

UNIVERSITY OF ZIMBABWE



**RESEARCH**  
*for*  
**ZIMBABWE AGENDA FOR SUSTAINABLE  
SOCIO-ECONOMIC TRANSFORMATION  
(ZIM ASSET)**

*Knowledge ❖ Diligence ❖ Integrity*

**RESEARCH AND INTELLECTUAL EXPO 2014**

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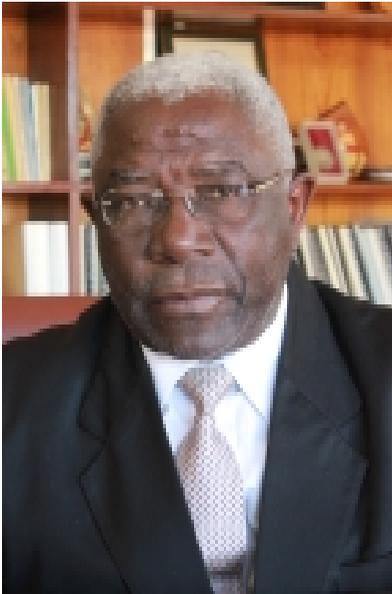
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# FROM THE VICE CHANCELLOR

Welcome to the University of Zimbabwe (UZ) 2014 Research and Intellectual Expo (RIE) Exhibition stand.



This year, the UZ stand is organized around the **Zimbabwe Agenda for Sustainable Socio-Economic Transformation (Zim Asset)** and the 2014 RIE theme: **Engagement, Innovation and Diversity for National Transformation and Development**. Zim Asset is the Government of Zimbabwe's policy blueprint for national transformation and development for the 2014-2018 period. From the two broad frameworks, the UZ Exhibition theme is **"It is the Innovative Knowledge Workers that Count"**.

The pronouncement by Government on Zim Asset left the institution with no option but to rally behind the blueprint. To this end, our research has been deliberately organized around the four Zim Asset sectors, namely; **Social Services and Poverty Eradication, Food Security and Nutrition, Infrastructure and**

**Utilities and Beneficiation and Value Addition**. In reviewing the UZ research on exhibit, it is clear that the institution is in the right direction as there is adequate representation from all four sectors of Zim Asset. The UZ research has sufficient diversity and the innovative knowledge workers remain engaged with communities and targets of Zim Asset. Important to note is the intensity of investigations on indigenous knowledge systems and issues of beneficiation and value addition around agriculture. The focus on indigenous knowledge systems, beneficiation and value addition are highlighted in Zim Asset as critical in moving this country forward. In addition, academics in the Faculties of Science and the College of Health Sciences are involved in research at the frontiers of knowledge and innovation that match international standards anywhere in the world.

The commitment of the researchers exhibiting this year, that I refer to as **"innovative knowledge workers"**, is unquestionable. This research has taken place despite limited funding. Academics have largely relied on their own ingenuity to

search for funding, form research groups and collaborate across disciplines to compete with the best in the world. Going forward, the UZ is committed to fund the institutional research agenda that is centred on Zim Asset and hope other parties can come on board to support these innovative knowledge workers.

## The Chancellery Pick

The research under this theme consists of a selection of “**quick wins**” and **high impact** research on national transformation and development across all four sectors. The research ranges from those ready for commercialization to implementation at a large scale and those that directly respond to challenges the country is currently experiencing. It is my belief that with sufficient support, our research has the capacity to have significant impact on national transformation and development targets in Zim Asset.

Finally, I would like to thank the UZ innovative knowledge workers who volunteered to represent the UZ at this year’s Expo. Their presence at the Expo is not only a benefit to them, but to the institution and the entire nation. It takes great courage to share with others your knowledge and intellect. To the Government of Zimbabwe, we are grateful for providing the environment that enables these innovative knowledge workers to flourish despite the difficult socio-economic environment. Lastly, but not least, to our partners in both the private and public sectors, international organizations that have provided funding in health and other research areas, and friends of the University that have supported us during hard times, your support is greatly appreciated by staff, students and myself as the head of this great institution.

***Enjoy your visit at the UZ Stand***

# 1. SOCIAL SERVICES AND POVERTY ERADICATION



# A. EDUCATION

## TITLE OF PROJECT

*The NatiV Project*

## RESEARCHERS/TEAM MEMBERS

I.N. Mutamiri; G Brooking

## PROJECT DESCRIPTION

NatiV is an Android application under development for e-learning infrastructure that will teach children how to read Shona. NatiV aims at improving a child's syllable-to-sound (letter-to-sound) association. It implements simple, core Android application development concepts, with a UI and gestures that are child-friendly. A new TTS voice is being created for NatiV, in the Shona language spoken in Zimbabwe. NatiV is also being made with special consideration to dyslectic children.

## CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES-EDUCATION

Education is the foundation for wealth creation. We are aiming at meeting the documented EDUCATION growth targets for Zim Asset (2014 to 2018). This project (especially the local language Text-To-Speech technology research) is a potential heavy contributor to the sector key result area "ICT Research and Development" of Zim Asset.

## TITLE OF PROJECT

*Zimbabwe Primary School English Literacy Norms Project*

## RESEARCHERS/TEAM MEMBERS

C. Dyanda, N. Takaendesa

## PROJECT DESCRIPTION

The Zimbabwe Primary School English Literacy Norms Project seeks to improve the teaching and learning of English in Zimbabwe primary schools to improve overall academic achievement through the development of effective English literacy competences. The project involves primary school pupils, teachers and parents. The English language is important because

it is the medium of instruction from primary school upwards. It is the key to effective curricular access at all levels. The project showcases common sources of supporting language structures, reading and writing errors among primary school pupils.

### **CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — EDUCATION**

Basic education is the foundation of literacy. Good foundation in literacy is acquired through English medium of instruction, which is a second language to the majority of Zimbabwe children. Primary school graduates who have effective English language skills have better chances in the informal and formal sectors of the economy and academic success in secondary education.

### **TITLE OF PROJECT**

*Family Planning Saves the Lives of Mothers and Children and Promotes Economic Development*

### **RESEARCHERS/TEAM MEMBERS**

M. M. Mhloyi, N. N. Wekwete and S. Moyo

### **PROJECT DESCRIPTION**

The project involves use of 'Impact NOW,' an excel-based model that estimates the health and economic impact of Family Planning and how it promotes economic development. It demonstrates how family planning: (i) Impacts on maternal and child mortality, showing the number of maternal and child deaths averted, thereby saving the lives of women and children; and (ii) saves money which is then channeled to other areas of development, in order to meet the Millennium Development Goals (MDGs).

### **CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — EDUCATION**

The project will contribute to Zim Asset under the Theme Social Services and Poverty Eradication. The implementation of Impact Now prevents unnecessary maternal and child deaths by using family planning; thereby benefiting, not only the community, but also the country at large. The money saved through the deaths averted can then be channeled to other areas, such as education and poverty eradication. This would subsequently help in promoting socio-economic development.

