have trained a total of 30 teachers from Nkhota-kota, Mzimba and Rumphi districts. The teachers from various schools in the respective districts were identified through the District Education Manager (DEM).

Participants came from both primary and secondary schools with nine (9) being female representing 30 % of the total. The list of participants is provided in Annex 4 and the full report can be assessed from PCO.

Figure 3: Participants for gender and climate change training in Mzuzu

The training aimed at building several skills including:

a) Identify critical research questions and apply innovative methodologies in teaching climate change concepts
b) Equip participants with knowledge and skills of establishing and managing climate change school based projects
c) Engage participants in interdisciplinary dialogue and problem-solving through discussing communication and advocacy approaches to sharing climate change information
d) Explore ways of interpreting and implementing secondary school syllabus focusing on climate change related topics
e) Develop strategies for promoting communication and advocacy on climate change issues explored
f) One round career talk in various secondary schools One short-course training on gender and climate change for extension workers

Career talk in secondary

The programme supported the development of a tool-kit that will be used to promote science among girls in secondary schools. The testing and validation of the toolkit for career talks in secondary schools has not been done. Funds permitting this activity will be considered in the next financial year (2017/18). The toolkit will be used as an eye opener for girls to embrace science and technology in their studies career plans. The toolkit covers the several areas including (i) Need assessment to understand the context and environment in which girls learn (ii) designing mentorship programme (iii) developing an action plan (iv) implementation of mentorship programme (v) evaluation of mentorship programme.

Short-course training on gender and climate change for extension workers

The programme further supported the training of 32 (6 females) front line staff from CABMACC impact areas (Dedza-5; Balaka-10; Rumphi-4; Mzimba-4; Nkhota-kota-3 and Phalombe-6). The training was facilitated by experts from LUANAR, Farm Radio and College of Medicine. The course that for three days was conducted at Bunda Campus from December 12-15, 2016. The toolkit developed with support from CABMACC was used to design and deliver module. Figure 4 show participants attending the training.

Figure 4: Training in session for the front line training on gender, health and climate change

The training toolkit has been designed to support extension workers' trainings as part of their capacity building. The modules covered include the following:

1. Understanding Climate Change
2. Impacts of Climate Change on Health
3. Linkages between Climate Change, Gender and Health
4. Planning and Assessment of Health Risks and Related Conditions at Local Level
5. Gender Mainstreaming in Monitoring and Evaluation of Health Related Impacts of Climate Change
6. Disaster Response and Mitigation
7. Communication and Advocacy for Managing Climate Change

The list of participants is provided in Annex 5 and a full report can be assessed from the programmes coordinating office.

3.3 Output 3: HIV/AIDS issues mainstreamed into teaching and research programmes across LUANAR

Table 4 shows planned activities against achievements on output 3. The programme has supported the drafting of an HIV/AIDS guidebook for institutions of higher learning. The guidebook is being developed by experts in HIV/AIDS management and education such as experts from College of Medicine, National Aids Commission, Ministry of Health (Health Education Unit) and LUANAR.

Table 5*: Achieved targets for Output 3*

Planned activities	Indicator	Target/Achieved		Comments
		Annual target	Achieved	
Publishing HIV/AIDS guidebook	No. of HIV/AIDS guidebook published	1	0	Being reviewed
Support VCT services at LUANAR Health Centre	No. of health centre supported	1	1	On-going
	No. of staff supported for further studies	1	1	On-going
Support social learning forum	No. of HIV/AIDS social learning fora developed	1	1	Being reviewed

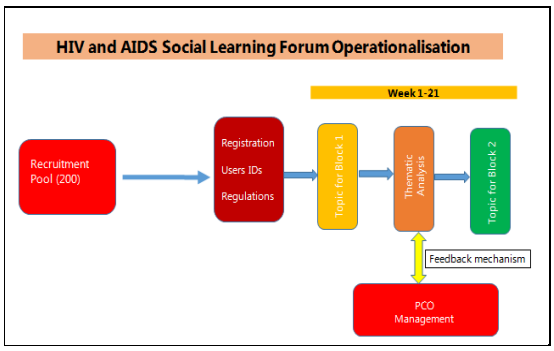
Both students and staff members at LUANAR and other institutions countrywide will use the guidebook. The guidebook will assist in HIV/AIDS awareness in issues such as counselling, testing, treatment, stigma and prevention. During the reporting period, the draft book was submitted to the Secretariat for further review. Some of the chapters in the book include (i) HIV transmission, care, management and support (ii) positive living (iii) Approaches to management of HIV/AIDS in centres of higher education (iv) human rights in relation to HIV and AIDS (v) Main streaming HIV and AIDS in higher education (vi) Essential life skills (vii) Monitoring HIV and AIDS.

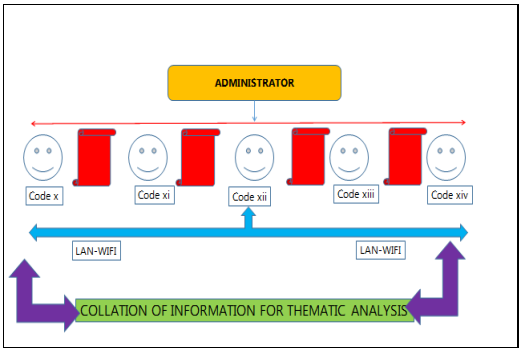
The programme supported one (1) member of staff from Bunda Health Centre to undergo a BSc of Science Degree in General Surgery (Hons) at College of Medicine and has since completed his studies.. Due to this training, LUANAR now has a qualified Surgeon who is able to handle and conduct minor surgeries which were previously referred to Kamuzu Central Hospital.

Social learning forum

LUANAR in consultation with Kamuzu College of Nursing and other institutions conceptualised the HIV and AIDS Virtual Social Learning Forum for students and staff members use. The concept has been validated by staff members and students at City and Bunda campuses have been oriented on the application. Students have also been contributing to the forum. The project has also produced a social learning user and administrator manuals. The links to the social fora is being tested.

Figure 5 below show an operationalisation and administration of the virtual platform





Way forward and recommendation

1. Orient NRC campus students on the social learning forum
2. Identify a full time administrator to manage the forum
3. Disseminate the technology to other learning institutions
4. Continuously update topics and get feedback from users

3.4 Output 4: Improved information access, documentation and ICT services.

This output has achieved few activities during the reporting period (See Table 5). The programme is contributing to the payment of monthly bills for Internet. In addition, the programme has supported the publication of a resource book on "Improving Livelihoods in Malawi" and review of the second issue of the MAJANDS (University Journal).

Table 6: Achievements for Output 4

Planned activities	Indicator	Target/Achieved		Comments
		Annual target	Achieved	
Ongoing maintenance monthly bills for internet	No of months	12	9	On-going
Establishment and maintaining of e-learning systems	No of E-Learning system established	1	1	On-going
Publish resource textbooks	No. of resource books published	1	1	Published
Ongoing production of university journal	No. of journals edition published	2	1	Being reviewed

E-learning system

The E-learning system that was established in collaboration with other programmes such as Skills Development Programme is being used by the university to deliver Open and Distance Learning (ODL). The system has also promoted use of online teaching and learning aids by faculty and students.

The programme received support from partners from Norway to develop digital teaching materials in information literacy, and training on the use of the Learning Management System (LMS) Moodle. However, there are considerable challenges to the implementation and use of a learning management at LUANAR due to intermittent connectivity capacities and power supply.

One important development has been with regard to extension and establishment of "slave" servers in ODL and other sites where content is to be accessed. Digital learning resources have been placed in Moodle on a Master cloud server and tested. Slave servers will sync with the Master server at regular intervals and give more resilience with regard to poor net capacities and power outages. Students are yet to access Moodle resources offline upon procurement of Office 365 software. The university needs to explore the use of this system (MOODLE) offline in the CABMACC impact areas.

LUANAR Library staff have since then developed a very well structured and content rich course on Moodle to be used for the library's information literacy training for regular and ODL students.

University journal

For the journal, the editorial team has accepted nine (9) papers of the special issue which are under review. Currently, the work is with typesetter to prepare for online publication. The titles of the accepted papers are presented in Annex 6. The journal

has been officially handed over to the DRO for sustainability and further publication of the journal.

3.5 Output 5: Innovative research, best bet practices and technologies developed on climate change adaptation and mitigation undertaken

This forms the main intervention of the programme whereby seven (7) research projects are being implemented by Malawian experts in collaboration with partners from Norway. The actual programme indicators are provided in Table 6. The results show that the programme is continuing supporting seven (7) research projects and eight (8) more research projects have been added to be implemented by students (See Annex 7. There is also one research working on renewable energy led by postgraduate students under the Department of Engineering.

Table 7: Achievements for Output 5

Planned activities	Indicator	Target/Achieved		Comment
		Annual target	Achieved	
Ongoing support for seven (7) research projects	No. of research projects supported	7	7	On-going
Ongoing support for four (4) research projects with Norwegian partners	No. of research projects supported	4	4	On-going
Ongoing support for one (1) renewable energy project	No. of projects supported	1	1	On-going
Ongoing support of research projects in other areas	No. of research projects supported	0	8	On-going
Ongoing support of two (2) PhD students at Norwegian University of Life Sciences	No. of students supported	2	2	On-going
Ongoing support of three (3) trainings of indigenous crops and land races	No of trainings conducted	3	1	On-going
	No of people trained			On-going

The programme is continuing supporting research and capacity building interventions under the indigenous vegetable project. Students pursuing PhD in Norway are also supported for their research in Malawi.

3.5.1 Techno-economic feasibility of decentralized production of bio- ethanol using waste from cassava

The goal of the CABMACC's bio-ethanol production project in Nkhotakota is to test and develop technologies that transform biodegradable waste for energy generation.

The project aims at improving the process of converting cassava wastes into ethanol by cassava farmers so as to increase their returns from cassava towards improving their livelihoods and food security. The purpose of the project is to use existing indigenous knowledge and engage associations that are already involved in cassava processing into the production of ethanol using cassava wastes through decentralized community-based enterprises that are linked to available markets.

The project, therefore, aims at (1) optimizing technical and economic conditions under which wet ethanol can be produced from solid and liquid cassava wastes generated by households and commercial processing plants owned by Nkhotakota Cassava Processors Association (NCPA) located in Zidyana and Linga EPAs of Nkhotakota DADO); and (2) creating a business model that links the product to Ethanol Company of Malawi (ETHCO) Limited located at Dwangwa in Nkhotakota district. The project is also being implemented in order to enable: (a) development of technologies to convert cassava wastes into bio-ethanol; (b) improvement of livelihoods and food security of the community; and (c) mitigation of climate change.

This project has been going on since December, 2014 and is expected to wind up in December, 2017 (36 months duration). Stakeholders involved in the project include: Salima Agricultural Development Division (SLADD) and Zidyana and Linga Extension Planning Areas (EPAs), MUST and LUANAR, the Ethanol Company Limited (ETHCO), and Nkhotakota Cassava Processors Association (NCPA) which has 872 members of whom 51.1% are women.

Findings

The study established that one litre of ethanol was lasting an average of **256 minutes**, and the foodstuff cooked the most of times is nsima, being cooked. Using the Pareto 80:20 principle, the daily cooking time is **137 minutes**, the time it takes to prepare nsima, tea, vegetables, fish and warm water.

Length of utilisation

When using fuel, the users are interested to know how long the fuel will last. Preliminary findings show that the length of utilisation of one (1) of ethanol turned out to be **256 minutes.** This implied that most households were setting their stove at maximum power.

Level of acceptance

The level of acceptance is the rate at which the cook stoves were accepted as the number one cook stove at household. The level of acceptance was established as a percentage of days within which the available fuel would have been used up against the average number of days within which the fuel was actually used up. Analysis shows that the level of acceptance for ethanol stove was at 7.8%. This shows that the ethanol stove is far from being accepted as a standard stove among the Nkhotakota working partners. The low level implies that the targeted households still

prefer to cook using alternative means of cooking; that is, using firewood and/or charcoal.

Figure 6 showing different cooking methods used in Nkhotakota

The preferred cooking method

The promoted cooking method

The low level of acceptance can mainly be attributed to two factors, economic and participants' selection. Considering that one litre of ethanol fuel would last for less than two days, the cost of ethanol at MK719.89 (US$1.00) per litre (ETHCO, 2016) or MK10,798.35 (US15.00) per month is perceived to be prohibitively expensive, considering that usual expenditure on firewood and/or charcoal averages MK3,255.00 (US$4.52) per month. The second reason for low level of acceptance was probably participants' selection. Since ethanol stoves were a new technology in Nkhotakota, its adoption would have been better if the project purposefully targeted innovators or early adopters. The random selection of participants as used in this study does not ensure that such a group is selected. An option will be to consider testing the stove in urban areas.

Performance indicators

Table 8 reports progress of the project in terms of the outcomes and output indicators. These include the performance indicators as stated in the project's Monitoring and Evaluation Framework.

Table 8: Monitoring and Evaluation Indicators for the Ethanol Project

Objective	Indicators	Baseline value	Status April 2017	End of Project Target
Overall objective: Assess the technical-economic feasibility of decentralized production of bio-ethanol from cassava wastes	Percentage of population participating in the ethanol production and value chain.	0	1.2%	10%
	Proportion of population in target area using ethanol stoves.	0	36	36
	Volumes of ethanol supplied to ETHCO	0	0	20,000
	Percentage increase in cassava production in the area	45.6%	45.6	50%

	Percentage increase in real household income and wealth in the area	139,000.	-	150,000
	Percentage of households that have food reserves in critical months	29%	-	35%
	Percentages of households that are adopting undesirable coping strategies.	38%	-	30%
	Percentage of households in the target area accessing loan (by gender).	38%	-	40%
1. Develop decentralized cassava waste ethanol product ion system	Number of reports or journal articles on methods of ethanol production	0	1	2
	Protocol for standard ethanol production	0	Draft	1
	Number of ethanol technologies developed.	0	3	4
	Number of patents filed	0		1
	Quality of the ethanol produced using proposed ethanol production technology	0	12%	35%
	Relative productivity of the ethanol production technology.	0	0.5 liters at 12% alcohol	0.2 litres@ 35% alcohol
	Relative productivity of the ethanol production technology.	0	0.2 liters at 7.5% alcohol	0.2 litres@ 35% alcohol
	Adoption of proposed ethanol technologies and innovations	0	<1% (35-200 households)	10% (±5000 households)
	Percentage of households in the area willing to participate in project activities.	0	-	30%
	Value of lab & field equipment procured	0	9,714,546	32,811,659.00
	Availability of raw materials for the ethanol production plants.	0	600	100,000
2. Develop organizational structures and supply chains for decentralized small scale ethanol production plants to	Proportion of population reached out within target area.	0	0.44%	10%
	No of organization committing as stakeholders in the project/no of MOU signed for collaborative support in the project.	0	2	4

supply ETHCO in Nkhotakota	No of bulking tanks procured and installed within the target area.	0	1	3
	Percentage of waste absorbed by the ethanol production plants	0	0.49%	50%
	Efficiency [1] of the ethanol supply chain	3	3	5
	No of level 3 players in the ethanol supply chain	0	0	15
	Report on determinants of participation in ethanol value chain system	0	0	1
3. Transfer Developed technologies to selected pilot farmer within target area	No. of households willing to supply cassava waste for ethanol production	-	0	12.5% (5000 farm families)
	Percentage increase in cassava hectarage in the area	17334	17334	20,000
	Percentage of households growing improved cassava varieties	>50%	-	>50%
	No of ethanol producing plants established in the target area	0	1	3
	Number of individuals trained [2] in ethanol production and entrepreneurship	0	60	75
	Number of training manuals developed	0		1
	Number of individuals in target area using stoves	0	35	36
	Volume of ethanol at 35% concentration produced.	0	0	20,000
4. Potential of ethanol processing residues as organic fertilizer and stock feeds assessed	Quantity of products being produced from wastes.	0	0	20,000 of each
	Detailed report on thesis progress.	0	0	3

Challenges

Some of the challenges encountered include the poor data records by households engaged in the ethanol stove trial study for the cook stove localization and academic calendar limitation for students engaged in fertilizer and stock feed study.

