

## ON-GOING RESEARCH PROJECTS

1	Enhancing the Potential for Community Participation in Sustainable Management of Chyulu Water Catchment in Southern Kenya.	Dr. Samuel Kimani Kiumbuki	Dr. Jane Wanza Mutinda	April 2018	March 2019
2	Enhancing Innovative Institutions to Climate Change in Kenya	Dr. Mather Ngigi	Prof. Charles Ombuki	April 2018	March 2019
3	A Practical Mentorship Model for Raising Learning Outcomes Among Academically Low Achieving Students in Machakos University	Prof. James M. Muola,	Dr. Wycliffe Amukowa Dr. David Mulwa  Dr. Peter Kimiti	April 2018	March 2019
4.	Socio-Economic Factors Influencing Optimum Maize Productivity in Kenya: A Case of Selected Counties (Kisii, Transnzoia, Bungoma& Machakos	Evans Geoffrey Mogeni		April 2018	March 2019
5.	The Impact of Research Infrastructure on the Quality of Research in Selected Kenyan Universities	Dr. Geoffrey M.Maroko	Dr. Sophia Njeru Dr. Larry Ndivo	April 2018	March 2019
6	Hybrid Renewable Energy Production Digesters	Dr. David Wafula Wekesa		April 2018	March 2019
7	GraphenatedPolypyrrole Nanocomposite for Real Time Determination of Highly Carcinogenic Hydrazine in Water	Dr. Stephen Nzioki Mailu		April 2018	March 2019
8	Solar water Desalination in a Vacuum of Infinite Volume	Ng'ang'a Benson Wang'ombe		April 2018	March 2019

NO	NAME OF PROJECT	PRINCIPAL INVESTIGATOR AND INSTITUTION OF AFFILIATION	PARTNERS AND INSTITUTIONS OF AFFILIATION	START DATE	END DATE
1.	A situational analysis of intervention measures in management of HIV and Aids Prevalence in Kisii County	Dr. Geoffrey Maroko, MKSU	Dr Gladys Mookia - KU Dr Meshack Onyambu – KU Dr Augustine Nyakudi – PAC	2017	2020
2	Development of small wind-solar hybrid system for electrification of rural households in Kenya	Dr. Joseph N. Kamau, JKUAT	Dr. David W. Wekesa, MU. Dr. Joseph K. Gathua, KU Dr. Churchill O. Saoko, JKUAT	2017	2020
3.	Climate Smart water harvesting & conservation technologies for improved food security in selected parts of kitui county	Dr. Charles Ndungu, SEKU	Dr. Patricia Muendo, MksU Dr. Monica Mucheru, KU	2017	2020

## HIGHLIGHTS OF ON-GOING RESEARCH PROJECTS

**BENSON WANGOMBE NGANGA**

### *Solar Water Desalination in a Vacuum of Infinite Volume*



Presence of fluoride in drinking water sources is a global concern as it causes dental and skeletal fluorosis. This leads to health complications, because the bones of the victims are weakened and results to disability. Furthermore, it affects children personality, especially when their teeth are attacked and tan; smile is beauty. The most common water desalination method is reverse osmosis but it is an expensive undertaking in terms of electric power bills and it is also not accessible to the poor. Places like Kitui, Njoro, Naivasha, Turkana and Baringo, dental and skeletal fluorosis is real. Coincidentally or fortunately, these areas enjoy massive solar energy which can be harnessed to desalinate water sources. A research is currently underway in Machakos University, to apply solar thermal energy to pre-heat water before it is sent into a vacuum created and based on the principle of barometric height. This is illustrated in the figure. Here, reduction in pressure, cause water to flash or in a more common word, boil, at temperatures below room temperature. Condensing water is then trapped and channeled for drinking purposes. The volume of the vacuum is made infinitely large to counteract negative effects of the non condensable gases, as they can lead to its rapid depletion. A degassing unit will also be installed to remove these gases before they enter the vacuum.