**TITLE OF PROJECT**

*Invoking the Past for Innovation and National Development*

**RESEARCHERS/TEAM MEMBERS**

S. Katsamudanga, A. Nhamo, P. Nyabezi, G. Chikumbirike, G Pwiti, R. Kapumha

**PROJECT DESCRIPTION**

The project is about utilising archaeological and cultural heritage for social and economic development. Archaeological and cultural heritage places are major world tourist attractions, contributing significantly in tourism earnings and in poverty reduction. At the same time, they are sources of inspiration for innovation and developmental projects. Zimbabwe is well endowed with thousands of archaeological sites that have the potential of being major tourist attractions. Unfortunately, the tourism sector has limited knowledge of the archaeology of the country and finds it difficult to present and interpret these resources.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES: INDIGENOUS KNOWLEDGE SYSTEMS**

Value Addition and Beneficiation through human capacity building and development, domestic tourism development and promotion, tourism research and information management

**TITLE OF PROJECT:**

*Embracing Assistive Technologies for Users with Special Needs. Social Services and Poverty Eradication.*

**RESEARCHERS/TEAM MEMBERS**

A Chikonzo, Y. Chimuka, J Munyoro and J.D Phiri

**PROJECT DESCRIPTION**

The University of Zimbabwe (UZ) Libraries through a partnership with Commercial Bank of Zimbabwe (CBZ) Holdings have mobilised state of the art Information Communication Technology (ICTs) tools for users with Special Needs. These tools are accessible from the Main Library and Disability Resource Centre (DRC) Library. The available assistive tools are meant for users with low vision and the blind. The introduction of these assistive tools is not an end in itself but a means for the library to continuously

probe ways of empowering users with special needs in the ever-changing digital environment.

### **CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — EDUCATION**

The thrust of the Social Services and Poverty Eradication Cluster is to improve the living standards of the citizenry for an empowered society and growing economy. Integration of people with disabilities in community development has been identified as critical for national economic progress. The University of Zimbabwe Library has embraced Information and Communication Technologies (ICTs) and is empowering persons with special needs to independently access information and knowledge. This is of vital importance in ensuring that people with special needs are able to participate as creative and productive members of the society.

### **TITLE OF PROJECT**

*Innovative Solutions for Behavioral Research on Humans and Animals*

### **RESEARCHERS/TEAM MEMBERS**

G. Javangwe, M C Matika, RB Bundy, S Bundy, S Mhizha, T Muromo and M. Paradza

### **PROJECT DESCRIPTION**

The current exhibit showcases the laboratory equipment and software packages that can be used to fully integrate observation into human development, including training and support for diverse settings, ranging from developmental psychology, cognitive psychology, consumer behaviour, workforce production behaviour and eye tracking. The aim is to demonstrate how we can translate research questions into practical and proven solutions and services. This laboratory provides a cutting edge platform for training in video based behavioural research solutions and technologies.

### **CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — EDUCATION**

It contributes to Zim Asset by providing evidence-based solutions to persistent questions and problems on human behavior to help nurture a productive and health citizenry.

**TITLE OF PROJECT**

*Taboos and Proverbs as Methodology for Unearthing African 'Science'*

**RESEARCHERS/TEAM MEMBERS**

W.Z. Sadomba, A. Wakandigara, A. Nhamo

**PROJECT DESCRIPTION:**

This research explores a new methodology for researching science and technology as practiced by indigenous Africans. Currently there is no methodology for retrieving scientific knowledge archives of non-literate societies as indigenous Zimbabweans, yet in some fields current science is inferior. The methodology demonstrates retrieval of their knowledge in chemistry, genetics, and metallurgy.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES-EDUCATION.****TITLE OF PROJECT**

*Realizing the Full Potential of Indigenous Languages as Resources for Socio-Economic Development*

**RESEARCHERS/TEAM MEMBERS**

E. Chabata; T.L. Gopo; Z. Mamvura; T. Gwekwerere

**PROJECT DESCRIPTION**

In any country the diversity of languages brings with it broad bases of potential for wealth and development — or problems if not managed well. The Project Describes Zimbabwean indigenous languages and cultures in line with the quest for self-definition, effective communication and cultural expression in diversity. It also endeavors to document and strengthen Zimbabwean indigenous languages with a view to raising their status.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — EDUCATION**

This project contributes towards the fruition of the goals and objectives of Zim Asset through three basic ways. First and foremost, the project underscores the importance of self-definition through the linguistic and cultural prism. Self-definition entails self-consciousness. It enables groups to conceive and pursue agendas of their own without having to pay homage to outsiders. This is the first and indispensable right for a free and

sovereign people. Secondly, the project emphasizes the importance of African languages in the achievement of Zim Asset priorities through effective communication. The realization here is that in a lot of cases, critical knowledge is lost and opportunities are given away because of their packaging in languages that indigenous economic players cannot decipher.

### **TITLE OF PROJECT**

***Children in Cultural Context: University of Zimbabwe Centre of Child Development and Research***

### **RESEARCHERS/TEAM MEMBERS**

J. Tafirenyika, M. Dozva, S. Mhizha, N. Mushowe, A Mamvuto

### **PROJECT DESCRIPTION**

The exhibit is a demonstration on the practical use of child study equipment in data collection and analysis. Feeding-time infant-caregiver interactions, toddlers' and preschoolers' interactions during play were captured. Data sets showing social competences are exhibited.

### **CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — EDUCATION**

To promote best practice in childcare, positive child growth and development for the production of future human resources for the national economy

### **TITLE OF PROJECT**

***Signification of Cultural/Religious Garb, Symbols, Vessels/Instruments and Artifacts***

### **RESEARCHERS/TEAM MEMBERS**

F Mabiri, A Chiwara, M Moyo

### **PROJECT DESCRIPTION**

The displays will comprise religious artifacts like musical instruments, regalia, as well as a display of ancient economic systems, visa-viz the manufacture of ancient coinage and its reception in the contemporary economic systems.

## CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — EDUCATION

The immediate financial benefits of this presentation are not prioritized here, as is the case with many disciplines of a humanitarian nature. However, participants stand to gain a lot in terms of appreciating the prevalence of certain dressing trends in various religious communities, to which a huge percentage of people subscribe. The invaluable Courtauld collection of coins stands a great chance of doing well in a museum setup, to which end many universities have set up miniature museums of Classical and religious material. Some of the coins in the collection are extremely rare, which should make Zimbabwe a major stopover destination for academics and connoisseurs of art. The project will also emphasise tapping indigenous knowledge systems through research. Character formation (Human wealth) linked with Humanities, and an enhancement of the department and faculty's visibility.

### TITLE OF PROJECT

*Literature, Film and Productive Partnerships in Service Provision and Poverty Eradication*

### RESEARCHERS/TEAM MEMBERS

P. Mateveke, R. Chikafa, S. Mandizvidza, A. Mupondi, E Mhlanga, B Yombayomba

### PROJECT DESCRIPTION

Literature and film have fundamental roles to play in the realization of the Zim Asset and the eventual development of the country that is indexed to this blueprint. This project seeks to create an awareness of the centrality of literature and film in narrating and capturing the country's history and in determining present efforts at development. Beyond that, it also shows how products of literature and film can help in service provision and poverty alleviation in the country. Working with various partners, we seek to capture images and narratives of the past and present for the reconstruction of the state along the lines of black empowerment. We also use our products to help in imagining and concretizing ideas of the Zimbabwe that every citizen would want.

## CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — EDUCATION

As a department, we fit well into the Zim Asset section called: 'Social services and poverty eradication.' This ties up with the department's thrust

towards using literature and film in partnerships that lead to production. These include but are not limited to film organisations, telecommunication organisations, writers' organisations and publishers. The items we are going to exhibit create knowledge within the community.