[1] Prevalence of cases of late delivery of raw materials or ethanol, prevalence of cases of rejects of products (raw materials/ ethanol) on receipt and prevalence of cases of high price variations.

[2] Training done at level base- training of suppliers (peels processing), Ethanol producers, bulkers, transporter

Conclusion

The ethanol production field results point to requirement for further work as the yield achieved is too low.

Way forward and Recommendation

1. Draft and finalise analysis of results writing of manuscript for data collected so far in terms of techno-feasibility
2. Share drafted manuscript, Kachasu and ethanol protocols with PCO as project output
3. Initiate fabrication of stove prototype to test with cassava-based ethanol they want to fabricate.
4. Document any milestones and outputs and impact to date and number of beneficiaries including cost-benefit analysis of proposed stove. Data recording by households should also be improved.
5. The project should conduct a detailed cost benefit analysis to compare ethanol and charcoal or firewood or briquettes to see if at all ethanol would be more attractive for the intended users.
6. Consider engaging government as early as possible on waiver of VAT to make ethanol affordable vs current available energy sources
7. Project to use the PITT M and E tool in the remaining period

3.5.2 Livestock value chain, food security, and environmental quality: Transforming rural livelihoods through community based resilience indigenous livestock management practice

This research project is being led by the Trustees for Agricultural Promotion Program (TAPP) and is being implemented in Bolero EPA in Rumphi. The project aims at developing the guidelines that will improve livestock management based on local knowledge for improved food security and climate change adaptation.

One of the activities done in the reporting period was construction of a solar-powered borehole for livestock watering (See Figure 6). This was in line with the project's 7th specific objective that is to assess coping mechanisms currently employed by communities in addressing livestock drinking water problems. The solar powered borehole has been constructed to aid water provision trial. Animals in a range of less than 1-3 kilometre are accessing water from this borehole thus reducing distance to water source. In addition, the borehole ensures availability of clean water and provides security to the animals against wild animals.

Figure 7: Livestock drinking from the solar-powered borehole

During the same period, the project also developed a LCBRF assessment plan. Potential practices were compiled and used to design indigenous livestock management practice guidelines. The guidelines will assist in improving food security and climate change adaptation. Resulting from this work, the project facilitated the designing and implementation of guidelines for indigenous livestock management practices that would be rolled out in future and feed into policy formulation. This process is on-going as the guidelines are being tested and validated and yet to be presented to the programme secretariat for ethics, and quality control and assurance.

As part of its capacity building element, the project employed two LUANAR students on industrial attachments. The students were attached at Bolero EPA. The students were involved in most of the project's day to day activities. Among the activities which these students were involved in include; administration of drugs to livestock, castration and meat inspection at abattoir.

Within the same project, Norwegian partners are also jointly implementing some interventions. A master student in genetics and breeding, and a veterinarian, Muhammad Azher Bhatti (Figure 6), defended his MSc thesis: "*Climate change resilience through enhanced reproduction and lactation performance in Malawian Zebu Cattle*" on January 16th 2017. Key findings from this study shows that water availability influence cow production and reproduction status. In addition, animals with short distance to water source (0-1KM) had significantly ($P<0.05$) higher milk yield compared to those in a range of greater than 1KM to 5 KM. The study recommended that farmers have their own water sources for livestock, for example dams, well, etc. The intervention of the water point by the project and community therefore addresses this challenge.

Figure 8: Norwegian student working with farmers in Bolero, Rumphi

In April and October 2016, three veterinarians from Norway, TAPP employees and advisory personnel from Rumphi visited the project site and obtained pregnancy diagnoses, measured body weight, and obtained blood and fecal samples from all included cows and associated young stock. The team further identified another 50 fall calving cows with offspring that will be followed throughout 2016 and 2017. The team will continue to test the feasibility of using leguminous leaves mixed with maize bran as a feed additive to increase production and enhance reproductive function of fall calving Zebu-cows during the dry period.

Way forward and Recommendations

Whilst some of the interventions have been implemented as per original idea, the programme has the following Way forward and Recommendations:

i. finalizing all the data bases including a data base for livestock indigenous knowledge practices, the linkage among weather variability, livestock practices and copping strategies
ii. finalize the draft guidelines for enhancing adaptation to climate change
iii. pay less attention to the interventions that will not contribute to project objectives;
iv. Complete, test and validate and document guidelines for local indigenous knowledge on feeds and feeding practices. utilize research by students and Norwegians to contribute to the proposed guidelines.
v. Document results/milestones and perceived and actual impacts to date including statistics of beneficiaries.
vi. Review and revise work plans of activities against remaining period and funds
vii. Develop exit strategy
viii. Conduct training for farmers and EPA staff with respect to maintenance of water point facilities and crush repair.
ix. Repair crushes to prevent further deterioration of structure at Chikwawa.
x. Encourage farmers to use local materials such as grass and plastic sheets to construct cattle shelters instead of emphasizing iron sheets.
xi. Arrange day for launch of water point. But before this, there is need for the community to embark on the following emerging possible activities to make the water point as a model of a multipurpose facility:
    a) Train community in minor repairs of solar equipment faults.
    b) Use of solar power generated for security lights and by surrounding households at a fee where possible
    c) Establishing a commercial water kiosk as an IGA
    d) Use excess water by establishing vegetable and herbal garden; fish pond and tree nursery for use by community.
    e) Establish biogas plants for cattle owners
    f) Encourage cattle shelter beneficiaries to start repayment and pass-on to other beneficiaries

3.5.3 Evaluate feeding and breeding technologies for optimal Dairy Productivity (REDCAP)

This project was designed to evaluate feeding and breeding technologies for optimal dairy productivity and reduced carbon emissions with focus on smallholder farmers in drought prone areas of Dedza District in Malawi. It is envisaged that through the project, cost-effective feeding and breeding management technologies will be investigated, adapted and promoted in smallholder farms to sustainably contribute to improved livelihoods while reducing production of greenhouse gas (GHGs) emissions per unit output of milk.

Within the reporting period, the project maintained continuous monitoring and recording of animal performance in response to improved health, breeding and feeding management. The project also continued with feed trials using rations based on Leucaena, sunflower and *Sesbania sesban.* Preliminary results involving two (2)

BSc students show that leucaena supplemented diets increase milk production from less than 10 litres to up to 15 litres per day.

The project has finalised assessing the phenotypic features of existing breeds and grades for optimal milk production. Currently, the project awaiting analysis for genotypic characteristics of the breeds and grades from the International Livestock Research Institute (ILRI).

As part of the feeding technology trials, the project acquired and distributed pasture seeds to facilitate farmer pasture establishment. The project also finalized characterizing the features of the existing feeds and feeding regimes.

With respect to capacity building, the project conducted farmers training in Village Loan and Savings in order to support the revolving drug fund. A total of 20 male and 6 female farmers (4 from Mayani and 22 from Dzawonekwekha MBGs) underwent the training which included business record keeping. Another training was on manure management to promote practices that reduce greenhouse gas emissions. This training involved 24 farmers (15 male and 9 females). Other capacity building initiatives were learning tour of farmers to Katete Dairy farm on 19th September 2016 to expose the farmers to different aspects on milk processing, hygiene and regulatory requirements. In addition, the project trained 64 (38 males and 26 females) farmers in SMS recording system. To promote animal health, the project also conducted a training of Community Based Animal Health Workers (CAHWs).

The project also developed Information Education and Communication (IEC) materials including posters, brochures and leaflets covering dairy husbandry and nutrition; and leadership manual. These materials will facilitate knowledge sharing and technology transfer beyond the direct beneficiaries.

Challenges

The major challenge experienced by the project is the procurement of the artificial insemination kits (AI kits) for use with the PCR machine.

Way forward and Recommendations

The following Way forward and Recommendations are made:
1. Expedite procurement of the AI kits
2. Finalise data analysis on evaluation of genotypes.
3. Document details on beneficiaries and impacts.
4. Develop workplan for the remaining period and use of available funds
5. Develop clear exit strategies

3.5.4 Develop allometric model and tools for predicting above and belowground biomass in miombo and agroforestry farmlands

The main goal of this project is to test a combination of field data and remote sensing to reduce the uncertainty in the estimation of forest above ground biomass in the *miombo* woodlands in Malawi. The specific objectives of the study are: to develop allometric models for predicting above- and belowground biomass in *miombo* woodland and farm lands, to assess new remote sensing methods for above and below ground biomass estimation and evaluate yield performance of maize under pigeon peas and soybean legumes. The project has so far developed two (2) models for biomass inventory in Miombo woodlands and are now being used by scientists including the Forestry Research Institute of Malawi. These are candidate models for studies on REDD+ for Malawi.

The three (3) graduate students involved in the research work have all completed coursework, One member of staff has graduated with PhD and has published three (3) papers in high profile journals while two manuscripts have been submitted to journals. This research involved testing the appropriateness of the eBee Remote Sensing equipment in quantifying biomass and carbon for trees outside forest (agroforestry fields).

The published papers are as shown below:

a) Kachamba, D. 2016. Biomass estimation models and methods for miombo woodlands in Malawi using field and remotely sensed data. Philosophiae Doctor (PhD) Thesis 2016:92, 141 pp. Department of Ecology and Natural Resource Management, Norwegian University of Life Sciences.
b) Kachamba, D. & Eid, T. 2016. Total tree, merchantable stem and branch volume models for miombo woodlands of Malawi. *Southern Forests* 78: 41-51.
c) Kachamba, D., Eid, T. & Gobakken, T. 2016. Above- and belowground biomass models for trees in the miombo woodlands of Malawi. *Forests* 7(2), 38.
d) Kachamba, D., Ørka, H.O., Gobakken, T., Eid, T. & Mwase, W. 2016. Biomass estimation using 3D data from unmanned aerial vehicle imagery in a tropical woodland. *Remote Sensing* 8 (11), *968.*
e) Kachamba, D., Ørka, H.O., Gobakken, T., Eid, T. & Næsset, E. 2017. Influence of plot size and sample size on efficiency of biomass estimates in inventories of dry tropical forests assisted by photogrammetric data from an unmanned aerial vehicle. Manuscript.

In addition, two (2) MSc students have submitted their theses for examination and shall be completing in the next three (3) months. The project also involves two (2) undergraduate students.

Project has trained over 350 farmers in Luvwere, Mpherembe and Kazuni in management of tree nursery and sustainable agricultural practices including agroforestry involving growing of pigeon peas, soybeans and maize. Preliminary

results show that adoption of these agroforestry practices have increased maize and soybeans thereby improving their resilience to climate change. Farmers reported that plots where maize is mixed with legumes had soil moisture which lasted longer than other ordinary standalone plots. Farmers' perception is that pigeon peas tap water to the ground which is made available to the shallow-rooted maize plants. Due to these observable benefits over 20 farmers have joined project activities by procuring own seed and started growing. In terms of publicity and visibility, the project has featured in four (4) radio programmes on Zodiak, three (3) programmes on Galaxy and two (2) TV programmes.

Challenges

Implementation of the project activities faced some challenges including damage of agroforestry trials in Kazuni by wildlife and termites, delays in procurement of wood extraction equipment, low interest to plant pigeon peas by communities, remoteness of project site requiring constant supervision and transport logistics. For the pigeon peas, factors affecting low adoption include non-consumption of pigeon peas, perception of pigeon peas as livestock feed and problems of destruction of plants by livestock especially goats. Another problem is delays in pprocurement of required equipment not locally found.

Way forward and Recommendations

The following Way forward and Recommendations have been made:

1. Finalise remaining two objectives: estimate amount of carbon sequestered by Miombo woodlands and agroforestry field and evaluate yield performance of maize under pigeon peas shrubs.
2. Test the models in other areas for validation
3. Do an assessment of actual beneficiaries for evidence
4. Conduct farmer and extension worker training on climate change
5. Consider how Malawi can acquire and use e-Bee Technology in Malawi including for crop estimates
6. Enhance awareness and capacity building in adoption of climate smart agriculture technologies
7. Consider procurement of the equipment not available in Malawi through Norwegian Partners.
8. Produce policy briefs on biomass assessment and management of communal forests.
9. Develop exit strategies with community and relevant stakeholders

3.5.5 Improve incomes and environmental management of fisher folk communities for enhanced resilient to climate change.

The goal of the project is to improve incomes of rural communities and environmental management of fisher folk communities for enhanced resilience to

climate change. The project has three objectives namely, i) To evaluate, test and adopt the use of clean energy and sustainable processing technologies on small fishes, ii) To develop and test a small scale fisher folk entrepreneurial model and lastly iii) To develop a tool or model for building capacity and governance.

This project is being implemented in Linga EPA in Nkhota-kota District targeting fisher folk communities from T/A Malengachanzi.

Achievements during the reporting period

Handover of the solar dryers to the communities (BVCs)

The project during the reporting period handed over the two solar dryers to the Chipala and Vinthenga Beach Village Committees. Communities are actively using the facilities with success stories of producing high quality dried fish. The use of solar energy source has reduced the need to use firewood hence saving the environment. The solar drier, which is enclosed, has also ensures that there is no infestation with flies unlike other open rack driers. However, the major concern from the community was that the facility is small and the demand for use is very high often culminating into stiff competition especially among women fish processors on use of the facility.

Figure 9: Solar dryer at Vinthenga BVC

The summary of the project achievements for the reporting period is shown in Table 9 below.