**EVANS MOGENI**



### *An Investigation of Factors Influencing Maize Productivity In Kenya: A Case of Selected counties (Transzoia & Machakos)*

The purpose for this study was to investigate input-production factors for realization of optimum productivity of maize in Trans-nzoia and Machakos counties. The study adopted descriptive survey design which was used to obtain information to describe the existing phenomena. The target population was farmers in the two counties. The examining system utilized was the multistage stratified arbitrary inspecting strategy. Data collection was done through the use of questionnaire, focus group discussion and interview schedule. The study found that maize productivity is affected positively by the land of size, amount of seed planted, amount of fertilizer used and amount of pesticide used.

The study revealed that amount of manure and human labour used were statistically insignificant hence they can be excluded in the model. The study also found that credit accessing Machakos County had positive influence on maize productivity and was significant at 5% level. The results indicated that a unit increase in the access to credit maize productivity by 13.046 units. The other variables that had positive significant influence on maize productivity include farming experience, extension services, group membership, education level of the farmer, size of the family and household income. This study concludes that the government should ensure that the farmers get farm inputs in time and at good price in order to enable them produce more crops. This will grow the economy and therefore address the issue of unemployment. On addition the government should put more money on the sector of agriculture to ensure there is an easy working channel by the farmers to improve maize production and also consider to revise the Land tenure system.



**PROF. JAMES MUOLA (PRINCIPAL INVESTIGATOR)**

***Practical Mentorship Model for Raising Learning Outcomes among Academically Low Achieving Students in Machakos University***

*Researchers: 1) Prof. James M. Muola, (Principal investigator), 2) Dr. Wycliffe Amukowa (Co-Principal Researcher), 3) Dr. David Mulwa (Researcher) and 4) Dr. Peter Kimiti (Researcher)*

This research project was motivated by the fact that the academic performance of university students has been deteriorating despite the existence of student mentorship programmes that do not seem to be effective. According to the Audit Report of 2017 by the Commission for University Education (CUE), more than 30% of students were having issues with respect to their academic performance. Some of the areas of concern were; missing marks, high failure rates and too many examination disciplinary cases.

A team of researchers from the School of Education attempted to address this problem through a research project focusing on the development of a model on academic mentorship to establish whether after subjecting low achieving students to a rigorous mentorship process can improve their performance and minimize the failure rate. It was hypothesized that a well-structured and modelled academic mentorship programme will result into improved academic performance and progression rates among academically at risk students and enhanced mentorship competences of faculty academic staff. So far, the baseline survey findings show that students have a fairly positive perception towards academic mentorship and that there is need for mentorship to address issues

related academic orientation, examination preparation, development of a good study schedule/habits, maintaining high grades, setting academic and career goals among other areas.

**DR. DAVID WAFULAWEKESA**



***Development of Hybrid Renewable Energy Production Digesters in Machakos County***

The proposed research main objective is to design hybrid energy production digesters for sustainable energy supply in Machakos University and its surrounding community. This main project will be achieved through the following specific activities:

1. To perform load assessment of electricity demand for domestic and commercial use in Machakos University and its environs.
2. To assess Biomass and Solar thermal energy resource potential in Machakos County.
3. To fabricate and design small Solar-Biomass hybrid renewable production digester prototypes for available renewable energy resources.
4. To compare the operations of the hybrid digester prototypes with different bio-wastes to obtain the optimal production for use.

Objectives 3 and 4 are to be carried out simultaneously up to the end in March 2019. The project is has incorporated a Masters student (MSc. Energy Technology) from the Institute of Energy and Environmental Technology (IEET), JKUAT. The student is helping in the collection of data for objectives 1 and 2. He is expected to graduate by June 2019. The equipment and asset acquired so far in the implementation of the research project includes solar power pack, revolution counter, digester unit system, Tesla meter, bar foot solar lamps and generator coils.

**DR GEOFFREY MAROKO**



***The Impact of Research Infrastructure on the Quality of Postgraduate Research Outputs in Selected Kenyan Universities***

The grant awarded by Machakos University for the project was Kenya Shillings four hundred thousand. The Principal Investigator in the project is Dr Geoffrey Maroko from the Department of Linguistics and Languages. Partners in the

project are Dr Sophia Njeru and Dr Larry Ndivo from the Department of Fashion Design and Marketing and Linguistics and Languages respectively. The specific objectives of the project are to: evaluate the postgraduate research support infrastructure in selected Kenyan Universities; assess how the research infrastructure impact the quality of research training; evaluate the quality of postgraduate research outputs in the universities. The project is on-going.