## B. HEALTH

### TITLE OF PROJECT

***Strengthening Health Systems: The Medical Education Partnership Initiative Zimbabwe (MEPI).***

### RESEARCHERS/TEAM MEMBERS

J Hakim, J Matenga, S Nhiwatiwa University of Zimbabwe College of Health Sciences, Harare, Zimbabwe; T Campbell (University of Colorado, Denver), M Barry (Stanford University), F Cowan ( University College, London) and M. Abas (King's College, London)

### PROJECT DESCRIPTION

The University of Zimbabwe College of Health Sciences (UZCHS) is one of the 13 Sub-saharan African medical schools that received funding from National Institutes of Health (NIH) and PEPFAR in 2010 for the purposes of developing or expanding and enhancing models of medical education. These models are intended to support the goals of increasing the number of new health workers trained, strengthen medical education systems and build clinical and research capacity in Zimbabwe.

### CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES-HEALTH

This project contributes to Zim Asset through capacity building of health workers in professional development and research. The goal is to strengthen health systems through enhanced medical education that will create a healthy and active nation capable of increasing productivity leading to income growth and ultimately reduced poverty.

### TITLE OF PROJECT

***Mitigating the Impacts of HIV and AIDS***

### RESEARCHERS/TEAM MEMBERS:

R Chineka, A Madzudzo, P C Mujati and W. Chidembo.

## PROJECT DESCRIPTION

In the wake of increased environmental and sustainability challenges, universities have been challenged to take stock of society's needs and take leadership in curriculum development. Universities as knowledge generators are obliged to enable the provision of quality and relevant education that is responsive to the students' needs and animates people for positive social transformation. This project, located at Parirewa High School thus seeks to enhance teachers' capacities to effectively integrate HIV and AIDS education in the secondary school curriculum in a bid to reduce its negative impacts on the quality of education and, hence quality of life of youths living in contexts of risky and vulnerability related to HIV and AIDS.

## CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH

There are arguments to suggest that the country cannot achieve sustainable development if HIV and AIDS are not curbed. The project seeks to reduce infections, fight stigma and discrimination and, to produce health minds for wealth creation. A healthy nation is a wealthy nation.

## TITLE OF PROJECT

***Serological Survey of Brucella canis in Dogs in Urban Harare and Selected Rural Communities in Zimbabwe.***

## RESEARCHERS/TEAM MEMBERS

D.M Pfukenyi, G. Matope, and S. Dhliwayo.

## PROJECT DESCRIPTION

A cross-sectional study was conducted in order to detect antibodies for *Brucella canis* (*B. canis*) in dogs from urban Harare and five selected rural communities in Zimbabwe. Sera from randomly selected dogs were tested for antibodies to *B. canis* using an enzyme-linked immunosorbent assay. Overall, 17.6% of sera samples tested (57/324, 95% CI: 13.5–21.7) were positive for *B. canis* antibodies. For rural dogs, seroprevalence varied from 11.7%–37.9%. Rural dogs recorded a higher seroprevalence (20.7%, 95% CI: 15.0–26.4) compared with Harare urban dogs (12.7%, 95% CI: 6.9–18.5) but the difference was not significant ( $p = 0.07$ ). Female dogs from both sectors had a higher seroprevalence compared with males, but the differences were not significant ( $p > 0.05$ ).

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH**

Pets provide many benefits to humans. They comfort us and give us companionship. Not only are pets wonderful companions they also provide significant psychological and physiological benefits to owners. However, some animals can pass diseases to people. Many diseases affecting humans can be traced to animals or animal products. Human beings can acquire diseases directly from an animal, or indirectly, through the environment.

**TITLE OF PROJECT**

*Using Mobile Technologies to Inform Clinical Decision Making*

**RESEARCHERS/TEAM MEMBERS**

A.Chikonzo, M. Muziringa

**PROJECT DESCRIPTION**

As the use of smartphones, personal computers, Ipads and other hand held devices become more prevalent; healthcare professionals are now making use of increasingly flexible technology to access medical information to inform clinical care. Evidence-based practice (EBP) is a shift among healthcare professionals from the traditional emphasis on authoritative opinion to an emphasis of research evidence extracted from current and latest electronic resources.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH**

The use of smart phones in accessing clinical research evidence has the potential to improve healthcare outcomes for the country. This approach will have positive results in addressing the core health priority areas of the country such as HIV/AIDS, maternal mortality and morbidity, malaria, tuberculosis, diarrhea and other communicable diseases.

**TITLE OF PROJECT**

*Prominent Ears: Anthropometric Study of the Ear of Black Primary School Children in Harare*

**RESEARCHERS/TEAM MEMBERS**

G. I. Muguti

**PROJECT DESCRIPTION**

Prominent ear is the most common congenital ear deformity affecting 5% of children in the Western world and has psychosocial effects on the bearer. It is important to know the prevalence in the local population as well as to know the parameters of ear morphology locally. These parameters can be useful in the diagnosis and evaluation of ear anomalies. The study provides a set of biometric data of auricular dimensions for normal black children. This data is useful for ear reconstruction.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH**

The study provides a set of important biometric data, which can be used for diagnosis of ear anomalies and for more efficient and cost effective reconstructive procedures of the ear.

**TITLE OF PROJECT**

*Determinants and Pattern of Utilization of Allogenic Blood in Elective General Surgical Operations*

**RESEARCHERS/TEAM MEMBERS**

G. I. Muguti

**PROJECT DESCRIPTION**

Auditing of blood utilization in any hospital helps in improving blood ordering systems, which can reduce hospital costs and risks of allogenic blood exposure to patients. The study shows that overall there was appropriate utilization of blood among patients scheduled for major elective operations. However there was over cross matching for some major operations.

**CONTRIBUTION TO ZIM ASSET**

Adopting the maximum surgical blood ordering schedule will ensure more efficient and cost effective utilization of allogenic blood in our hospitals. Clinicians should adopt the maximum surgical blood-ordering schedule.

**TITLE OF PROJECT**

*Harnessing Expressive Arts Therapies as Diagnostic and Therapeutic Tools in Diverse Settings*

**RESEARCHERS/TEAM MEMBERS**

G. Javangwe

**PROJECT DESCRIPTION**

The project profiles selected expressive arts modalities that can be used as diagnostic and therapeutic tools in diverse settings. This project demonstrates the infusion of expressive arts therapies in staff debriefing, training, assessment of children during custody evaluation and determination, victim offender mediation, and trauma focused interventions.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH**

The presentation contributes to Zim Asset by providing cost effective psychological and mental health options for people in resource-constrained settings.

**TITLE OF PROJECT**

*Operationalising Psychological Innovations in Forensic Contexts.*

**RESEARCHERS/TEAM MEMBERS**

G. Javangwe, G. Mapokotera, V Muchakwaya, T,Ponde, K Hazangwi, R.B Bundy, S Mhizha

**PROJECT DESCRIPTION**

The current exhibit models a Centre of Excellence for inmate assessment, treatment, rehabilitation and reintegration. It is modeled around "Inspiring Innovation in Correctional Services". We developed specific strategies that encompass (a) identification and training Zimbabwean prisons and correctional staff in assessment, treatment and rehabilitation of offenders (b) piloting sex offender assessment, treatment and rehabilitation in Zimbabwe, starting with inmates and migrant-ex-inmates and (c) transforming lives of prisoners through integrated expressive arts and play therapies and (d) identifying inmate and ex-inmate pre and post release needs.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH**

The rationale of project is to bringing together different key stakeholders to deliberate on how Zimbabwe Prisons and Correctional Service (ZPCS) can work together with communities to improve the welfare of inmates.