Table 9: Summary of project achievements for the planned project milestones during the reporting quarter

OBJECTIVES/ OUTPUTS	Activity/Milestone	Progress/ Achievement	% towards achieving target	Expected time frame when to accomplish the target	Comments/ Remarks
OBJECTIVE 1: To evaluate, test and adopt the use of clean energy and	Conduct trials on drying efficiency of solar drier & smoking kilns	Work on smoking kilns complete	75% of the target achieved	June 2017	Progress Report prepared
	Assess shelf life, and quality of processed fish	Work complete and report in first draft	95% of the target achieved	June 2017	Research Report prepared

sustainable processing technologies on small fishes (MZUNI/FRU)	Analysis of TVB-N, peroxide value and sensory analysis	Done	100% of the target achieved	June 2017	Research report and manuscript prepared
	Cost benefit analysis of different fish smoking technologies vs wood usage	Done	100% of the target achieved	June 2017	Research report and manuscript prepared
	Develop value addition products (packaging &Training)	Work continuing but managed to showcase sample during fair	60% of the target achieved	June 2017	Project Report prepared
	Handing over facilities to BVCs	Done. BVCs now own the facilities	100% of the target achieved	June 2017	Project Report written
	Production of Case Studies/Brochures	Not done but preparations underway	10% of the target achieved	June 2017	Project Report written
	Conduct trials on drying efficiency of solar drier & smoking kilns	Work on smoking kilns complete	60% of the target achieved	June 2017	Progress Report prepared
	Assess shelf life, and quality of processed fish	Done	100% of the target achieved	June 2017	Research report and manuscript prepared
	Develop value addition products (packaging &Training)	Work continuing but managed to showcase sample during fair	60% of the target achieved	June 2017	Project Report prepared
OBJECTIVE 2: To develop and test a small scale fisher folk entrepreneuri al model (MZUNI)	Conceptualize the entrepreneurship model	Work in progress	85% of the target achieved	June 2017	Research Report prepared
	Test and validate the entrepreneurship model	Work in progress	85% of the target achieved	June 2017	Research Report prepared
	Conduct market research, efficiency and viability	Work in progress	85% of the target achieved	June 2017	Research Report prepared
	Field visits and data collection	Continued	100% of the target achieved	June 2017	Progress Report prepared

OBJECTIVE 3: To develop a Tool or model for building capacity and governance (LUANAR)	Training on governance and group dynamics	Not done. Work has been re-scheduled	0% of the target achieved	June 2017	Progress Report prepared
	Field visits and data collection	Continued as normal	90% of the target achieved	June 2017	Progress Report prepared
Other Outputs/Miles tones	Erect project sign posts	Done – 4 sign posts erected	100% of the target achieved	June 2017	Progress Report prepared
	Conduct quarterly review meetings	Done on 6th April, 2017	100% of the target achieved	March 2017	Progress Report prepared
	Conduct dissemination workshop	Not wholly done but managed to showcase products at Agriculture Fair	50% of the target achieved	June 2017	Progress Report prepared
	Publish at least 3 papers in peer reviewed journals	Three manuscripts prepared	70% of the target achieved	June 2017	Papers on smoking technology, Baseline study prepared for journal review

In terms of publicity and visibility, research findings were presented at the Aquaculture Centre of Excellence (ACE) Project Launch in Lilongwe and at the African Postharvest Congress (Nairobi, Kenya) in March 2017. In addition, three (3) MSc students (1 at LUANAR and 2 at MZUNI) supported by the project made presentations at a CABMACC Students Research Dissemination in September/October 2016 at Sogecoa Golden Peacock Hotel. Samples of solar dried packed fish from the project were also taken for exhibition at the RUFORUM Conference in Cape Town, South Africa.

Challenges

A major concern from the community, as raised from one of the project visits was that the facility was too small against a very high demand.

Way forward and Recommendations

The recommendations were as follows:

1. Complete remaining research activities especially activities under objectives 2 and 3

2. Disseminate developed fish processing technologies (Solar tent dryer, smoking kilns and wood utilization, case studies)
3. Finalise manuscripts from the research project for publishing
4. Help communities solve conflicts for efficient use of facilities
5. Clearly document milestones in terms of benefits and impacts on target beneficiaries
6. Develop work plan to implement unfinished tasks on entrepreneurial model
7. On use of kilns, the project should clarify on source of wood and how the project is encouraging sustainable use of trees for fuel. The project should also encourage tree planting for those using improved firewood kilns.
8. Project to use the PITT M and E tool in the remaining period
9. Extend or add another solar dryer at Vinthenga BVC, if funds will permit or empower communities to construct own driers to accommodate more fishermen
10. Develop clear exit strategy to include linking fishermen to markets

3.5.6 Scaling-out Integrated Soil Fertility Management (ISFM) approaches for improved crop resilience to climate change

This research project is being implemented in Balaka district. The goal of this project is to contribute to increased crop productivity and improved food security for smallholder farmers managing maize based farming systems in Malawi. The purpose is to enhance knowledge and capacity of smallholder farmers and extension officers in the use of guidelines that can be used to develop context-specific ISFM packages that are resilient to the varying climate under different clusters of soil types and resources.

Specific objectives:-

i. Establish integrated farms (learning centres) as an entry point to climate smart/ISFM technologies.
ii. To measure farm level productivity and profitability of climate smart/ISFM technologies.
iii. Developing/popularizing/introducing communication tools for reaching farmers, students and extension agents and improve capacity of district extension frontline staff and farmers to understand climate smart and ISFM packages as a means of facilitating adoption.
iv. To study determinants of adoption of climate smart and ISFM practices.

Achievements

During the reporting period, the project completed the baseline survey report on impact and output indicators on livelihoods and on knowledge, use and constraints on ISFM technologies finalized. In terms of capacity building, the project trained frontline staff and lead farmers on knowledge and principles of ISFM CSA practices. These included 99 beneficiaries in 3 villages comprising three (3) lead farmers and 30 follower farmers per village with women representation at above 50%. The project

also purchased and distributed seven (7) books on "Guide to Conservation Agriculture Practices in Malawi," packaged by the National Conservation Agriculture Task Force to EPA and district collaborating staff. The books highlight good practices in conservation agriculture and will assist in quality control of the studies. The project also distributed National Guidelines for Implementing Conservation Agriculture in Malawi. During the period, the project established 16 CA Learning Centres. Of the 16 centres, eight (8) involving pigeon peas and eight (8) cow peas. The project also established 165 Grain Legume Rotation learning Centres (GLR-LC) in 13 villages. The project distributed seeds for groundnuts, pigeon peas and cowpeas to 99 beneficiaries in three (3) villages at 33 beneficiaries per village. For sustainability, the project is implementing a legume seed pass on program where farmers pass-on seeds to each other every season after harvest.

In addition, the project also initiated and broadcasted 15 minutes radio programmes that run for 3 months from November 2016 to mid-February 2017 through 25 radio listening groups in collaboration with Agricultural Communication Branch and Zodiak Broadcasting Cooperation (ZBS). Each group comprised of 10-15 farmers. The radio programs featured farmer voices in the knowledge, attitude and practices of ISFM and climate smart agriculture with a focus on conservation agriculture and crop rotations with legumes. The main challenge experienced was the inability of farmers to replace radio batteries.

In collaboration with Farm Radio Trust, the project also developed video materials. The video documentary was aimed at sharing knowledge of technologies being developed or promoted in the project and motivate farmers to adopt them or practice them more extensively. In terms of outreach, the project held four field days conducted and attended by staff and a total of 586 participants that included lead/follower/non-follower farmers or follower farmers and other non-targeted farmers (332 females and 254 male). The field days showcased trials on CA and grain legume rotation learning centres.

With respect to capacity building, the project hosted an MSc student from Norwegian University of Life Sciences (NMBU) who conducted a study on 'Opportunities and constraints of communication tools in the dissemination of ISFM in Balaka'. In undertaking these activities, all key collaborators were involved including Crops Officers, Land Resources Conservation Officers and AEDC and AEDOs.

In terms of collaboration, Professor Bishal Sitaula and Jens B. Aune followed up the project during visits to Malawi from 18 to 23 July 2016. Issues discussed during the visits included farmers' constraints and opportunities for using the technologies as well as issues related to scaling-up of the activities. On the other Dr. Jens B. Aune assisted the Malawian partners in identifying methods for assessing carbon in vegetation and soil in project areas.

Overall, this project has enhanced the adaptive and absorptive capacity of about 586 farmers and extension workers to address issues of climate change.

Challenge

The main challenge experienced was the inability of farmers to sustain replacement of radio batteries.

Way forward and Recommendation

1. The project should consider introducing solar powered radios for the listening clubs.
2. Project to finalise manuscript development of data collected so far. In addition, the project need to finalise and share video documentary with the programmes office and stakeholders.
3. Develop and update documentation of project beneficiaries and impact to date
4. Strengthen collaboration with field staff in data collection, reporting and implementation as part of the exit strategy by linking up with other actors such as MoAIWD, ICRAF and AISAP projects and other NGOs to take over after project phase-out.
5. Develop workplan for the remaining activities in relation to the available funds and time period.
6. Use and update PITT M and E tool in the remaining period

3.5.7 Enhancing Adaptive Capacity of Female Smallholder Farmers to Climate Change

The purpose of this project is to contribute towards reduced vulnerability and increased resilience of rural livelihoods by enhancing female farmers' adaptive capacity to climate change.

The specific objectives of the study are: (i) to increase adoption of CSA technologies among female smallholders, (ii) to improve capacity among female smallholder to adapt to impact of climate change and (iii) to develop a frame work to guide agricultural research interventions, plans and policies to enhance adaptive capacity of female smallholder farmers.

Achievements in the reporting period

The project produced, reviewed and held a stakeholders validation workshop regarding two (2) training manuals on CSA technologies, one (1) for Lead farmers and the other for frontline staff. Among others, the manual for frontline staff contain a module on Climate Smart Technologies (CSA) to enhance knowledge and skills on climate change and CSA technologies. The project also produced four (4) brochures titled (i) Capacity of Extension Workers and Lead Farmers in Disseminating CSA Technologies, (ii) Level of Adaptive Capacity among Male and Female Farmers, and (iv) Current State of Adoption and Dis-Adoption of Climate.

The project also produced a video documentary that contains success stories of three (3) farmers on best practices of the CSA technologies. It is envisaged that the documentary will be used to motivate other farmers in Phalombe and Nkhotakota districts to adopt the CSA technologies.

In terms of capacity building, the project trained 30 extension workers and teachers from Phalombe, Dowa and Nkhotakota on the concepts of climate change and climate smart agriculture technologies. The project is also supporting two (2) MSc students in LUANAR and NMBU. Finally, the project has also produced a draft policy brief which is being finalized.

Way forward and Recommendations

The following recommendations were made:

1. Finalise training manual and train frontline staff and lead farmers on how to use the manual.
2. Translate the manual and brochures into local languages.
3. Finalise development of a framework for enhancing adaptive capacity for vulnerable groups especially women developed, remaining two case studies, training manuals and video documentary and value chain analysis
4. Review and revisit the objective: "Adoption of CSA technologies increased among female smallholder farmers" and how to be achieved.
5. Explore mechanism for institutionalisation of the training manual in the country's extension system through Department of Agricultural Extension Services (DAES), Department of Land Resources Conservation (DLRC) and mainstreaming of climate change in formal education through the Malawi Institute of Education (MIE).
6. Develop workplan for the remaining activities in relation to the available funds and time period.
7. Use and update PITT M and E tool in the remaining period

3.5.8 Other Research Projects

The programme supported three (3) other research projects as follows:

1. *Promotion of indigenous vegetables seed production, conservation and utilisation in Malawi* by De Abel Sefasi, Dr Charity Chonde, Dr Eric Chilembwe, Ms Jacinta Nyaika and Mrs Sibongile Chimzinga

The major objective of this project is to improve the productivity and conservation of indigenous vegetables for smallholder farmers through access to quality seed and good agronomic practices. During this period, the project focused on the specific objective: To produce and deliver good quality IV seed at LUANAR-Bunda and farmer fields. Six (6) indigenous vegetables namely Cats whiskers (luni), Ethiopian mustard (kamganje), amaranthus (Bonongwe), purple hibiscus, white/green hibiscus and black jack (chisoso) were planted, each on an area of 0,125 hectare. Seed

inspection and certification is being done in conjunction with the Seed Services Unit of the Department of Agricultural Research Services (SSU – DARS)

Figure 10: Field of cats' whiskers one day commencing harvesting

Figure 11: Cats' whiskers field on the day before of harvesting

The project also produced a draft manual and 10 brochures on agronomic and post-harvest practices of common indigenous vegetables in Malawi.

Way forward and recommendations

a) Validate and finalise training manual for distribution to farmers, extension workers and other stakeholders.
b) Translate the manual and brochures into local languages of the targeted beneficiaries.

2. *Promoting biomass briquettes to reduce the demand for charcoal and firewood* by Wellam Kamthunzi, PhD, Thawani Sanjika, PhD, Emmanuel Likoya and Tamara Nyirenda

The goal of the CABMACC Briquette Project is to reduce pressure on forest resources and the energy crisis in Malawi by promoting alternative energy sources. The main objective of the CABMACC Briquette Project is to promote biomass briquettes as an alternative to firewood and charcoal. The specific objectives of the project are as follows:

a) To analyze trends and factors in biomass energy use and adoption of briquettes in Lilongwe peri-urban areas.
b) To develop and evaluate best management practices in briquette production based on different feedstock and handling and use practices.
c) To assess factors affecting effective promotion of briquettes as a market-based intervention to replace firewood and charcoal.

Preliminary measurements of density of the briquettes indicate a value of 940 kg/m^3 for wood shavings briquettes and 1130 kg/m^3 for sawdust briquettes. The corresponding energy densities are 19 kJ/cc for wood shavings briquettes and 23 kJ/cc for sawdust briquettes

During the period, the project managed to procure some equipment for use in the activities for the briquette production and assessment studies. Some households in the community surrounding Bunda College have been selected to pilot-test the briquettes. The households have been given improved cooking stoves and are supplied with a variety of briquettes that the project is producing. The households are expected to provide feedback to the project team on their assessment of the briquettes as an alternative to firewood and charcoal. Participatory preliminary assessment made by the households shows that they are satisfied with the performance of the briquettes made of sawdust and wood shavings without mixing them with crop residues. In addition, as a promotion strategy, some briquettes were sold to vendors at Mitundu to sell to vendors. It was encouraging to note that there was a big demand for the LUANAR briquettes. This was partly attributed to the fact that the briquettes are superior to other briquettes because they are much denser than the other briquettes than the others.