#### **MR. SAMUEL KIMANI KIUMBUKU**



*Enhancing Community Participation in Sustainable Management of Chyulu Water Catchment in Southern Kenya. Principle Investigator: Samuel Kimani Kiumbuku School of Environment and Natural Resource Management*

The research project is being done to enhance community participation of Chyulu water catchment with specific focus of determining utilization of Chyulu catchment resources by local communities, environmental impacts of human activities on the catchment; current institutional arrangement for community participation in the management of the catchment; and to identify the gaps if any in community participation in the management of the catchment. Despite being one of the most important dryland catchments in Kenya, Chyulu catchment has been largely degraded by inappropriate anthropogenic commercial and livelihood activities that include logging, farming, charcoal burning, and livestock incursions. Its management has also been characterized by conflicts between conservation agencies and local communities concerning access and utilization of resources.

After part of the catchment was gazetted as a national park, government conservation agencies have been working to completely keep community members out of the protected area. However this has lead to prolonged confrontations with the communities whose livelihoods have depended on the catchment for decades. From the preliminary results of this project it was established that illegal encroachment into the catchment is still rampant and that these management efforts have not deterred further degradation. For purposes of sustainability in management of the catchment the project seeks to enhance co-management involving local communities and other stakeholders in order to establish consensus and a trade-off between conservation and community livelihood needs.

## PROF. GEOFFREY MAROKO

### Kisii County HIV/AIDS Project



A multi-institutional and multidisciplinary research project which was funded Kenya Shillings ten million by the National Research Fund is on-going at Kisii County. The Principal Investigator, Prof. Geoffrey Maroko, is in collaboration with Dr Gladys Mokuia and Dr Meshack Onyambu of Kenyatta University and Dr Augustus Nyakundi of Pan African Christian University. The team

seeks to evaluate interventions aimed at reducing new HIV infections in Kisii County; assess interventions at improving health outcomes and wellness of people living with HIV; evaluate the interventions on the Human Rights Approach in facilitating access to services for PLHIV; and assess interventions at strengthening integration and/or coordination of community and healthcare systems.



*Prof. Geoffrey Maroko (with notebook), Dr Gladys Mokuia (left) and Dr Augustus Nyakundi (back) pose for a photo with HTS and PSC staff at the Kisii Prison HIV/Aids Clinic after a focus group interview.*

The project also seeks to determine the role of alternative and complementary medicine in the management of HIV & Aids in the County; identify interventions that strengthen research, innovation and information management for HIV mitigation; and to propose interventions at improving uptake of strategic research information, monitoring and evaluation to inform HIV control programming. Expected outputs of the project will involve policy engagement with communities of practice in the fight against HIV/Aids in Kisii County including the County Government, National Aids Control Council (NACC) and NGOs. The project also seeks to mainstream complementary/alternative medicine

HIV/Aids-related opportunistic infections. Other outputs include conference presentations, capacity building activities and publications.

#### DR. PATRICIA N. MUENDO



**Dr. Muendo** is part of a Multi-disciplinary collaborative research between Machakos University, South Eastern Kenya University and Kenyatta University. The project was awarded a grant of Kshs. 16 million funded by the National Research Fund (NRF) in the 2016/2017 financial year. It focusses on adoption of Climate smart rainwater harvesting technologies for improved food security in Kitui County.

#### DR. DAVID WAFULAWEKESA (PH.D.)



**Dr. Wekesa** is part of a multi-disciplinary team that got National Research Fund (NRF) grant for the year 2016/2017 (Multidisciplinary Research Grant: Kshs. Ksh.18, 475,000), Kenya. Research Project title: *Development of Small Wind-Solar Hybrid System for Electrification of Rural Households in Kenya.*

**Role:** Project coordinator for developing Numerical models for small Wind-Solar Hybrid system and perform Computational Fluid Dynamics (CFD) Simulations.  
**Collaborators:** Prof. Joseph Kamau (JKUAT); Dr. Joseph Gathua (KU); Dr. Churchill Saoke (JKUAT)