**TITLE OF PROJECT:**

***Tracking the Evolution of HIV Neutralizing Antibodies for HIV Vaccine Development.***

**RESEARCHERS/TEAM MEMBERS**

T. Mduluza, A. Vengesai and N. Midzi

**PROJECT DESCRIPTION**

The work gives some evidence supporting the development of antibodies capable to neutralizing the ever-changing viral quasi species. Further provision of treatment reveals the development of effective neutralizing antibodies. In one of the acutely infected showed a sharp decrease in viral load, at the same time there was markedly increase in neutralizing antibodies. The work gives evidence in support of possible management of HIV infection during early transmission period.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH**

Biomedical Researchers in Zimbabwe could contribute interesting pointers towards controlling of the scourge caused by HIV infections. HIV-1 subtype C neutralizing antibodies from primary infection develops much later, around 5 months with significant potency increasing at around 2 years post infection. While any subsequent viral strains generated from mutation are rapidly recognized by the developing immune response, especially post introduction of antiretroviral treatment. This has given interesting pointers to HIV vaccine development and design for prevention working together with treatment.

**TITLE OF PROJECT**

***Regenerative Medicine: Innovative Attempt to Treat Burn Wounds in Children***

**RESEARCHERS/TEAM MEMBERS**

F. Chidzondo, I. Sithole-Niang and C.J. Chetsanga

**PROJECT DESCRIPTION**

This study is a search for frugal health technology innovations that can apply biochemistry, pharmaceutical and biotechnology capabilities at the University of Zimbabwe, and other networked institutions to search for

ways to apply regenerative medicine to treat Zimbabwean infants and children with wounds from burns. The study will leverage the theoretical and practical groundings of the researchers and their networks in biochemistry, immunology, biotechnology and tissue culture to investigate the possibility of using regenerative medicine to treat burn wounds in infants and children. An inter-disciplinary approach involving medical practitioners, pharmacists, biochemists and biotechnologists as well as social scientists will be adopted.

### **CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH**

Social service delivery leading to reduced morbidity and mortality rate is the target of this project. Health institutions especially hospitals capacitated and well stocked with stem cells and regenerative tissue to help in the treatment of burns particularly in children.

### **TITLE OF PROJECT**

*Seroprevalence of Leptospirosis In Dogs in Urban Harare and Selected Rural Communities in Zimbabwe*

### **RESEARCHERS/TEAM MEMBERS**

D.M Pfukenyi, G. Matope, and S. Dhlwayo.

### **PROJECT DESCRIPTION**

A cross-sectional study was conducted to investigate seroprevalence of Canine Leptospirosis in urban Harare and five selected rural communities in Zimbabwe and to assess public awareness of the disease. This study showed that, leptospirosis was present and represented a risk to dogs from urban Harare and the selected rural communities in Zimbabwe. Availing training programmes for dog owners would be beneficial in improving disease control and reducing the public health risk of pet zoonoses.

### **CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES & POVERTY ERADICATION**

Leptospirosis, a contagious disease affecting both animals and humans and spread by infection with a bacterial pathogen called *Leptospira*, may result in chronic liver and kidney disease and fatality in the dog. In light of these findings, it is believed that research into other serovars could shed light into the epidemiology of leptospirosis in Zimbabwe. Organizing, coordinating and publicizing studies and surveys about companion animal zoonoses such as leptospirosis can advance human health in Zimbabwe.

**TITLE OF PROJECT**

***Strengthening Research and Innovation: UZCHS Research Support Centre Services***

**RESEARCHERS/TEAM MEMBERS**

E.Gomo, T. Mashaah, M.M Chidzonga, J.G Hakim

**PROJECT DESCRIPTION**

The University of Zimbabwe College of Health Sciences (UZCHS) established a Research Support Centre (RSC) that provides comprehensive research support services for research and research capacity strengthening. The RSC aims to be a one-stop shop for researchers and students providing comprehensive pre- and post-award support services as well as research capacity building.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH**

The College has the capacity to provide evidence based research and skills that informs policy and practice to drive Zim Asset.

**TITLE OF PROJECT:**

***The Medical Education Partnership Initiative Zimbabwe: Medical Education Partnership Initiative — NECTAR Programme.***

**RESEARCHERS/TEAM MEMBERS**

J. Hakim, J. Matenga, S. Nhiwatiwa, T Campbell, M Barry, F Cowan and M Abas.

**PROJECT DESCRIPTION**

UZCHS is one of the 13 Sub-saharan African medical schools that received funding from National Institutes of Health (NIH) and PEPFAR in 2010 for the purposes of developing or expanding and enhancing models of medical education. These models are intended to support the goals of increasing the number of new health workers trained, strengthen medical education systems and build clinical and research capacity in Zimbabwe.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH**

Social Services and Poverty Eradication is one of the main cluster themes of Zim Asset. This project will seek to contribute to Zim Asset through efforts

in increasing healthcare workers trained, retention of doctors in Zimbabwe and invest in regionally relevant research. The ultimate goal is to strengthen health care systems through enhanced medical education. Strengthened health care systems lead to a healthy and active citizenry that can become productive members of society.

### **TITLE OF PROJECT**

*University of Zimbabwe-University of California San Francisco Collaborative Research Program*

### **RESEARCHERS/TEAM MEMBERS:**

Z M Chirenje, T. Chipato, J. Hakim and M Mbizvo

### **PROJECT DESCRIPTION**

The University of Zimbabwe-University of California San Francisco Collaborative Research Programme (UZ-UCSF) was established in 1994 to implement high quality science addressing HIV prevention and therapy; its aim is to control Zimbabwe's HIV/AIDS epidemic and contribute to global policy as a center of excellence at the University of Zimbabwe College of Health Sciences (UZCHS) in collaboration with UCSF and its partner institutions. UZ-UCSF has well-established infrastructure consisting of 2 administrative sites, a Central Laboratory located at the UZCHS, and a Central Pharmacy to support the its 6 Clinical Research Sites (2 in Harare and 4 in Chitungwiza).UZ-UCSF researchers will be conducting HIV Vaccine clinical trials starting in 2015.

### **CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH**

UZ-UCSF implements high quality science addressing HIV prevention and therapy. Its aim is to control Zimbabwe's HIV/AIDS epidemic by contributing to the global knowledge base related to HIV prevention and treatment. A healthy population with increased life expectancy will drive the Zim Asset agenda.

### **TITLE OF PROJECT**

*The Root to the Future*

### **RESEARCHERS/TEAM MEMBERS**

Enactus University of Zimbabwe

**PROJECT DESCRIPTION**

The project seeks to address problems being faced by Zimbabwe's health sector through employing Indigenous Knowledge Systems in the form of indigenous herbal medicines as well as information dissemination through a Virtual Learning Centre.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH**

The project seeks to help in the provision of indigenous alternative and complementary herbal medicines to those who cannot access and afford the conventional medicine; improve their accessibility and visibility by creating a website with a virtual learning centre which provide information on herbs thereby contributing to social services and poverty eradication and people for the digital agent system which will help increase their market reach while by word of mouth information is disseminated.