Challenges

Failure to procure key measurement instrumentation and equipment such as electric power meter, carbon dioxide and carbon monoxide meters and thermometers for phase two activities. The project also lacks suitable production facilities that should include a shed for keeping feedstock for the production of the briquettes, a building for packaging and storing the briquettes and a kitchen for carrying out cooking tests. Another challenge is that the two research assistants in the project left for further studies and this has seriously affected the implementation of the project. The community outreach component of the project that aimed at promoting and marketing the briquettes has greatly been affected by the departure of the research assistants

The specific objectives of the CABMACC Briquette Project are as follows:

a) To analyze trends and factors in biomass energy use and adoption of briquettes in Lilongwe peri-urban areas.
b) To develop and evaluate best management practices in briquette production based on different feedstock and handling and use practices.
c) To assess factors affecting effective promotion of briquettes as a market-based intervention to replace firewood and charcoal.

3. *Pilot-scale anaerobic phased-solids (APS) Bioreactor for production of biogas and bio-solid copost from organic waste at Bunda College* by Dr Wellam Kamthunzi and Dumisani E. Siwinda (Graduate Student, MSc. Environment and Climate Change)

The goal of the CABMACC Biogas Project is to enhance energy and food security through the sustainable production of biogas as an energy source and organic bio-solids as fertiliser for crops. The main is to demonstrate the potential for the production of biogas and bio-solid compost from the processing of food, farm and yard waste using an anaerobic phased-solids bioreactor (APS-Bioreactor) system. Specifically, the project has the following specific objectives:

a) To construct an APS-bioreactor system for processing solid waste into biogas and bio-solid compost and for generating electricity from biogas.
b) To operate and monitor the performance of the APS-bioreactor system in terms of quality and quantity of biogas and bio-solid compost and the amount of electricity produced;
c) To physically and chemically analyse the waste stream reaching and exiting the APS-bioreactor.

Achievements to date

The project commenced the construction of the APS-bioreactor facilities including construction of the waste handling platform, one hydrolysis reactor, feed tank, methanogenesis reactor and the effluent tank. It is envisaged that by the end of the project, the outputs will include (i) assessment on the performance characteristics of an APS-bioreactor for processing waste into biogas and bio-solid compost, (ii) establishment of a bio-gas powered electricity power plant and (iii) production of Bio-solid compost as organic fertiliser.

The completed bioreactor facilities. From left to right: the hydrolysis reactor, the feed tank, the methanogenesis reactor and the effluent tank.

It is envisaged that the bioreactor will initially be operated using cow manure in order to establish the desired bacteria. Thereafter, the system will be fed using the solid waste collected from Bunda.

Figure 12 shows the completed bioreactor facilities.

Challenges

The major challenge has been delays in the construction of the gasholder by the contractor.

Way forward and recommendations

The project should finalise construction of the gasholder by identifying another contractor since the current one has failed to deliver within the agreed specified time.

The project should also finalise the installation of the power plant and the bio-solid composting plant including gas pipeline, a biogas treatment system (a blower, a condensate trap to remove water vapour from the biogas) and an iron-filled filter or scrubber to remove hydrogen sulphide (H_2S) from the biogas.

4. *Green Credit Standards under the Green Credit Scheme Project* by LUANAR and Tearfund

The project developed Green Credit Standards. Green Credit Scheme aims to engage Malawi's citizens in the conservation and management of natural resources and the environment through green credit awards. These include forest and energy resources, soil and water resources, wildlife and fisheries, wetlands and wastes.

Achievements to date

LUANAR, in collaboration with Tearfund and Government has drafted Green Credits Standards under the Green Credit Scheme Programme. These standards were discussed at a luncheon held on January 26, 2017 at Golden Peacock Lilongwe to brief Government Directors of Departments of Forestry, (Mrs N. Mughogho); Environmental Affairs Department (Mr. B. Yasin); Land Resources and Conservation (Mr. J. Mussa) and Agriculture and Extension Services (Y.C. Tegha) on the Green Credit Scheme and the Standards being developed by LUANAR and Tearfund, and to get Government approval of both the Green Credit Scheme and the standards. The establishment of the scheme is on the premise of rewarding citizens after they have taken actions to conserve natural resources and the environment. Green Credits are based on consumer loyalty reward schemes – a simple, proven and widely accepted model. It I envisaged that through this scheme, citizens are awarded Green Credits for every verifiable action that they take to conserve natural resources and the environment.

Way forward and recommendations

The following are the way forward and recommendations:

a) Develop a Concept Note for a detailed financing mechanism for the program to help to determine the resource needs for the proposed scheme including Green Climate Fund.
b) Engage other relevant actors and policy makers in ministries such as Ministry of Finance, Ministry of Economic Planning and Development, and Ministry of Local Government, including local banks and companies, in order to get their material and moral support for the Green Credit Scheme
c) Convene a meeting with Shire River Basin Project management team, JICA, Lilongwe Water Board, and UNDP to learn from their past experience on the proposed Programme.
d) Finalise draft standards until such a time when they will be ready to be handed over to Government through Environmental Affairs Department for implementation.

3.5.9 Students' Research

The programme, through the Director of Research and outreach continues to support climate change related BSc research projects for four (4) female and four (4) male students. The names and research titles are provided in Annex 7.

Major outcomes of the students' research projects include the following:

(i) Assessing the effects of weather variability on cattle production in TA Ngabu, Chikwawa by Janet Nanganga. This research has shown that cattle farmers are able to relate weather variability with adverse events such as drought, erratic rainfall, floods, and high temperatures and high diseases incidences and fodder unavailability and heat stress in animals. Despite this knowledge, most farmers have not integrated adaptation and mitigation measures in their livestock production system. The study has proposed hat cattle owners and other livestock keepers need capacity building with respect to climate change adaptation and mitigation measures including feed conservation as hay and silage, planting of drought tolerant multipurpose legumes and trees and deliberate growing of pasture for their animals

(ii) Development and Evaluation of Low-cost Solar Water Heaters by Priscilla Sesani: Results of this study have shown that locally constructed solar water heaters can reduce cost of heating water by up to 89% and 77% to MK1.09 or MK1.80 per litre versus MK9.80 and Mk4.80 per litre for electric geysers and commercial solar water heaters respectively.

(iii) Development and Evaluation of a Solar Parabolic trough Power Plant by Providence Maliro: Preliminary results show that a locally produced solar parabolic trough power plant can produce up to 0.64kWh per day which can power 9-watt LED bulbs for 4 hours with 95% efficiency at MK168.45/kWh. This power plant can replace use of paraffin lamps up to 61.3litres thereby preventing CO2 emission of 158kg per day. The research study serves as a demonstration for proof of concept.

3.5.9 Identification of community innovations

The programme supported research to assess and identify community technologies that can be linked to graduate entrepreneurship programmes. The study was conducted in six (6) districts; Thyolo, Phalombe, Dedza, Salima, Nkhata-bay and Rumphi. Initial findings of the study show that communities in these districts are engaged in several entrepreneurial innovations across a wide range of industries including agriculture, energy, transportation and arts and crafts. These innovations generate a number of benefits for both the primary innovators as well as surrounding communities some of which include: increased production, income, availability of household necessities, aid agricultural work, agricultural inputs, preserving culture and attracting tourists.

The study also identified a number of challenges that surround such locally based innovations and established that, even though such innovations are locally based, the environmental and social impacts are not significant. The local innovators' desire for external support is a major opportunity for collaboration. Most of the innovators indicated that they have not had external support in their innovations but a few have mentioned support in terms of linkages with markets. Government ministries have also been involved in helping to scale up innovations but to a very small scale. Other forms of support, also to a small scale, were highlighted as being in terms of material support.

The innovators also indicated that the innovations have opportunities to be improved especially in terms of the use of more modern and durable materials to add value to the products. This is where the graduate entrepreneurship programme (GEP) will come in to improve these innovations and employ a business model to upscale them and market them. The full report can be accessed from PCO.

3.6 Output 6: Capacity of key stakeholders enhanced for climate change adaptation and mitigation

3.6.1 Overall achievements

The programme as well as project supported several interventions to address this output (See Table 10). Throughout the training programmes, various modules have been produced which will be finalised to circulate to the public. In addition, some of the modules will be used to host national trainings on commercial basis.

Table 10: Planned activities against achievements for Output 6

Planned activities	Indicator	Target/Achieved		Comments
		Annual target	Achieved	
Conduct three (3) short courses for policy makers	No. of courses/ training held	3	1	Inadequate resources to support the remaining courses
	No. of policy makers trained	30	44	High demand for the workshop by policy makers
Production of Annual newsletter	No. of newsletters produced	1	1	Draft newsletter produced. In addition, bi-annual report was produced and distributed at RUFORUM Annual General Meeting
Support five (5) radio campaigns and six (6) TV programmes	No. of radio campaigns	5	19	4 News clips; 6 Morning basket; 9 studio Zokonda amayi recordings
	No. of face to face interactions	0	3	Visit to zokonda amayi sites 3
	No. of TV programme slots	6	0	Funds used on radio zokonda amayi programmes

Support three (3) meetings for development of knowledge management systems for policy processes	No. of meetings held	3	2	Two meetings and participation of 3 staff members at a workshop in Kenya
Train 50 lead farmers	No. of lead farmers trained	50	11	11 students were trained as lead-farmer trainers
Ongoing support of CABMACC website	Website hosted	1	1	On-going

Training of the Members of Parliament

In the reporting period, the programme has successfully trained 44 members of parliament in Climate change and Development. Although the training initially, targeted MPs from CABMACC target districts, the training also included members of the women caucus of Parliament, of which 20 were males. The training was conducted in order to equip the members of parliament with the right information on climate change that will assist MPs in making well-informed decisions on matters of climate change.

During the training, the MPs where taken through five sessions including Understanding Climate Change, Climate Change, Agriculture and Rural Livelihood, Climate Change, Gender and Development Linkages, Gender Analysis for Climate Change and Climate Change Communication and Advocacy.

Through the training, a new-found partnership has been formed between LUANAR and MPs, this partnership is critical in addressing climate change and the overall development of the nation. The partnership also seeks to close the gap between members of parliament and their access to information and research. The list of those that attended the training is included as Annex 9.

The programme, is finalizing an annual newsletter that will provide an insight into the Programmes achievements within the four (4) years of its implementation.

An independent company (Professional Website Designers) was assigned the responsibility of hosting the CABMACC website. However, for sustainability purposes, the programme is considering hosting of all programme related information on the LUANAR website.

Training of journalists

In the reporting period, the programme trained 27 journalists (12 females and 15 males) from across the country media houses to enhance awareness on climate change especially targeting interventions by women. The journalist were also training in climate change challenges for proper planning and implementation. The programme also partnered with Malawi Broadcasting Corporation to cover several issues in relation to climate change. This was through the Zokonda Amayi programe. The

programmes included local indicators of climate change and weather variability, current challenges and copping strategies and future interventions.

Capacity of lead farmers

The programme supported a study to assess current capacity building approaches used to train lead farmers in Dowa, Kasungu and Ntchisi. The study found that there are a number of approaches currently in use to build the capacity of lead farmers. It was however established that extension approaches are not designed to isolate between lead farmers and follower farmers but rather target the general farming community with the lead farmers themselves viewed as an extension approach. Some challenges were highlighted pertaining to the lead farmer approach. Some of these challenges include delay in passing of knowledge and skills of new technologies; mobility; lead farmers having too many technology to transfer to the general farming community (ideally they are supposed to be responsible for one technology); negative mind-set of the some follower farmers who transmit negative energy.

Based on the lessons learnt from the study, the programme trained 11 recently graduated students from LUANAR's two campuses (Bunda and NRC) in lead farmer capacity building. The students (Lead farmer Experiential Trainers) were been sent out to the CABMACC EPAs in the six (6) districts and will work hand in hand with the extension community in building the capacity of lead farmers. This will necessitate technology transfer among which would be the technologies being developed or promoted by the CABMACC projects and other research initiatives. It is expected that each trainer will train 5 lead farmers or more who in turn train 10 follower-farmers. However, due to contractual issues, the initiative has since stalled.

4.0 Summary of financial report

4.1 Income from July 2016 to June 2017

Table 11 has income information for the programme for July 2016 to June 2017. The table show that during the reporting period, the total amount of NOK10,842,178 (US$1,306,286) was available representing 76% of the annual budget. The total amount includes NOK5,000,000 (US$595,308.97) from the Embassy, balance brought forward from 2015/16 financial year and interest gained from both foreign denominated and local accounts of NOK5,837,053 (US$710,360).

Table 11: Summary of income and expenditure (July 2016 - June 2017)

INCOME	MK	NOK	US $
Balance b/d	423,327,660	5,882,725	708,762
Grants from Norwegian Embassy	433,267,082	4,941,064	595,309
Interest Receivable	1,341,524	15,465	1,863
Exchange Gain	71,437,985	-	-
Other income	253,650	2,924	352
Total Income	**929,627,901**	**10,842,178**	**1,306,286**

4.2 Expenditure as at June 2017

Expenditure information is provided in Table 12. In 2016/17 financial year, the cost of implementing activities was NOK9,214,046 (US$1,110,126) representing 65% of the 2016/17 financial year budget of NOK 14,277,411 (US$1, 720, 170) and 85% of funds available of NOK10,842,178 (US$1,306,286)

Table 12: Expenditure as at June 2017

EXPENDITURE	MK	NOK	US$
Improving the capacity of LUANAR & Key Stakeholders	154,135,470	1,776,839	214,077
Gender Mainstreaming into Teaching & Research programmes	22,349,749	257,643	31,041
HIV/AIDS Issues Mainstreamed into Teaching & Research	12,835,608	147,966	17,827
Improved Information Access, Documentation & ICT Services	63,049,552	726,821	87,569
Innovative Research & Technology Development in CC Adaptation	261,404,273	3,013,410	363,061
Commissioned Research	16,533,958	190,600	22,715
Post Graduate Research Grants	17,794,877	205,135	24,715
Capacity of key Stakeholders Enhanced for CC Adaptation	53,635,062	618,293	74,493
Programme Monitoring & Evaluation	30,805,094	355,144	42,785
Programme Implementation & Coordination	166,746,751	1,922,223	231,583
Total Expenditure	**799,290,392**	**9,214,046**	**1,110,126**
Excess of Receipts over Expenditure	**130,337,509**	**1,628,132**	**196,160**

The table further shows that more resources were provided for implementation of CABMACC Research Projects under Innovative Research and support of capacity building stakeholders. Furthermore, the support for capacity building for LUANAR and key stakeholders, improved information access, capacity building for climate change adaptation and programme implementation and coordination (which carters for collaboration with Norwegian Partners, synergies and networking, salaries and staff benefits).