**TITLE OF PROJECT**

*AIDS International Training and Research Program (AITRP).*

**RESEARCHERS/TEAM MEMBERS**

C.C. Maponga, G.D Morse, T.Mudzviti, T. Monera, S. G. Takudzwa, Mtisi, M. Tshabalala, D. Chagwena, F. Makita, P. Jaravani, F. Mazambara-Gavaza, T.Sithole, M. Zende

**PROJECT DESCRIPTION**

This is a human capital capacity building collaborative research and training program for postgraduate and postdoctoral fellows in HIV and AIDS pharmacotherapy, drug development with a focus on those of plant origin. Innovations will be based on utilization of emerging technologies including, information communication technology, biotechnology and nanotechnology. Efforts are centered on promotion of partnership between government, private sector (pharmaceutical industry), and academic and research institutions to increase high-level interdisciplinary skills.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — HEALTH**

In pursuit of accelerated economic growth and wealth creation, Zimbabwe Agenda for Sustainable Socio-Economic Transformation (Zim Asset), under the Human Capacity Building and Development cluster key

result area has tasked the Ministry responsible for higher education to lead in the promotion of increased indigenous knowledge systems, registration of intellectual property, the establishment of a nanotechnology institute as well as the training and retaining of nanotechnologists. Our Collaborative research and training program is aimed at addressing these. Research on drug development from natural plant flora will also respond to Zim Asset's Value Addition and Beneficiation theme.

## C: ECONOMIC-POVERTY ERADICATION

### TITLE OF PROJECT

*Nurturing Latent Entrepreneurship and the Growth of Small Firms in Zimbabwe.*

### RESEARCHERS/TEAM MEMBERS

Muponda; S Gumbe; F Mupambireyi; A Mhizha

### PROJECT DESCRIPTION

The project is concerned with enhancing the productivity of small-scale furniture manufacturing firms through creating an enabling environment for technological innovations (new product designs, new markets, new distribution channels, new production techniques). The firms are located at Glenview high-density suburb in Harare. The Faculty of Commerce is working together with 10 small firms, officials from the Small and Medium Enterprise Advisory Council (SMEAC) and Glenview District Office.

### CONTRIBUTION TO ZIM ASSET: POVERTY ERADICATION

The theme of the project is in line with Zim Asset to increase the income levels of the families and dependents of the furniture manufacturers. When properly nurtured, small firms evolve into big companies that can employ significant numbers of people.

### TITLE OF PROJECT

*Platform Independent Mobile Marketplace Application integrated with Mobile Money Transfer services*

### RESEARCHERS/TEAM MEMBERS

N Zanamwe, M Mafi, B Munyangaro

**PROJECT DESCRIPTION**

A Mobile Marketplace Application which works on Apple, Blackberry or Android phones and is integrated with Mobile Money Transfer services like Ecocash, Teleshop etc. The system facilitates transfer of money between accounts, brings buyers and sellers together by providing a premier mobile marketplace, offers location services to facilitate easier filtering of products from the marketplace and informs users about current issues to do with MMT, the application, new developments in the industry.

**CONTRIBUTION TO ZIM ASSET: POVERTY ERADICATION**

In-line with Zim Asset the project will enhance service delivery and wealth creation. This project will revolutionaries how people do business in the country. Goods will be advertised and bought with utmost speed and efficiency. This is bound to create revenue for the country.

**TITLE OF PROJECT**

*Mobile Auction for Agricultural Products*

**RESEARCHERS/TEAM MEMBERS**

N. Zanamwe

**PROJECT DESCRIPTION:**

The system enables farmers to register for the auction via SMS and receive confirmation. Also, the system allows farmers to add products they are selling. The products will then be sent to customers in advance before the auction date and only registered customers will be able to bid for the products using their mobile phone's, SMS gateway. When the customers place their bids, they attach the prices they will be willing to bid for respective products. From the submitted bids, the system selects the highest bidder and sends these details to all registered customers.

**CONTRIBUTION TO ZIM ASSET: POVERTY ERADICATION**

The project will fall under the Food Security and Nutrition and the Social Services and Poverty Eradication clusters by the fact that it enables trade in agricultural produce thereby uplifting the living standards of rural and farming communities

**TITLE OF PROJECT**

***Geoinformation Science and Earth Observation: Pillar of a Nation***

**RESEARCHERS/TEAM MEMBERS**

A. Murwira, M. Masocha, I. Gwitira, F. M. Zengeya, M. Shekede, L. Mlambo, N. Zanamwe, B. Nyambo

**PROJECT DESCRIPTION**

The project involves the applications of Geoinformation Science and Earth Observation in key areas of the economy including agriculture, near-real time data collection and aggregation, monitoring environment and security, as well as natural and mineral resources prospecting and discovery.

**CONTRIBUTION TO ZIM ASSET: ALL FOUR SECTORS OF ZIM ASSET**

Zim Asset success depends on Zimbabwe leveraging on its natural resources for rapid and sustainable economic development. Geoinformation Science and Earth Observation applications in agriculture, infrastructure management, environmental management, as well as natural and mineral resources prospecting and discovery is key to Zimbabwe's development into a 21<sup>st</sup> century economy and beyond.

**TITLE OF PROJECT**

***Development of Entrepreneurial Leadership Skills***

**RESEARCHERS/TEAM MEMBERS**

Sandada, Makoni, Madzikanda and Gwena

**PROJECT DESCRIPTION**

The project is concerned with offering banking convenience through use of ATM machines. Customers can access their funds 24 hours a day as well as settle their bills on ATM machines, some of these ATMs are being provided by XX Company, which was started by Tafadzwa Gwena, as a result of his MBA studies. He is going to demonstrate physically the ATMs being offered and some of the latest key features being offered by ATM machines, all in an effort to enhance banking convenience.

**CONTRIBUTION TO ZIM ASSET: SOCIAL SERVICES — POVERTY ERADICATION**

The project will increase customer convenience when making transactions. The company has also created employment opportunities for Zimbabweans.

**TITLE OF PROJECT**

*Automation of Secure Practices to Prevent Structured Query Language Injection and Cross Site Request Forgery*

**RESEARCHERS/TEAM MEMBERS**

N. Zanamwe, K. Parshotam

**PROJECT DESCRIPTION:**

The surge of internet use has resulted in the internet being used for financial transactions, advertisements and communication. With increasing amount of websites being developed older websites have been left unattended and have serious security issues. Zimbabwe, as it transitions into the modern era has seen a rising number of websites as well as an increasing number of websites being hacked. A model of automating preventive measures, with minimal coding, against Structured Query Language (SQL) Injection and Cross Site Request Forgery (CSRF) was developed.

**CONTRIBUTION TO ZIM ASSET: POVERTY ERADICATION**

In-line with Zim Asset the project will fall under the Social Services and Poverty Eradication cluster. This was motivated by the need to improve website security in Zimbabwe since several websites have been hacked in the recent past. The project will go a long way in trying to enhance service delivery by ensuring that people are secure when transacting online.

**TITLE OF PROJECT**

*A Drive Towards Sustainable Development: Indigenisation and Economic Empowerment.*

**RESEARCHERS/TEAM MEMBERS**

C Manyeruke, A Murwira, F Mupereki

**PROJECT DESCRIPTION**

The exhibit is a demonstration of how the Indigenisation Economic Empowerment Policy is benefiting communities. It shows indigenous farmers and miners in their fields, processing their products and marketing them. Issues still outstanding are exhibited in the production chains.

**CONTRIBUTION TO ZIM ASSET: POVERTY ERADICATION**

To promote an understanding at policy level and research institutions on benefits and challenges emanating from a 100% indigenisation land reform program and indigenous transformations in mining.

**TITLE OF PROJECT**

*Gender and National Development in Zimbabwe: A Focus on Women*

**RESEARCHERS/TEAM MEMBERS**

C. Manyeruke, D. Chimankire, F Mupereki

**PROJECT DESCRIPTION**

This exhibit demonstrates the leading role played by women in promoting the national development agenda in various economic sectors. It will also highlight their problems which require attention at both research and policy level.

**CONTRIBUTION TO ZIM ASSET: POVERTY ERADICATION**

To harness women's contributions to economic development across all sectors by highlighting their work but mapping alternative options too.

**TITLE OF PROJECT**

*Second chance Education for the cChildren and Young People of Zimbabwe.*

**RESEARCHERS/TEAM MEMBERS**

D.D. Midzi, T Kaziboni

**PROJECT DESCRIPTION**

The project's goal is to support the Ministry of Education, Sport, Arts and Culture by training teachers of out-of-school children through accelerated

learning programmes for reintegration into the formal school system. The teachers are trained in methodologies by the members of the Adult Education Department. Research is also done on the challenges that these children face as they attempt to return to school.

### **CONTRIBUTION TO ZIM ASSET**

The project aims to enhance the Zimbabwean human resource. The more children and youth return to and complete school, the more of them will be empowered as they will be able to either find employment or create employment and be self-sufficient. The entry of these children into school increases Zimbabwe's literacy rate.

### **TITLE OF PROJECT**

*Educating school dropout girls for wealth creation*

### **RESEARCHERS/TEAM MEMBERS**

R. Moyana, L Madyirapanze

### **PROJECT DESCRIPTION**

The research focused on the number of girls that drop out of school because of pregnancy; how many of them return to school or not; whether they return to the same school; challenges faced and whether they finally complete school to pursue chosen careers.

### **CONTRIBUTION TO ZIM ASSET**

"Educate a girl and you educate a nation". Educated girls have the opportunity to empower their families and raise their own children in such a way that they too are afforded the opportunity to go to school and be independent of social welfare schemes in their country. Women are important contributors to a country's wealth creation as they form half of the nation's population and education is key. Therefore, every girl should be assisted to complete their studies. Beneficiaries of the research are drop out girls who benefit from the research by being assisted to return to school.

### **TITLE OF PROJECT**

*The graduate tracking web based system*

## RESEARCHERS/TEAM MEMBERS

L.Mukavhi, J Gandari, L Musekiwa and J Muzinda (HITRAC).

## PROJECT DESCRIPTION

Graduate tracking is a process of acquiring data relating to the whereabouts and employment details of graduates who have been through the institution. It has been undertaken by the department of Health Professions Education in collaboration with NECTAR to develop an automated system to track the College of Health Sciences graduates. The graduate tracker system is capable of capturing graduate current and historical data which includes demographic information, qualifications, and areas of specialisation, educational history, employment and placements and can generate various reports. The system has a feedback portal where graduates can update their information and evaluate various aspects of their curriculum against work experience. Surveys can be conducted through the same portal. The health regulatory bodies systems and the University's main registration system can be integrated with this system.

## CONTRIBUTION TO ZIM ASSET: VALUE ADDITION AND BENEFICIATION

Graduate tracking is a major tool in providing information for the Health Workforce Observatory which is a body that makes decisions that assist in the betterment of the nation health service delivery. An assessment of graduates' contribution to their placement communities and social responsibilities can be done; also of importance would be their relevance to those communities. The reports generated from the system can aid in decision and policy making in aspects such as curriculum reviews, quality of graduates, research collaboration, graduate spatial distribution and discipline distribution. Human Resources essential for national development in the health sector can be easily located giving statistics of those retained in the country and those who have migrated.



## 2. FOOD SECURITY AND NUTRITION



**TITLE OF PROJECT**

***Postharvest Science and Technology: The Missing link to Enhancing Food and Nutrition Security in Zimbabwe and in the SADC region in a Changing Climate***

**RESEARCHERS/TEAM MEMBERS**

Mvumi B.M., Chigoverah A. A., Machezano H., Rwafa R., Nyabako T.

**PROJECT DESCRIPTION**

Over the years, significant research and development (R&D) efforts have concentrated on increasing agricultural productivity in order to achieve food security without realizing that postharvest loss (PHL) reduction can complement food production and increase access to meet the enormous food demand. In SSA this has been worsened by the occurrence of new pests such as the larger grain borer (LGB) that causes 3 to 4 times the normal storage losses. Climate change and variability increase food insecurity through droughts, extreme temperatures, and in some cases floods. Increased temperatures also increase the rate of pesticide degradation enhancing frequent pest population booms.

**CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION**

Food safety associated with synthetic pesticide over-dependence and poor postharvest handling resulting in mycotoxin development that threaten human and livestock health in Zimbabwe. In Zimbabwe, postharvest aspects are now enshrined in Zim Asset and the Food and Nutrition Security Policies.

**TITLE OF PROJECT**

***Resuscitation of African Food Chain and Art***

**RESEARCHERS/TEAM MEMBERS**

Z. W. Sadomba , K. Mujeyi, R. Nyoni, A. Nhamo .

**PROJECT DESCRIPTION**

This research investigates the whole food chain of indigenous African agricultural knowledge and explores linkages of art, fusing the past and the present. The research examines a new concept of open-air community cultural museum. Ancient rock art and contemporary 'Shona' stone

sculpture are fused and indigenous agronomy, technology and foods are renewed.

## **CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION**

### **TITLE OF PROJECT**

*Plantbased Automatic Irrigation Scheduling using a non-contact Infrared Sensor.*

### **RESEARCHERS/TEAM MEMBERS**

M. Munyaradzi, J. Mabika

### **PROJECT DESCRIPTION**

The present study is aimed at developing an automatic irrigation controller which uses signals from plant canopy temperature to schedule irrigation. Plant based methods to schedule irrigation have the advantage over other scheduling methods in that they integrate both soil moisture and atmospheric data, and so are more accurate in predicting the amount of irrigation required and also the timing of the irrigation. This translates to meaningful water savings and improved productivity. The heart of the controller circuit, the PIC 16F872 microcontroller, was programmed in both C and assembly language. Currently, the researchers are in the process of evaluating the control system.

## **CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRION, INFRASTRUCTURE AND UTILITIES**

In-line with Zim Asset, this project will play an important role in contributing to food security and poverty eradication. The low cost of the system will mean that many farmers will afford the system and improve their water management and crop quality and yield leading to high market prices.

### **TITLE OF PROJECT**

*Value Addition to Sweet Potatoes*

### **RESEARCHERS/TEAM MEMBERS**

T. Rukuni, R. Nazare, A. Madzima

## PROJECT DESCRIPTION

There are several challenges in the marketing of sweet potatoes. The crop is highly perishable and very bulky, therefore, transportation is expensive. If they are kept in the ground after maturity they are prone to attack by pests especially the sweet potato weevil. Processing sweet potatoes offers an avenue to avert post harvest losses. In certain cases the market demands certain tuber sizes rendering very large and very small tubers unmarketable. Mechanically damaged tubers cannot be marketed easily. So these can be processed.

Sweet potatoes can be processed into a wide range of products e.g. flour for bakery and confectionery products, starch, crisps, juice, jam, ketchup. Farmers and entrepreneurs stand to gain by engaging in sweet potato value addition. The project aims to develop and promote activities that value adds to the sweet potato crop.

## CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION, BENEFICIATION AND VALUE ADDITION

Value addition to sweet potatoes will build a prosperous, diverse and competitive food security and nutrition sector that contributes significantly to the national development through provision of an enabling environment for sustainable economic empowerment and social transformation.