4.3 Summary of use of funds against budget from July 2016 to June 2017

Table 13 below shows the summary of funds used during the reporting period. The detailed summary of programme expenditure is provided in Annex 10

Table 13: Summary of use of finances

Summary of activities	Budget		Expenditure			Balance	
	US$	NOK	MK	US$	NOK	US$	NOK
Improving the capacity of LUANAR & Key Stakeholders	335,000	2,780,500	154,135,470	214,077	1,776,839	120,923	1,003,661
Gender Mainstreaming into Teaching & Research programmes	56,500	468,950	22,349,749	31,041	257,643	25,459	211,307
HIV/AIDS Issues Mainstreamed into Teaching & Research	34,375	285,313	12,835,608	17,827	147,966	16,548	137,347
Improved Information Access, Documentation & ICT Services	132,000	1,095,600	63,049,552	87,569	726,821	44,431	369,799
Innovative Research & Technology Development in CC Adaptation	525,000	4,357,500	261,404,273	363,061	3,013,410	161,939	1,344,090
Commissioned Research	25,000	207,500	16,533,958	22,715	190,600	2,036	16,900
Post Graduate Research Grants	71,250	591,375	17,794,877	24,715	205,135	46,535	386,240
Capacity of key Stakeholders Enhanced for CC Adaptation	129,750	1,076,925	53,635,062	74,493	618,293	55,257	458,632
Programme Monitoring & Evaluation	65,000	539,500	30,805,094	42,785	355,144	22,215	184,356
Programme Implementation & Coordination	346,295	2,874,248	166,746,751	231,583	1,922,223	114,702	952,025
GRAND TOTAL	**1,720,170**	**14,277,411**	**799,290,392**	**1,110,126**	**9,214,046**	**610,044**	**5,065,365**

5.0 Assessment of the efficiency of the programme

5.1 Efficiency for Objective 1: Building the capacity of LUANAR

Objective 1 (Enhanced capacity by the university towards merging local and global climate change perspectives) has not faced critical challenges in terms of efficiency. The programme has supported more staff members than originally planned as most of their studies are undertaken within Africa (planned 7 PhD, actual 14 supported; planned 6 BSc, actual 15 supported). The programme is only supporting students' tuition hence enabling to support more female students (58 in Year 3 versus 67 in Year 4 against the planned 25 each year).

5.2 Objective 2: Research Interventions

Objective 2 (increased knowledge, technology and systems for climate change, adaptation and mitigation) – almost 60% of the research projects have spent above 50% of their budgets and have produced new knowledge and technologies (prototype) within their budgets although the technologies are yet to be tested and validated.

5.3 Objective 3: Building Capacity of Stakeholders

Objective 3 (increased capacity on advocacy, outreach, networking and mainstreaming of climate change within national policies and plans) has had high costs due to increased number of participants than planned (planned 30 versus actual 44 members of parliament) while training for teachers and front line staff were within their planned budgets. Apart from staff, the programme has enabled the building of capacity for undergraduate BSc students to conduct first class climate change related research.

6.0 Major deviations from plans

Under the curriculum review the programme supported the Faculty of Natural Resources Management at Bunda campus to develop a strategic plan and research agenda. Instead of providing support directly to lead farmers the programme engaged experiential lead farmer trainers who were deployed to 11 EPAs to support the lead farmers. These are former students from Natural Resources and Bunda campuses. They were trained on several areas to support lead farmers during the 2016/17 cropping season.

7.0 Assessment of problems and risks

The most important risk has been the depreciation of the NOK which implies an effective decrease in the amount of funding the programme will get in Malawi Kwacha and US Dollar terms. Annex 10 provides a thorough analysis of the risks-both those identified at the programme planning phase and those emerging in the course of implementation of the programme.

Currently the programme has documented a reduction in the risk related to poor coordination on climate change at national level. The programme initiated the development of the National Resilience Plan with support of Department of the Risk Reduction Management, Department of Environmental Affairs, Office of the Vice President and the donor community. On financial management, the university established the office of the internal audit and purchases related to the programme are guided by the procurement act. To guard against devaluation, the university operates foreign currency denominated accounts (FCDA) to cushion depreciation of the Malawi Kwacha. Through the support of the training programme, staff turnover has been retained. Deliberate efforts were made to support both MSc and PhD faculty (approximately 30% of all trained).

Currently the programme is facing new and emerging risks such as; low exchange rates between the NOK and USD, intermittent power supply by ESCOM and extreme weather conditions.

8.0 Adjustments to activity plans

During the reporting period, there were no immediate plans to adjust the interventions. However, there was potential to critically review the research projects and map the way forwards.

9.0 Achievements in relation to purpose

The programme has recorded several achievements in the past four years. During this period, achievements included capacity building (completion of studies of staff members, write-shop for proposal writing skills), publication (LUANAR journal, journal articles, resource book, toolkits, training manuals, gender policy), and advocacy and outreach (training of members of parliament, primary and secondary school teachers, extension workers and lead farmers) .

The completion of studies by members of staff has enhanced the skills of individuals of some have been given challenging positions within the university. For instance, one (1) of the beneficiaries of MSc studies was a female lecturer who has assumed the position of matron/warden for female students who will also be a role model for undergraduates while another BSc student is the Assistant Librarian.

We have also noted several members of staff enhancing their publication and proposal writing skills. The university has publishing “Improving Rural Livelihoods” that will be circulated to the wider community for continued capacity building among different stakeholders. Some of the staff members are now in the phase of taking academic research work to the communities.

Specifically, the major contributions to the goal of adaptation and mitigation to climate change include the following:

1. The project has assisted fish processors to reduce reliance on wood fuel for processing fish by adopting solar-based and wood reducing smoking kilns and environmentally friendly fish processing technologies. These technologies have also helped processors to produce clean, hygienic and high quality fish products with high market value thereby increasing income.

2. The Integrated Soil Fertility management project managed to build capacity of 396 farmers and extension staff to better understanding principles and application of Climate Smart technologies for water conservation and enhanced yields through integration of legumes such as pigeon peas using Grain Legume Rotation Learning Centres. The project has therefore enhanced the adaptive and absorptive capacity of both lead and ordinary farmers and extension workers to address climate-related shocks through scaling up of climate smart, sensitive and responsive interventions such as integrated and mixed cropping of maize with drought tolerant crops.

3. The Livestock Value Chain project has, jointly with farmers, helped livestock farmers in Bolero to construct an 80 meter solar powered borehole to address the problem of water shortage caused by climate change induced drought. Livestock now can fetch cleaner water within close reach which is also safe from predators. Reduced distances to access water points also implies that animals preserve and use nutrients for more productive purposes such as milk production.

4. The Biomass project introduced intercropping of legumes such as pigeon pea with maize among target farmers. Farmers reported that soil moisture lasted for longer periods and maize yields were high in plots where maize was intercropped with legumes. The project has helped introduce drought tolerant crops such as pigeon peas which was not previously commonly grown in the area.

5. CABMACC in collaboration with Tearfund initiated development of Green Credit Standards with the aim of engaging Malawi's citizens in the conservation and management of natural resources and the environment through green credit awards which will be awarded for verifiable actions that reduce degradation of the natural resources and the environment.

6. A BSc student project on Development and Evaluation of Low-cost Solar Water Heaters has shown that locally constructed solar water heaters can reduce cost of heating water by up to 89% and 77% to MK1.09 or MK1.80 per litre versus MK9.80 and MK4.80 per litre for electric geysers and commercial solar water heaters respectively.

7. Another BSc project has shown that that a locally produced solar parabolic trough power plant can produce up to 0.64kWh per day which can power 9-watt LED bulbs for 4 hours with 95% efficiency at MK168.45/kWh. This power plant can replace use of paraffin lamps up to 61.3litres thereby preventing CO_2 emission of 158kg per day. This is a clear demonstration of proof of concept.

9.1 Highlights of selected beneficiary experiences with the CABMACC programme

Following visits to the project sites by the Research and Capacity Building sub-committee of the Programme advisory committee, majority of target beneficiaries consulted voiced satisfaction with the CABMACC Programme. In Bolero Rumphi, livestock farmers were happy that their animals would now access water without walking long distances. In addition, the water was cleaner and animals were safe from attacks by predators. Livestock farmers were also appreciative that through the project, animals were now being treated and vaccinated through collaborative efforts with veterinary counterparts from NMBU in Norway.

In Mzimba, under the Biomass Inventory project, farmers were excited with the project because it had enabled them to adopt hitherto unheard of crops such as pigeon peas. 'in plots where maize was intercropped with pigeon peas, the moisture could last longer and the maize plant stand looked healthier and greener leading to higher yields', said the Chairman of farmers. The project also introduced a new maize variety which was liked by many. However, some farmers complained that this variety was not available in the agro-dealers. The project would link up with the suppliers on how to make this variety readily available for farmers.

Under the Seedfish project, fish processors expressed gratitude and expressed how they felt supported by this project to process better quality fish in a clean hygienic environment using solar energy and not firewood. Fish processors also indicated that the good quality of fish produced fetches higher prices that that processed on open drying racks. However, others expressed concern that the solar driers were not adequate to cater for all the fish processors in the area. Noteworthy, some of the fish processors were women hence women empowerment.

10.0 Collaboration/coordination

The collaboration is demand driven in areas where NMBU has competence that is relevant for LUANAR. Norwegian program coordinator closely followed up project participants in Norwegian side and also in part LUANAR side and continued to provide professional guidance in research and training activities as anticipated in the project. The NMBU partners continued to NMBU collaborate on five research projects with Malawian partners and helped in the supervision two PhD candidates from LUANAR. In addition, Norwegians also participated advising in governance structures (Midterm evaluation, Steering Committee and PAC Meeting, Communication Strategies) of the project.

10.1 Developing methods for biomass and carbon assessment for miombo woodlands and agroforestry fields in Malawi

Under this project, collaborators from Norway are Tron Eid at the Department of Ecology and Natural Resource Management and Hans Ole Ørka and Terje Gobakken, Department of Ecology and Natural Resource Management, Norwegian University of Life Sciences.

10.2 Livestock Value chain, food security and environmental quality: Transforming rural livelihoods through Community-based Resilience and Indigenous Livestock Management Practice guidelines in Malawi.

Under this project, three veterinarians from Norway visited the project in October 2016 and April 2017. Together with TAPP employees and advisory personnel from Rumphi, the Norwegian partners obtained pregnancy diagnoses, measured body weight, and obtained blood and fecal samples from all included cows and associated young stock. Altogether 150 cows with offsprings will be included in the investigation. One student from NMBU (Muhammad Azher Bhatti) defended his MSc thesis and was awarded the grade A for his work.

10.3 Scaling Out Integrated Soil Fertility Management (ISFM) Approaches to Improve Crop Resilience to Climate Change

Under this project, the Norwegian partners are J Aune, B Sitaula, Mike Moulton. Professor Bishal Sitaula followed up the project during visits to Malawi 18 to 23 July, 2016 and 9 to 13 January 2017. Jens Aune gave a particular attention to the progress of the ISFM project with legumes. During these visits, Messrs Sitaula and Jens made a field visit to Balaka to assess the field operation and get farmers feedback on the project. In addition, Jens B. Aune assisted the Malawian partners in identifying methods for assessing carbon in vegetation and soil in project areas.

At management level, Prof Sitaula and Jens B. Aune also participated in the biannual meeting with the Project Advisory Committee (PAC). Prof. Sitaula met the Programmes Coordinator to discuss the overall progress of the CABMACC projects.

10.4 Framework Enhancing Adaptive Capacity of Female Farmers to Climate Change Project

Under this project, Dr Gry Synnevag visited Malawi in April 2017. During this visited, Dr Synnevag and her Malawian counterpart Dr Kakota visited the project site to plan for training using the manual that has been produced by the project. Dr Synnevag also participated in the drafting of one policy brief based on research findings.

On capacity building, an MSc thesis "Adoption of climate smart agriculture (CSA) technologies among female smallholder farmers in Malawi" was defended by Noragric student Edith Zighe Kitsao whose field work was conducted in close collaboration with the research team in Malawi. The objective of the research to explore the gender related barriers affecting adoption of CSA technologies.

This currently involves supervising of PhD candidate at NMBU from Malawi and Master Students in Malawi.

10.5 Malawi PhD NMBU Students progress

Student 1: Moses Limuwa

The student has completed all requirements for mandatory coursework. Data collection was completed in August 2016 under the supervision of Professor Trond Storebakken (TS). The data collection was conducted in collaboration with the SEED-Fish project. The student has so far submitted the following manuscripts for publication:

1. Paper 1: Analysis of climate change research in Malawi on perspectives of sustainable fisheries management in a changing environment.

2. Paper 2: Lake Malawi small-scale fishers and climate change: Adaptation strategies and determinants.

3. Paper 3: Leaving the maize fields for fishing: Lake Malawi smallscale fishers' gender roles under a changing environment.

The student is expected to collect data for the final study 4 on Impact of fisheries development assistance on livelihood of fishers under hydrodynamic changes in summer of 2017.

Student 2: Trust Kasambala

The student successfully completed all mandatory courses. He also attended training at ICIPE Kenya on collection, identification and characterization of fungal entomopathogens and techniques used in insect pathology from March 1 to April 16 2016. Data collection for three objectives has been finalized and the student is currently drafting papers 1, 2 and 3.

Library related activities

Liv Ellingsen, Mike Moulton and Joanna Boddens-Hosang visited LUANAR in April 2017 under the Communication Strategy Component of the programme. During this period, the team held meetings and discussions with Communication Strategy Champions including the LUANAR University Librarian (Mr. Salanje) and Dr Felix Maulidi and Patricia Ngwale, the Media Specialist. During these meetings, the team and their Malawian counterparts to identify gaps and how to link the different initiatives based on the CABMACC programme document and project goals. One of the outcomes of the visit is the recommendation for the CABMACC programme to involve the library in establishing a repository of all documentation related to the programme for easy access online and in hard copies. The team also made a field trip to the REDCAPP in Dedza.

During the visit, Mike Moulton, also had discussions with LUANAR ICT and ODL staff to support the implementation and use of a learning management system (Moodle) at LUANAR and 2) to support the innovative use of technology (particularly the use of an LMS, digital stories). Mike Mouton also visited the Mzuzu ODL Satellite Centres to learn how it is being operationalized including exploring the possibility for how CABMACC could use the 'slave server' system in the extension and ODL.

11.0 Monitoring and Evaluation

Monitoring and evaluation aspects are in two (2) components namely; (i) monitoring by the Programme Advisory Sub-committee on Research and Capacity Building and (ii) Mid-term Evaluation.

11.1 Monitoring by the Programme Advisory Sub-Committee on Research and Capacity Building

During the reporting year, Monitoring (M), Evaluation (E) and Learning aspects of the programme were hampered by absence of an M and E pecialist who resigned in 2016. However, the M and E aspects were handled by the PCO office and the Project Advisory Sub-Committee on Research and Capacity Building. In December 2016, the committee held meetings with all the Principal Investigators of Projects and also visited all the project sites from March 28 to April 7, 2017. The overall objective of the exercise was to independently review and monitor projects' activities and come up with strategies to deal with major challenges or deviations arising during implementation.

Overall assessment of the projects led to the following conclusions:

i. That most projects have developed some technologies but remains with testing, validation and ultimate dissemination of technologies to target clientele.
ii. That projects need to finalise publication of manuscripts and manuals need to be finalized for some projects.
iii. That projects should improve in collection of data with respect to hoe the project are contributing to the overall goal of the CABMACC programme; key milestones achieved to date and observable impacts as they contribute to improving food security and livelihood and adaptation and mitigation against climate change in the project impact areas. To achieve this each project follow a standard data collection template distributed by the PC office.
iv. That each project should clearly articulate evidence of collaboration and involvement of other actors and outputs beyond CABMACC.
v. That each project should develop a detailed work plan for the remaining period of the programme with a clear check list and time line to help them follow-up on what is to be done within the remaining period and financial resources.
vi. That members of the PAC committee should visit some of the projects to get a hands-on feel of project implementation on the ground.

11.2 Mid-term Evaluation

The Royal Norwegian Embassy in Lilongwe (RNE) initiated a midterm review (MTR) of the CABMACC Program in order to obtain an assessment of the achievements of the Program against the goals, purpose, objectives, outputs and expected results specified in the contract between LUANAR and the Norwegian Ministry of Foreign Affairs (MFA), and in the Program Document (PD). The team comprised of Robert Kafakoma (National consultant) and Bjørn Gildestad (Team leader) from the Nordic Consulting Group (NCG) Oslo, Norway. The major findings of the MTR are summarized as follows:

i. Appropriateness and relevance: The Program appears highly relevant and consistent with the Malawian development, food security and climate change strategies, policies and programmes. However, there are weak links with other partners such as the private sector business.

ii. Effectiveness and impact: The selection of impact indicators were perceived as restricted scope and the major challenge is the Program's limited outreach to small numbers of farmers and villagers relative to the population in the target areas.

iii. Outputs and efficiency: The capacity building component and the ICT component were advanced and activities planned under the gender component are on track. However, while projects have generated technologies for the adaptation to climate, testing and validation process is incomplete in some projects.

iv. Efficiency at coherence and coordination: The research projects appear to be conducted rather independently and could benefit from more coordination by LUANAR.

v. Financial management: The audit report for the year 2014/15 had no major issues. The programe experienced low budget absorption in the period 2013-16. Considering the falling value of NOK and depreciation of MKw visà-vis the USD, the evaluators opiniated that some budget components could have become less costly calculated in USD. Program management consume 26% instead of 16% of the budget which was partially attributed to low budget absorption.

vi. Risk management: The risk analysis of the PD is not followed up in the annual reports. A major risk for the successful completion of the Program is the reduction in budgets brought about by the depreciation in the value of the NOK versus USD which implies that insufficient funds could be at disposal for the testing and validation of the new technologies. There is also a risk of lacking commitment from Government to follow up with sufficient maintenance budgets for infrastructure.

vii. Program management: The expected 30% female representation in the Program Advisory Committee (PAC) has not been achieved and there is lack of alignment of the Program activities with the administration of research at LUANAR.

viii. Sustainability: There is firm ownership of the Program with relevant public institutions on board where research institutions are prepared to continue the activity under other budgets. However, a precondition for sustained benefits will be the Program's ability to complete the trial and error phase of the development to minimize the risk for the beneficiaries with the adoption of new technologies.

The MTR recommended that selection of impact indicators should be extended to include Program influence on the policy-making processes and that a separate table should be introduced to report on the indicators defined in the Agreement with Norway and also cover an appropriate analysis of the major Program risks. Overall, the implementation of CABMACC should be continued up to the end of the 5 years' term on provision of a positive outcome of the Audit Report 2015/16 expected available in December 2016. The Program should concentrate on achieving its goals regarding research and development of

techniques for mitigation and adaptation to climate change, and the outreach to beneficiaries. Priority should also be given to the monitoring of effects and impacts. Finally, the transfer of responsibility for Program activities from CABMACC to LUANAR's ordinary budgets, Government agencies and other partners and stakeholder should commence.

12.0 Conclusions and lessons learnt

During the reporting period, it can be concluded that the targeted indicators have been achieved despite some challenges encountered, especially in the research component.

For capacity building, majority of supported faculty are on course and over half of the members have successfully completed their studies. Those under PhD have completed their field studies and are working on their research.

The programme is on course to achieve most of its planned activities. Supporting training of staff members has been smooth with most of staff completing their studies without any challenges. Those that are pursuing PhD have all completed their field research studies. Those supported under MSc have graduated and one female has been appointed as a warden for female students at Bunda campus.

The programme has supported training programmes for stakeholders including teachers, front line staff from CABMACC impact sites and lead farmers. The programme has also build the capacity of students and members of staff in several areas including research proposal writing and publication.

The programme has supported the publication and development of literature for different stakeholders including tool kits for mentoring female students in secondary school on science subjects, toolkit for designing and implementing a training programme of gender and climate change, a handbook to primary and secondary school teachers on gender and climate change and a tool kit for mainstreaming HIV and AIDS in teaching, research and outreach in centres of higher education

Finally, the programme partnered with several partners including Malawi Broadcasting Corporation, College of Medicine, Farm Radio, Department of Climate Change and Meteorological Services, District departments and students to raise climate change awareness, build the capacity of key stakeholders at national level. This is in addition to the existing collaboration with NMBU.

ANNEXES

Annex 1: Research Themes for Faculty of Natural Resources

- Climate change and development / climate change, adaptation and mitigation
- Energy and development
- Water resource development and management
- Governance, management, resources mapping, waste water development
- Biodiversity and livelihoods
- Species classification and identification
- Indigenous knowledge systems
- Mineral Resources
- Governance, waste management,
- Product research and development
- Sanitation, hygiene and food safety)
- Land resource management
- Land use, land tenure (urban and rural planning zoning and settlements)
- Urban development
- Landscape restoration
- Aquaculture and food security
- Nutrition, breeding, fish health
- Social equity/justice)
- Policy research and analysis

Annex 2: LUANAR Circle Action plan for CIRCLE ISP, 2016

Concordat principle No and title	Current activity/policy/ process	Gap	Proposed action	Owner	Timescale	Success measure
Recruitment and Selection	• Recruitment guidelines • Standard operation procedure and Human resource policy	• Lack of recruitment policy • Need to update recruitment guidelines	• Develop a recruitment policy • Update the recruitment guidelines	• University Registrar	June 2017	• Policy document in place • Updated recruitment guidelines
Recognition and Value And; Support and Career Development (2)	• Recognised through promotions • Some aspects are covered in the Performance Management System	• Weak institutional framework for recognising researchers • Lack of institutional framework to recognise technical staff	• Develop criteria for identifying, recognising and valuing researchers • Establish a committee to the identification/awarding achievers • System to recognise technical staff	• Director of Research and Outreach • Chair of Deans	June 2017	• Criteria in place • Committee in place • Number of researchers recognised
Support and Career Development (1)	• Some (mostly old) laboratory	• No clear framework for research and technical staff	• Develop and operationalise support and career development for	• University Registrar	June 2017	• Support and career development

	facilities available • Some funding available from DVC, PCO and LUANAR-MSU Innovative Hub	career development • Lack of continuous development of personal soft skills • Inadequate institutional support for researchers	research and technical staff • Review and revise capacity development plan • Institutionalise Innovation hub and Programmes Office			framework in place • State-of-the-art equipment and laboratory facilities
Researchers' Responsibility	• Own initiatives to bring funds to the University • Mentorship • Contribute to government policies	• Teaching overload • Lack of motivation to solicit research funds • Weak mentorship between senior and junior staff • Poor dissemination of research results and poor translation into national policies • Failure by management to reinforce declaration of	• Building an institutional culture • Need for team building sessions (continuous engagement between research and administrative staff) • University level guidelines to facilitate researchers' responsibility • Provide space for consistent research results dissemination.	• Director of Research and Outreach, Director of Quality Assurance Deans and Heads	February 2017	• Policies briefs • Increased percentage of mentorship sessions • Increased dissemination of research results

		resource mobilisation efforts by researchers • Prohibitive procurement procedures to support researchers				
Diversity and Equality	• Gender policy in place • Performance Management System • Human Resource Policy • Existence of few international students • Existence of the Marketing strategy	• Lack of facilities to support female professionals • Poor internationalisation of university academic programmes • Poor Implementation of the marketing strategy • Lack of facilities to support the physically challenged	• Enhance Internet based marketing • Institutional framework to support female professionals • International accreditation/harmonisation of some academic programmes • Improve facilities to accommodate the physically challenged • To develop a diversity and equality policy	• Vice Chancellor,	2017	• The percentage of female professionals increased

Annex 3: List of participants (Teachers) trained on gender and climate change

No	Participant's name	Institutional address	Gender	Contact Details
1	Ronald Vitanda	Bolero FP School	M	0888 926 019
2	Madalitso Pwele	Chirambo FP School	F	0881 820 573
3	Bolower Kafunda	Lundu CDSS	M	0881 399 744
4	Elise Chipofya	Bolero CDSS	F	0888 720 668
5	Martha Gondwe	Kazuni Primary School Box 16, Rumphi	F	0888 307 894
6	Victor Tanganyika Bwanali	Luvwere CDSS Box 22, Kafukule	M	0888 508 114
7	Abner Dickens Chizewe Mtika	Enkondhlweni FP School Box 48, Mpherembe, Mzimba	M	0884 075 245
8	Jesbell Jere	Mpherembe CDSS Box 44, Mpherembe	M	0888 548 474
9	Frank Kaponda	Matamangwe Primary School, Box 34, Chia, Nkhotakota	M	0885 409 763
10	Rachael Tionge Kaudzu	Mkaika LEA School Box 16, Mkaika, Nkhotakota	F	0999 774 680
11	Rhoda Phiri	Chipati CDSS, Box 14, Chia	F	0999 243 559
12	Louis Nkhoko Chafa	Mkaika CDSS Box 36, Chia, Nkhotakota	M	0999 491 170
13	Dorothy Chamama	Nkhotakota CCAP Primary, Box 19, Nkhotakota	F	0884 892 326
14	Yobu Raphael Chiwonga	Thale 1, c/o Nkhotakota DEM, Box 20, Nkhotakota	M	01 292 314 0999 802 188
15	Fishani Kaombe	Linga CDSS P/Bag 1, Nkhotakota	F	0888 660 039
16	Sarah Mwale	Chinkhwamba Primary School, P/Bag 1, Benga, Nkhotakota	F	0888 710 763
17	Patrick Manjolo	Benga CDSS P/Bag 2, Nkhotakota	M	0881 877 770
18	Casterns Gwiramwendo Kalewa	Nkhotakota Secondary School, P/Bag 14, Nkhotakota	M	0991 681 486
19	Agness Reuben Msukwa	Zolozolo FP School, Box 77, Mzuzu	F	0884 491 829
20	Howard Kwelani Kumwenda	Masasa CDSS, Box 572, Mzuzu	M	0888 554 897 0999 250 628
21	Lucia Mfune	Lunyangwa Girls Primary, Box 333, Mzuzu	F	0993 779 457

22	Richard John Gondwe	Chibavi CDSS, Mzuzu City	F	0881 184 173
23	Ellah Judith Ngulube	Msongwe CDSS, Box 510, Mzuzu	F	0888 694 530
24	Ruth Alinane Maswaswa	Masasa FP School Box 167, Mzuzu	F	0881 881 686
25	Clement Ephraim Botte	Mchengautuwa CDSS Box 710, Mzuzu	M	0999 284 006 0884 296 503
26	Chriss Gondwe Thapasila	Katoto Primary School Box 375, Mzuzu	M	0888 375 710
27	Tiyezge Ester Moyo	Mzuzu CCAP School, Box 171, Mzuzu	F	0994 715 171 0888 505 320
28	Kondwani Diverson Chirwa	Moyale CDSS, Box 23, Mzuzu	M	0111 992 497 0888 038 559
29	Nchachi Whatford Mwandira	Zolozolo CDSS Box 765, Mzuzu	M	0999 325 927
30	Dalitso N. Nkhoma (Mrs Kanyenda)	Kawuwa LEA School Box 319, Mzuzu	F	099 818 772

Annex 4: List of participants (frontline staff) trained on gender and climate change

No.	Name	Gender	District
1	Rose Chasweka	F	Balaka
2	Fanny Kaliu	F	Dedza
3	Amissi Singo	M	Nkhota-kota
4	Justice Malunga	M	Nkhota-kota
5	Chrispin K. Banda	M	Dedza
6	Ida M. Mereka	F	Balaka
7	Alfred Silibonde	M	Dedza
8	Youngster R. Phiri	M	Mzimba
9	Sydney Mkata	M	Phalombe
10	Afick Douglas	M	Balaka
11	George R. Raisi	M	Balaka
12	Malunga Denson Nzunda	M	Rumphi
13	Adden M. P. Chawinga	M	Rumphi
14	Edith Mithenga	F	Mzuzu
15	Simon Makuluni	M	Phalombe
16	Donnex Mugara	M	Phalombe
17	Enerst Masanda	M	Dedza
18	Christopher Chigwa	M	Phalombe
19	Stephano K. Gondwe	M	Mzimba
20	Mireille Mkandawire	F	Dedza
21	Patricia M. Tembo	F	Balaka
22	Davidson Judson Bwanali	M	Phalombe
23	Brixio S. Phiri	M	Phalombe
24	Pilirani Mphepo	M	Rumphi
25	Gilbert H. Kadonje	M	Balaka
26	Waterford Simon	M	Balaka
27	Jackson Juwawo	M	Balaka
28	Jerome Mhone	M	Nkhotakota
29	Madalitso Chuma	M	Balaka
30	Lamsy Kuloya	M	Balaka
31	Rex M.D.K Mwenitanga	M	Rumphi
32	Robert Nfune L	M	Mzimba

Annex 5: List of papers and authors for the Special edition of the Journal

Paper title	Authors
Genetic diversity among Malawi grown local maize (*Zea mays* L.) genotypes using microsatellite markers	Matewele M and Changadeya W
Proximate composition of freshly caught tilapia from Chia lagoon and Lake Malawi	Chrissie Banda, Fanuel Kaputе*, Elias Chirwa, Wales Singini, Benjamin Kondowe, Kumbukani Mzengereza and Bob Jere
Ammonia and phosphate biofiltering efficiency of macroalgae under integrated mariculture systems	Augustine W. Mwandya
Determination of optimum sand-clay mixture of ceramic pitchers for small-scale bean irrigation	Darwin Dodoma Singa* and Jones Malama
Factors influencing Intertemporal Preference of Fisheries Resource Users of Lake Malombe in Malawi	Wales Singini, [2]Emmanuel Kaunda, Victor Kasulo and Wilson Jere
Growth, feed utilization and blood composition of *Clarias gariepinus* fed bamboo charcoal diet at various inclusion levels	Akegbejo-Samsons Y.[1]*, Odedoyin A.J[1] and Odulate D.O[1]
Consumer purchase decisions and other chain actors' cost structures: an application of a value chain analysis on *Oreochromis spp.* (Chambo)	Letson Yoyola Phiri*, [2]Josephy Dzanja, [3]Mafaniso Hara and [4]Tasokwa Kakota
Farmer perceptions on storability and trait preferences of local maize varieties in Central Malawi and their implications for maize breeding in Malawi	Macpherson Matewele
Reproductive biology and size structure of *Mylochromis anaphyrmus, (Teleostei: Cichlidae* Burgess & Axelrod 1973*)* in the demersal trawl Fishery of the southeast arm of Lake Malawi	Alexander E. M. Bulirani[1], Emmanuel K.W. H. Kaunda[2], Jeremy Likongwe[3], George F. Turner[4] and Olaf F. Weyl[5]

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Annex 6: Criteria used to identify research proposals from students

Category	No	Assessment Factors	Max
Technical and Scientific Merit	1	Relevance to CABMACC research agenda/goals as stipulated in the project document. Will the project significantly contribute to the CABMACC goals?	5
	2	Does the project provide sufficient technical and scientific background to justify the problem being investigated?	5
	3	Does the project proposal have research question/clear objectives?	5
	4	Will the specific activities lead to the proposed outcomes and attainment of the objectives?	5
	5	Are the results or outcomes realistically attainable ensuring a feasible project?	5
	6	Does the project proposal have realistic work plan?	5
	7	Is the proposed methodology innovative to tackling the problem being investigated?	5
	8	Will the proposed project add value to existing body of knowledge?	5
		TOTAL	40
Financial	1	Is the budget realistic to achieve the outcomes and objectives identified?	4
	2	Will the proposed expenditure match with the expected outputs to be generated (cost effectiveness)? To what extent do the resources go directly to the research activities other than other services?	4
	3	Is the project worth investing in? Does it present value for money?	6
		TOTAL	14
Environmental and Social Safeguards	1	Has the proposed project adequately considered the possible environmental and social impacts?	6
		TOTAL	6
		GRAND TOTAL	60

Annex 7 List of students who have benefited from CABMACC Research Grants

Name of Candidate	*Level*	*Research Title*	*Research Objective*	*Research Supervisors*	*Location*	*Funds Allocated*
Jane Nanganga	Graduate Researcher	Assessing The Effects of Weather Valiability on Cattle Production: Case Study of T/A N'gabu, Chikhwawa District.	-To investigate the direct and indirect impacts of weather variability on cattle production systems and productivity in Malawi. -To identify perceived impacts of weather variability on cattle production practices and productivity. -To propose adaptation measures to identified weather variability and attendant challenges.	A.Safalaoh, PhD	Chikhwawa	MK 662,000
Providence Maliro	Under Graduate Researcher	Development and Evaluation of a Solar Parabolic Trough Power Plant	-To develop and evaluate the performance of a locally built solar parabolic trough power plant. -To determine the quality of steam from the solar steam generator. -To determine the electricity production as a function of weather conditions. -To estimate the cost of producing power using the solar parabolic trough power plant	Dr.W. Kamthunzi	LUANAR	MK1,000,000

Priscilla Sesani	Under Graduate Researcher	Development and evaluation of low-cost solar water heaters (SWH) at Bunda College Campus	-To develop and evaluate the technical and economic performance of a variety of low-cost SWHs under Malawi conditions -To determine the optimum collector inclination angle for the SWHs -To determine the effect of type of pipe, collector cover and absorber plate on the performance of low-cost SWHs. -To determine the variation in the performance characteristics of the SWHs with time of the day and time of the year. -To estimate and compare the economic performance of the SWHs based on the life cycle energy and monetary savings and the unit cost of heating water. -To estimate the carbon dioxide mitigation potential for SWHs.	Dr. W. Kamthunzi	LUANAR	MK1,000,000
Lousi Matimati	Under Graduate Researcher	The Development and Evaluation of a Windmill Water Pumping System for Small-scale Irrigation	-To evaluate the technical, economic and environmental performance of a locally-fabricated low-cost windmill water pumping system for small-scale irrigation in Malawi.	Dr. W. Kamthunzi	LUANAR	MK 500,000

			-To fabricate a low-cost windmill water pumping system for small-scale irrigation. -To evaluate the technical performance of a windmill-powered drip irrigation system. -To assess the economic viability of the windmill water pumping system for small-scale irrigation. -To estimate the carbon dioxide mitigation potential of the windmill water pumping system.			
Martha Phiri	Under Graduate Researcher	Assessing the Effectiveness of Indeginous Rainfall Prediction Indicators in Forecasting Seasonal Changes in Floods Prone Areas (A Case Study Of T/A Mabuka, Mthirammanja EPA, Mulanje District)	-To assess the effectiveness of rainfall prediction indicators in forecasting seasonal changes -To identify and document indigenous indicators used to forecast weather (rainfall pattern) -To assess if the indigenous rainfall prediction indicators increase the communities adaptive capacity towards climate change -To compare indigenous rainfall prediction indicators with meteorological data	DR BHZ Moyo	Mulanje	MK1,100,000

Stanford .J. Nkhoma	Under Graduate Researcher	Assessment of Root Architectural Traits for Drought Tolerance in Common Beans (Phaseolus vulgaris L.)	-To examine root architectural traits in adaptation to drought conditions in common bean. -To determine variation in root architectural parameters of putatively moisture tolerant and sensitive genotypes of beans. -To assess yield response of common bean genotypes under moisture stressed and non-stressed conditions. -To determine if there is a relationship between root architectural parameters and yield in putatively moisture tolerant and sensitive genotypes of common bean.	Dr. M.F.A Maliro	LUANAR	
Kephas K.Mtiyesanji Fatsani	Under Graduate Researcher	Effect of Different Biofertilizer Formulations on Growth and Yield Performance of Maize Crop	-To determine the best bio fertilizer which will improve nutrient uptake of maize plants and yield -To identify specific effective strain of nitrogen fixing bacteria that can be used for production of maize biofertilizer. -To determine the amount of accumulated biologically fixed nitrogen in maize plant	Kingdom Kwapata PhD	LUANAR	
Patrick Nthanda	Under Graduate Researcher	Analysing the Quality and	-To analyse the quantity and quality of irrigation tail waters	DR. Mc Donald Mwinjiro	Zomba	

		Quantity of Irrigation Tailwaters for Irrigation: The Case Study of Likangala Irrigation Scheme	from the Likangala Irrigation scheme for irrigation. -To measure the chemical and physical parameters of the tail waters. -Quantify the irrigation tail waters of the Likangala Irrigation Scheme. -To compare the water quality with irrigation water standards. -To assess the impact of irrigated agriculture on the quality of water. -To compare the impact of rain-fed and irrigated agriculture on the quality of water of the tail water.			

Annex 8: List of Members of Parliament that attended a short course on climate change and development

Participant's name		Sex	Constituency/Institutional Address	Mobile No.	Email
1	Naomi Kilekwa, MP	F	Mulanje South East	0888 562 195	nakilekwa@gmail.com
2	Grace Obama Chiumia, MP (Minister)	F	Nkhatabay West	0888 603 641	grace_chiumia@yahoo.com
3	Beatrice Roseby Mwale, MP	F	Kasungu North, P.O. Box 5, Nkhamenya	0993 441 087	mwale-beatrice@yahoo.com
4	Chrissy Chiphana Tembo, MP	F	Lilongwe City North	0999 423 007 0884 118 792	chiphanatembo@gmail.com
5	Rachel P. Mazombwe Zulu, MP	F	Mchinji North	0999 279 719	patiencezulu@yahoo.com
6	Bonnex Malunga, MP	M	Dedza Central East	0994 669 876	bonnexm@yahoo.com
7	Mary Connie Livuza Mpanga, MP	F	Phalombe South, P/Bag 32, Phalombe	0888 637 896 0999 317 815	mcmmpanga@gmail.com
8	Khumbizi Kandodo Chiponda, MP	F	Kasungu South East	0999 955 303	khumbie@yahoo.com
9	Peter Mazizi, MP	M	Nkhotakota Central	0999 714 842	mazizipeter1@gmail.com
10	Frank Mapondo, MP	M	Balaka South Private Bag Liwonde	0996 453 960 0888 366 039	francismapondo@gmail.com frank.mapondo@yahoo.com
11	Patricia Nangozo Kainga, MP	F	Zomba Central	0999 125 494	patsendeza@gmail.com
12	Olipa Chimangeni, MP	F	Ntchisi North East	0999 695 395	meetolipa@gmail.com
13	Annie Aisha Adams, MP	F	Mangochi Nkungulu	0999 512 221	aishamadams@gmail.com
14	Jeffrey wa Jeffrey, MP	F	Nkhotakota South	0999 349 635 0881 492 805	greizedarjeffrey@yahoo.com

15	Everson Andrew Makowa Mwale, MP	M	Nkhotakota South East P.O. Box 28, Nkhotakota	0999 243 990	emakowamwale@yahoo.com emakowamwale@gmail.com
16	Joseph Chidanti Malunga, MP	M	Nsanje South West	0881 466 535	jchidantimalunga@yahoo.com
17	Richard William Chimwendo, MP	M	Dowa East	0999 038 779	chimwendo@yahoo.com
18	Victor Hetherwick Musowa, MP	M	Mulanje Bale	0888 730 614	victormusowa@gmail.com
19	Ralph Pacharo Jooma, MP	M	Mangochi Monkeybay	0999 592 111	rjooma2014@gmail.com
20	Commodius Nyirenda, MP	M	Nkhatabay North East	0888 134 936	hon.commodious@gmail.com
21	Patricia Annie Kaliati, MP	F	Mulanje West	0999 510 681	p.kaliati@yahoo.com
22	Juliana Lunguzi, MP	F	Dedza East	0995 408 166 0888 851 115	dedzaeast@gmail.com
23	Susan Kachololа Ndalama, MP	F	Blantyre Rural East	0999 751 122	susanndalama@gmail.com
24	Patrick Zebron H Chilondola	M	Dedza North	0999 159 424	pchilondola@yahoo.com
25	Patricia Shanil Dzimbiri, MP	F	Balaka West	0881 432 893	psmuluzi@hotmail.com
26	Emily Chinthu Phiri, MP	F	Nkhatabay South	0885 629 068	emilynyaphiri@yahoo.com
27	Mary Maulidi Khembo, MP	F	Neno South	0888 994 040	tgdynamicinvest@gmail.com
28	Harold PP Chinkhondo, MP	M	Dedza West P.O. Box 14, Chimoto, Dedza	0995 927 081 0888 355 986	hchinkhondo@gmail.com
29	Esther Mcheka Chilenje, MP	F	First Deputy Speaker, Nsanje North	0999 098 833	emchekachilenje@gmail.com
30	Lilian Patel, MP	F	Mangochi South	0995 423 955	lep151@yahoo.com
31	Peter Dimba, MP	M	Lilongwe South	0999 586 622	perdimba@gmail.com

32	Patricia Omega Mkanda, MP	F	Lilongwe North	0888 328 098	Patimkanda@yahoo.co.uk
33	Deus Gumba, MP	M	Mchinji South West	0999 303 582	deusgumba71@yahoo.com
34	Daniel HS Chiwere, MP	M	Dedza Central, P.O. Box 175, Dedza	0888 855 847 0995 914 310	danchiwere@yahoo.com
35	Vitus Gomamtunda Dzoole Mwale, MP	M	Lilongwe Msozi South	0996 319 050	dzoolegomamtunda@yahoo.co.uk
36	Willard Alfred Gwengwe, MP	M	Lilongwe South East	0885 730 606 0999 296 263	gwengwesophie@gmail.com
37	Maquenda Chunga, MP	M	Mzimba South	0997 313 719	maquenda@hotmail.com
38	Dr Jessie Kabwila, MP	F	Salima North West	0998 582 445	jkkabwila@yahoo.com
39	Marth Chanjo Lunji, MP	F	Nkhotakota North East	0996 204 379	marthalunji@gmail.com
40	Mary Thom Navicha, MP	F	Thyolo Thava	0995 186 801	navichamary@yahoo.com navichamary@gmail.com
41	Timothy Gerson Solomoni, MP	M	Thyolo East P.O. Box 126, Mikolongwe	0999 000 001 0884 379 689	gtsolomoni@yahoo.com
42	Olipa Myaba Kalanda Chiluwa, MP	F	Mzimba North East	0999 279 090 0888 319 342	olipachiluba@yahoo.com
43	Deliwe Alice Ngoma Banda, MP	F	Mzuzu Luwelezi	0992 244 646	alicedngoma@gmail.com
44	Amos Thomas Mailosi, MP	M	Phalombe East P.O. Box 25, Chiringa, Phalombe	0999 267 186	mailosiat@yahoo.com

Annex 9: Assessment of Risks and Assumptions

Risks as outlined in the PD and their status as at the reporting period			
Risk	Risk Level	Mitigation Measures	Comments/Status of risk as at reporting period
Poor coordination on climate change		Directly working with relevant stakeholders, including the Department of Environmental Affairs (in Ministry of Natural Resources, Energy and Environment) and relevant stakeholders	This risk has reduced in the course of the implementation of the programme. Structures (EAD, DCCMS, NTCCC, etc) have worked effectively and the recent launch of the national climate change management policy will strengthen coordination
Malawi's deterioration of governance issues and poor relation between Government, civil society, human rights groups and donors.	Medium-high	Programme management team and University are monitoring and shall continue to monitor this situation.	The state of governance has improved through the course of implementation of the programme with notable political will and commitment to CC issues as evident from approval of policies and strategies relevant to CC management and recent ratification of the Paris Agreement.
Corruption within the programme	Low	Capacity building of finance department	The programme has components for capacity building of the finance and procurement departments and this has promoted/facilitated efficient use of programme funds and at the wider university level.

Depletion of foreign exchange revenue	High-Low	Government negotiations with IMF and donor community and resumption of ECF Reprogramming of direct budget support to sectoral budget support	There has been no resumption of direct budget support from most donors. However, there has been more donor support to government sectors through various programmes and more support has also been given to different organisations supporting livelihood and resilience enhancement programmes.
Devaluation of local currency	Medium-high	Depositing funds into an existing FDA	The mitigation measure has been effective and ensured stability of funds given massive local inflation and devaluation
Government not honouring infrastructure development commitments		Investment and endowment funds	
Staff and stakeholders' unwillingness to participate in programme activities including submitting fundable project proposals	Low	Use of stakeholder network established by ARDEP and other joint ventures that have resulted in implementation of successful projects	The mitigation measure is effective as the programme received a number of bankable projects under the competitive grants component. This risk has been sustained however with regards to emerging research areas and the carbon credits initiative.
Stakeholders demonstrating participation reticence		Encourage stakeholders to take a proactive approach to the network, and demonstrate the benefits of collaboration and synergies	Networking has promoted active stakeholder participation within the component of stakeholder capacity building. However there is still need for effective participation of the private sector.
Identifying staff with minimum qualification	Low	Use set criteria of admission	Staff were identified based on set criteria and the risk did not significantly affect the

of education to enroll for MSc and PhD			implementation of the programme under that component
Delays in procurement	Low	Reviving the procurement systems at LUANAR	The procurement system has been working effectively and capacity building of procurement staff has facilitated efficiencies in the system
Inefficiencies in grants systems	Low	Set up review committees in advance and use of guidelines with lessons from ARDEP and BCDP	This risk did not pose a significant challenge in the implementation of the programme as the mitigation measures were effective.
HIV and AIDS support	Low	Programme deliberate putting in the fore issues of HIV/AIDS management	
Communities perceiving technologies as being too complex and socially unacceptable	Low	Working with decentralised structures such as VDCs, ADCs.	The approach in technology development has been bottom-up/participatory thus making sure that technologies developed are relevant and reflective of local needs, challenges, and capacity.
Climate change skepticism	Low	National consensus on climate change impacts	This has not affected the implementation of the project and extreme events within the implementation period have enhanced the programme relevance
Global support for the programme	Low	Continued support through legal instruments as provided for by UNFCCC	This has not affected the implementation of the programme and the recent passing of the Paris Agreement and its entry into force has further reduced the risk level
Adverse impacts of climate change (both droughts and flooding)	Low		The anticipation prior to the implementation of the project was that this would not significantly affect the implementation of the programme. However, 2 back-to-back extreme events

			(2014/15 flooding and 2015/16 drought) affected the projects and the relevance of some technologies in adapting to climate change impacts
Limited expertise in Advocacy and Outreach within the university given its primary role of teaching and research	Low-Medium	Enhance internal capacity while also directly work with various civil society organizations involved in climate change	
Emerging/ New risks over the course of the reporting period			
Exchange rates between NOKr and USD	High		The programme anticipated the risk of currency devaluation only from the local currency perspective. The depreciation of the NOKr implied the programme would get funds lower than budgeted for in terms of Malawi Kwacha and US Dollar
Low power supply by ESCOM	High	Use of backup generators	Massive power cuts directly resulting from low water levels in Lake Malawi and the Shire River which has affected ESCOM's generation capacity from XX Megawatts to YY Megawatts. This has affected operations of the programme and delayed delivery of some products while the extended use of backup generators has led to an increase in overhead costs
Extreme weather conditions (2015/16 El Nino)	Medium	Conduct an El Nino study as part of the emerging research areas component as highlighted in the programme document	The 2015/16 El Nino affected most farming communities and most farming technologies, to an extent, were not effective in minimising the impacts of the El

			Nino (drought). Some of the effects of the El Nino are food shortage, Low water supply for domestic and industrial uses.
Anticipated impacts of La Nina	Medium	Conduct a La Nina impact assessment study and build on lessons from the El Nino event of the 2015/16 season and the study that was conducted in relation to the same	The La Nina in 2016/17 is expected to bring above normal rainfall and this could have impacts in the development as well as promotion of some agricultural technologies. The impacts of the La Nina could also
Delayed submission of reports and general non-compliance (to contractual terms) from projects	Medium	Constant following up by secretariat and consultation of PAC Research Sub-Committee for technical backstopping	As a result of projects' failure to submit reports timely, the project has been failing to stay up to date with what is going on in the projects. This has affected coordination and monitoring and evaluation of the projects.

Annex 10: CABMACC EXPENDITURE AGAINST BUDGET JULY 2016 TO JUNE 2017

ACTIVITY	BUDGET		EXPENDITURE			BALANCE	
	NOK	US$	MK	NOK	US$	NOK	USD $
Improving the capacity of LUANAR & Key Stakeholders							
Curriculum Review Workshop to Feed into Capacity Plan	41,500	5,000	1,469,800	16,944	2,041	24,556	2,959
Develop & Implement PHD & MSc Programmes	41,500	5,000	1,375,421	15,856	1,910	25,644	3,090
Train seven (7) Members of Teaching Staff at MSc Level	186,750	22,500	4,402,858	50,755	6,115	135,995	16,385
Train eight (8) Members of Teaching Staff at PHD Level	1,202,670	144,900	91,269,487	1,052,134	126,763	150,536	18,137
Conduct eight (8) Mentoring Sessions for Proposal Dev, Scientific Write shop	83,000	10,000	420,000	4,842	583	78,158	9,417
Train three (3) Staff Members for MBA	166,000	20,000	6,613,872	76,243	9,186	89,757	10,814
Support training of Administrative staff	54,780	6,600	3,327,000	38,353	4,621	16,427	1,979
Train Three (3) Finance Personnel in Project Management	83,000	10,000	7,420,339	85,540	10,306	(2,540)	(306)
Procure Laboratory Equipment for NRM	74,700	9,000	752,138	8,670	1,045	66,030	7,955

ACTIVITY	BUDGET		EXPENDITURE			BALANCE	
	NOK	US$	MK	NOK	US$	NOK	USD $
Develop Guidelines for Mainstreaming Gender	83,000	10,000	3,275,738	37,762	4,550	45,238	5,450
50 BSc Scholarships for Female Students	581,000	70,000	25,235,700	290,912	35,050	290,088	34,950
Refresher Courses to Upgrade Library Skills for L/Staff	16,600	2,000	540,000	6,225	750	10,375	1,250
Create Technology Transfer Nodes among Rural Communities	166,000	20,000	8,033,117	92,604	11,157	73,396	8,843
Sub Total	**2,780,500**	**335,000**	**154,135,470**	**1,776,839**	**214,077**	**1,003,661**	**120,923**
Gender Mainstreaming into Teaching & Research Programmes							
Train Primary & Secondary School Teachers on CC	124,500	15,000	5,947,511	68,562	8,260	55,938	6,740
Career Talk to Promote Science Among Girls in S/Schools	178,450	21,500	2,250,000	25,938	3,125	152,513	18,375
Conduct Short Courses in Gender & CC	166,000	20,000	14,152,238	163,144	19,656	2,856	344
Sub Total	**468,950**	**56,500**	**22,349,749**	**257,643**	**31,041**	**211,307**	**25,459**
HIV/AIDS Issues Mainstreamed into Teaching & Research							
Develop a Guidebook on HIV/AIDS	124,500	15,000	6,981,358	80,480	9,696	44,020	5,304

ACTIVITY	BUDGET		EXPENDITURE			BALANCE	
	NOK	US$	MK	NOK	US$	NOK	USD $
Support Voluntary & Counselling & Testing VCT at BHC	77,813	9,375	3,133,000	36,117	4,351	41,696	5,024
Develop Guidelines for Mainstreaming HIV in Teaching, Research	41,500	5,000	896,250	10,332	1,245	31,168	3,755
Establish an HIV/AIDS Social Learning Forum	41,500	5,000	1,825,000	21,038	2,535	20,462	2,465
Sub Total	**285,313**	**34,375**	**12,835,608**	**147,966**	**17,827**	**137,346**	**16,548**
Improved Information Access, Documentation & ICT Services							
Update Library Software	93,375	11,250	5,105,037	58,850	7,090	34,525	4,160
Maintain Internet Connection	597,600	72,000	37,081,423	427,466	51,502	170,134	20,498
Procure Library Books & Subscribe E - Journals	155,625	18,750	7,951,144	91,659	11,043	63,966	7,707
Establish & Maintain E - Learning Systems	93,375	11,250	4,097,421	47,234	5,691	46,141	5,559
Publish Resource Textbooks	93,375	11,250	7,464,528	86,049	10,367	7,326	883
Produce University Journal on Agriculture & Environment	62,250	7,500	1,350,000	15,563	1,875	46,688	5,625
Sub Total	**1,095,600**	**132,000**	**63,049,552**	**726,821**	**87,569**	**368,779**	**44,431**

ACTIVITY	BUDGET		EXPENDITURE			BALANCE	
	NOK	US$	MK	NOK	US$	NOK	USD $
Innovative Research & Technology Development in CC Adaptation							
Establish 6 Competitive Grants to Address Knowledge Gabs	2,158,000	260,000	163,163,467	1,880,912	226,616	277,088	33,384
Implement 4 Research Projects on CC led by UMB	1,992,000	240,000	93,307,456	1,075,628	129,594	916,372	110,406
Promote Efficient & Effective Renewable Technology	207,500	25,000	4,933,350	56,871	6,852	150,629	18,148
Sub Total	**4,357,500**	**525,000**	**261,404,273**	**3,013,410**	**363,061**	**1,344,090**	**161,939**
Commissioned Research							
Other Research Areas	207,500	25,000	16,533,958	190,600	22,964	16,900	2,036
Sub Total	**207,500**	**25,000**	**16,533,958**	**190,600**	**22,964**	**16,900**	**2,036**
Post Graduate Research Grants							
Develop New Technologies & Systems for Enhanced CC	466,875	56,250	15,091,743	173,974	20,961	292,901	35,289
Training on Promotion of Conservation of Indigenous Crops	124,500	15,000	2,703,134	31,161	3,754	93,339	11,246
Sub Total	**591,375**	**71,250**	**17,794,877**	**205,135**	**24,715**	**386,240**	**46,535**

ACTIVITY	BUDGET		EXPENDITURE			BALANCE	
	NOK	US$	MK	NOK	US$	NOK	USD $
Capacity of key Stakeholders Enhanced for CC Adaptation							
Develop, produce & distribute IEC Materials	83,000	10,000	4,526,258	52,178	6,286	30,822	3,714
Conduct Short courses for Policy Makers on CC	166,000	20,000	16,556,422	190,859	22,995	(24,859)	(2,995)
Hold Dissemination Conference	124,500	15,000	1,230,000	14,179	1,708	110,321	13,292
Develop Policy Briefs	83,000	10,000	-	-	-	83,000	10,000
Produce Bi-annual Newsletters	37,350	4,500	-	-	-	37,350	4,500
Disseminate the Programmes & Research Findings	166,000	20,000	14,701,647	169,477	20,419	(3,477)	(419)
Develop Knowledge Management Systems for Policy Processes	93,375	11,250	6,191,286	71,372	8,599	22,003	2,651
Training Lead Farmers on CC Issues	199,200	24,000	10,069,450	116,078	13,985	83,122	10,015
Establish CABMACC Website	124,500	15,000	360,000	4,150	500	120,350	14,500
Sub Total	**1,076,925**	**129,750**	**53,635,062**	**618,293**	**74,493**	**458,632**	**55,257**
Programme Monitoring & Evaluation							
Mid-Term, End of Programme Evaluation & Annual Surveys	-	-		-	-	-	-

ACTIVITY	BUDGET		EXPENDITURE			BALANCE	
	NOK	US$	MK	NOK	US$	NOK	USD $
Develop M& E System & Conduct Regular Technical & Financial	539,500	65,000	30,805,094	355,114	42,785	184,386	22,215
Sub Total	**539,500**	**65,000**	**30,805,094**	**355,114**	**42,785**	**184,386**	**22,215**
Programme Implementation & Coordination							
Hold Annual Programme Meetings	41,500	5,000	731,500	8,433	1,016	33,067	3,984
Hold Programme Advisory Committee Meetings	175,296	21,120	12,883,597	148,519	17,894	26,777	3,226
Establish Coordination & Networking	249,000	30,000	27,502,034	317,037	38,197	(68,037)	(8,197)
Support Conferences & Meetings	91,300	11,000	6,761,742	77,948	9,391	13,352	1,609
Support Travel Costs, DSA, Per Diems & Lubricants	124,500	15,000	8,214,572	94,696	11,409	29,804	3,591
Support Communication	83,000	10,000	4,143,490	47,765	5,755	35,235	4,245
Vehicle Maintenance & Insurance	106,240	12,800	8,854,143	102,069	12,297	4,171	503
Maintain Equipment & Genset	63,495	7,650	3,915,467	45,137	5,438	18,358	2,212
Stationery & Office Supplies	74,078	8,925	3,352,314	38,645	4,656	35,433	4,269
Sundries & Bank Charges	49,800	6,000	4,091,276	47,163	5,682	2,637	318
Utilities	62,250	7,500	-	-	-	62,250	7,500
Audit Fees (Costs)	74,700	9,000	6,647,700	76,633	9,233	(1,933)	(233)
Salaries and Wages	811,740	97,800	45,154,080	520,526	62,714	291,214	35,086
Benefits & Gratuities	286,350	34,500	19,644,114	226,453	27,283	59,897	7,217

ACTIVITY	BUDGET		EXPENDITURE			BALANCE	
	NOK	US$	MK	NOK	US$	NOK	USD $
Administrative Overhead Costs	166,000	20,000	14,216,344	163,883	19,745	2,117	255
Norwegian Partners Coordination Costs	415,000	50,000	634,378	7,313	881	407,687	49,119
Sub Total	**2,874,249**	**346,295**	**166,746,751**	**1,922,219**	**231,593**	**952,029**	**114,702**
GRAND TOTAL	**14,277,411**	**1,720,170**	**799,290,392**	**9,214,042**	**1,110,126**	**5,063,369**	**610,044**
EQUIVALENT MK	**1,247,123,250**	**1,238,522,400**	**799,290,392**	**804,841,020**	**799,290,392**	**3,645,625,664**	**439,232,008**

The Average Conversional Rates of MK720 to US$ and NOK8.3/US$1 have been used to convert expenditures for July 2016 to June 2017

NOTES

1. The Exchange gain is due to the depreciation of Malawi Kwacha against American Dollar US$
2. The Financial year of July 2016 to June 2017 had a budget of NOK14,277,411 (US$1.720 million) equivalent of MK1.2billion at a rate of MK720/US$ and US$1.3 million was available for the reporting period and US$1.1million has been spent representing 65% of the budget and 85% of funds available
3. The vote for training of policy makers is overdrawn by US$2,995 because of the demand by Members of Parliaments to be trained in Climate Change hence the programme supported 44 Members of Parliaments against the 30 Members of Parliaments budgeted for. The shortfall was agreed to be covered from Development of policy brief vote under same output.
4. The vote for Coordination and Networking has been overdrawn by US$8,197 because the programme supported pre activities of African Centre for Excellence - Aqua fish project financed by World Bank. The programme is worthy $6 Million for 4 years implementation and its agreement has been signed. The deficit under this vote has been recovered from the savings from utilities vote within the same output namely Programme Management.