## TITLE OF PROJECT

*Processing and Value Addition Equipment*

## RESEARCHERS/TEAM MEMBERS

R Nazare, T Rukuni

## PROJECT DESCRIPTION

The exhibit is in four parts

- a) The first exhibit is of an active commercial solar dryer which is used to dehydrate fruits and vegetables. The technology promotes value addition to the products.
- b) The second exhibit is of a hard nut cracker which is used to break up amarula, macademia, hacha and peacan nuts. High value oils are then extracted from the kernels.

- c) The third exhibit is of a mobile diesel engine powered silage cutter. The technology is used to cut silage from fresh crop stalks and the product is then used to feed livestock. The equipment allows for in-situ processing of silage.
- d) The last exhibit is of a mobile multi crop diesel engine powered thresher/sheller. The unit is a high capacity processor with potential for use in multi-farm operations.

### **CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION, POVERTY ERADICATION**

Mechanizing post harvest processing operations has potential to address the national economy at two levels; Impact on the agricultural sector; Incentivize farmers by improving agricultural productivity.

#### **TITLE OF PROJECT:**

*AgriLink: Dancing in the Storm*

#### **RESEARCHERS/TEAM MEMBERS**

Enactus, University of Zimbabwe

#### **PROJECT DESCRIPTION**

An integrated 3 phased project comprising of mushroom farming, fish farming and marketing gardening. Phase 1: The mushroom production, using a new production house called a convertible darkroom and provides the fishpond with the residues as feed (cradle to grave) and the garden gets manure from the nutritious used substrate and pond water. Phase 2; the pond is aimed at providing an alternative source of protein and the mini hydro electricity generating setup. Phase 3; the water which is supposed to be drained out and discarded is used in the garden for irrigation using a new technology called aquaponics.

### **CONTRIBUTION TO ZIM ASSET: ALL FOUR SECTORS OF ZIM ASSET**

#### **TITLE OF PROJECT**

*“Bridging the Development Gap?” The Case of Smallholder Farming Projects in Rural Zimbabwe.*

**RESEARCHERS/TEAM MEMBERS**

E. Makombe, B. Kusena and T. Taringana

**PROJECT DESCRIPTION**

The project focuses on how smallholder agriculture is perhaps the most effective way of empowering the majority of rural Zimbabweans. It juxtaposes smallholder farming and large-scale commercial farming and shows how the later was a continuation of the colonial legacy that, to a larger extent, restricted the indigenous population to mere labourers. The project takes this scenario as a point of departure and views rural smallholder agriculture as a way of redressing age-long imbalances largely created by colonialism.

**CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION AND POVERTY ERADICATION.**

Agriculture being the mainstay of the Zimbabwean economy, supporting smallholder agriculture becomes the single most important means of empowering the majority of the Zimbabwean population.

**TITLE OF PROJECT**

*Indigenous and Exotic Pesticidal Plants — Optimising Science for Safe and Sustainable Control of Agricultural Pests*

**RESEARCHERS/TEAM MEMBERS**

B.M.Mvumi, E.T Nyahangare, E.Mazhawidza.

**PROJECT DESCRIPTION**

One of the greatest threat to increased agricultural productivity and hence increased food security and nutrition in Zimbabwe today is agricultural pest attack. The use of pesticidal plants is a possible option because they are locally available, cost-effective, regarded as safe, organic and has low persistence in the environment but most of these assertions are not evidence-based. Through our scientific investigations in Zimbabwe, over the last six years, we have shown that four locally available plants can be used effectively to reduce the tick loads on cattle.

**CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION**

When used as a component of Integrated Pest Management (IPM) programs, bio-pesticides can greatly decrease the use of conventional pesticides, enhance environmental quality, while sustaining agricultural productivity

**TITLE OF PROJECT**

*Sustainable Post-harvest Handling of Maize Cobs: Implications for Design and Technology Education in Zimbabwe*

**RESEARCHERS/TEAM MEMBERS**

P. Kwaira

**PROJECT DESCRIPTION**

This study involves the design and development of a low-cost and sustainable mechanism to handle maize cobs in preparation for shelling. It will benefit resettled farmers.

**CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION**

Appropriate and adequate handling pre-shelling of maize cobs reduces post harvest losses.

**TITLE OF PROJECT**

*The potential of Parinari curatellifolia (hacha/chakata) Fruit as a Raw Material for Food Products*

**RESEARCHERS/TEAM MEMBERS**

C.Benhura , M.Muchuweti , J. Kugara , S Nyagura and P.E. Gombiro

**PROJECT DESCRIPTION**

Parinari curatellifolia fruit is consumed as fresh fruit and has saved some rural communities from starvation in times of droughts and food shortages. Parinari curatellifolia fruit is used in preparation of syrup, finger millet meal porridge and cereal based products (zvambwa). The fruit has been used for medicinal purposes. Current initiatives are aimed at promoting utilization of the fruit determining the nutritional composition of the fruit and products and investigation of the shelf life of the products.

## CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION

The products will help in solving food security problems among local community members. The products may be commercialized and earn income for the rural communities.

### TITLE OF PROJECT

*Non-conventional Livestock Feeds for Improved Income Generation and Food Security*

### RESEARCHERS/TEAM MEMBERS

G. Jacob, T E. Halimani; I Zvinorova; S. Katsande

### PROJECT DESCRIPTION

The project evaluated non-conventional feeds for degradability and digestibility. It then investigated the use of these feed stuffs on production and economic performance. The tested feed stuffs were browse legume hay, forage legume hay, urea treated maize stover and fresh and ensiled cactus (*Opuntia ficus indica* and *Opuntia mecagantha*). The study concluded that more profit can be realised when non-conventional feed resources are used than when commercial feed are used.

## CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION

Health and wellbeing: Category B Public Health  
Nutrition and diet food security at house-hold level

### TITLE OF PROJECT

*Enhancing Productivity, Market Participation and Climate Change Adaptation in Smallholder Farming*

### RESEARCHERS/TEAM MEMBERS

SOFECSA-UZ Research Group — F. Mtambanengwe; H Nezomba; Muneta G Manzeke; J Rurinda and P. Mapfumo

### PROJECT DESCRIPTION

The Soil Fertility Consortium for Southern Africa (SOFECSA)-UZ research group working jointly with national agriculture and extension systems (NARES), private seed and fertilizer companies, local banks and farmer

organizations, is employing innovation platforms and field-based farmer learning centre approaches to promote technical and institutional options for increasing agricultural productivity and farmer income, and enhancing the adaptive capacity of smallholder communities to impacts of climate change.

## **CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION; SOCIAL SERVICES — POVERTY ERADICATION**

The SOFECSA activities have demonstrated a research for development framework that has the potential to capacitate farmers for self-mobilization and self-organization enabling them to collectively access production inputs (including information and knowledge) and adopt resource-conserving technologies. This has marked improvements towards household food-self sufficiency and a shift towards diversification into high value cash crops and off-farm activities against negative impacts of climate change.

### **TITLE OF PROJECT**

***Climate Smart Agriculture for Increased Food Production: Targeting Local Innovations to Respond to Soil Fertility Decline and Increasing Climate Variability and Change***

### **RESEARCHERS/TEAM MEMBERS**

SOFECSA\_UZ Research Group — Mtambanengwe; Nezomba; Manzeke; Rurinda and Mapfumo

### **PROJECT DESCRIPTION**

There is increasing evidence that the impacts of a changing climate will have great consequences on agriculture-based livelihoods in sub-Saharan Africa, including Zimbabwe. Smallholder farmers will be especially vulnerable to the impacts of climate variability and change. Their vulnerability arises from the dominant rural livelihoods, which are focused on rain-fed smallholder farming, which is sensitive to changes in climatic conditions. The SOFECSA-UZ research group works to develop and promote technical and institutional innovations that enhance contributions of integrated soil fertility management (ISFM) research and development as an entry point to climate change adaptation in Zimbabwe and other Southern African nations.

## CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION

ISFM innovations could add value to one of the most heralded CSA technologies to support sustainable agricultural productivity.

### TITLE OF PROJECT

*'Picking' Money from Baobab (Adansonia digitata) Fruits*

### RESEARCHERS/TEAM MEMBERS

B. Chipurura, M. Bhebehe, P. Mapfumo, P. C. Gondo and M. Muchuweti

### PROJECT DESCRIPTION

Baobab is a non-domesticated agro forestry tree species with various medicinal and food uses. Our research team has identified baobab fruit as an underutilized indigenous fruit species with the potential to be commercialised. We have analysed the baobab fruit for its nutritional and phytochemical contents. The fruit was found to be rich in minerals, vitamins and phytochemicals. Consequently, the pulp from the fruit was then used to formulate baobab-flavoured yoghurt.

## CONTRIBUTION TO ZIM ASSET: FOOD AND NUTRITION, SOCIAL SERVICES- POVERTY ERADICATION

Production of the baobab-flavoured yoghurts could increase the income of rural people who are involved in harvesting the fruit and processing of the pulp. Setting up small-medium dairy companies at some growth points will also create jobs. In addition, food sources will be increased and diversified thus improving food security and food availability in Zimbabwe.

### TITLE OF PROJECT

*Healthy Rangelands for Income Generation and Sustained Livelihoods*

### RESEARCHERS/TEAM MEMBERS

J. Gusha; P H Mugabe; I Zvinorova; S Katsande;; M Masocha

### PROJECT DESCRIPTION

The rangeland healthy status was assessed based on bush encroachment, floristic composition, species diversity and grass biomass yield in three farming systems. The Modified-Whittaker plot design was used

to sample herbaceous vegetation in rangelands under different land tenure and farming systems in Masvingo and Midlands provinces of Zimbabwe. A rangeland health condition status was calculated as the relative frequency and relative abundance of invasive and unpalatable species. Species diversity was not significantly different but all other measured parameters differ according farming system and grazing management.

## **CONTRIBUTION TO ZIM ASSET: FOOD AND NUTRITION SECURITY; POVERTY ERADICATION**

Agriculture, environmental, natural resources and tourism section under climate change, adaptation and mitigation. Rangelands in commercial settlement are characterised by palatable species thus providing quality forage in sufficient quantities to cattle. These rangelands therefore meet the nutrient requirements of cattle. If the nutrient requirements are satisfied, cows conceive and calve every year. Their calves grow fast and reach slaughter weight early. This boosts farmer's income. By contrast, communal and small scale rangelands are degraded and are dominated by unpalatable species (*Helichrysum kraussii*) and invasive alien species such as *Lantana camara*. The carrying capacity of communal rangelands has declined due an observed increase in unpalatable species (*Helichrysum kraussii*). This implies that in degraded rangelands forage quality is poor and forage quantity is inadequate hence low animal offtake and unsustainable livelihoods.

## **TITLE OF PROJECT**

***Optimizing the Utilization of Finger Millet in the Face of Climate Change for Sustainable Food Security and Nutrition***

## **RESEARCHERS/TEAM MEMBERS**

M. Gabaza, P. S. Muleya, M. Muchuweti, P. Mapfumo

## **PROJECT DESCRIPTION**

We present our recent work with women from Hwedza District in Zimbabwe, where we have discovered that various products can be made from finger millet (*rukweza*) including sour porridge and baked products consisting of up to 50 % finger millet flour combined with wheat flour. The use of fermentation in preparing products such as sour porridge as complementary food for children increases the bioavailability of iron and

zinc which is much needed to reduce the prevalence of their deficiencies already rampant in Zimbabwe. However, utilization of small grains still remains largely marginalized in Zimbabwe, and strategies to improve their utilization and consumption are needed.

### **CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION, VALUE ADDITION AND BENEFICIATION**

The project aimed at improving bioavailability of minerals in particular iron and zinc; improve nutrition because of the nutritional superiority of the grains and reduce in the long run the prevalence of non-communicable diseases such as diabetes and cardiovascular diseases; attain food security by increased growing of small grains to adapt to climate change. Production of baked products consisting of a certain level of finger millet can create markets for smallholder farmers, reduce burden on procurement of wheat and in turn reduce poverty.

### **TITLE OF PROJECT**

*Local Herbal Teas Competitive to Well Known International Brands*

### **RESEARCHERS/TEAM MEMBERS**

M. Bhebhe, M. Muchuweti and D. Tagwireyi

### **PROJECT DESCRIPTION**

The project is aimed at profiling the phytochemical characteristics of four local indigenous herbal teas namely *Lippia javanica* (zumbani), *Fadogia ancyrantha* (Makoni), *Myrothamnus flabellifolius* (Mufandichimuka) and *Ficus sycamore* leaves (Muwonde). These herbs have been used in Zimbabwe as teas since time immemorial either as medicine or simply nutraceuticals. However the missing link has been the scientific evidence of the existence of individual components responsible for the claimed health benefits. As Zimbabwean scientists we have taken it upon ourselves to bridge that gap.

### **CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION, BENEFICIATION AND VALUE ADDITION**

Zimbabwe is a vast repository of diverse plants that have been consumed as food, medicine or both, since time immemorial. However, the advent of well researched and marketed imported herbal teas like Rooibos™ has

limited the popularity of indigenous herbs. Vindicating the anecdotal claims on the indigenous herbs' health properties through research may help improve their marketability and appreciation by modern society. If local herbs are well marketed, the societies where these herbs grow naturally will enjoy the benefit of increased trade through demand as they embark on harvesting and selling to packagers and retailers nationwide and abroad.

### **TITLE OF PROJECT**

***Assuring Agricultural and Food Safety of Genetically Modified Organisms in Southern Africa***

### **RESEARCHERS/TEAM MEMBERS**

I. Sithole-Niang.

### **PROJECT DESCRIPTION: FOOD SECURITY AND NUTRITION**

The project is a partnership between the Council for Scientific and Industrial Research- University of Pretoria, University of Namibia and the University of Zimbabwe. The partners were chosen from countries with functional biosafety regulatory frameworks at different stages of development and utilization. South Africa is a country with a fully functional biosafety regulatory system and is commercializing genetically modified (GM) crops; Zimbabwe is a country with a regulatory system that has enabled confined field trials of both Bt maize and Bt cotton, while Namibia has a functional regulatory system that has not permitted any trials. Scientists at these universities will acquire knowledge and expertise including genomics, that will be incorporated into curricula and training programmes on biotechnology and biosafety in their institutions to ensure sustainability. It is envisaged that these well-trained scientists will be well positioned to provide unbiased information and advice to various stakeholders along the agricultural value chain.

### **CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION**

The Project will contribute to the Food Security and Nutrition Cluster of ZimAsset through the creation of an improved enabling Policy and Legislative environment in the Agricultural Biotechnology sector. This will be achieved through public awareness, stakeholder participation and dialogue with decision makers.

**TITLE OF PROJECT**

*The Molecular Biology Teaching Laboratory*

**RESEARCHERS/TEAM MEMBERS**

I. Sithole-Niang, I. Munhenzva, F. Chidzwndo, S. Mukanganyama and H. Zharo.

**PROJECT DESCRIPTION:**

The Molecular Biology Teaching Laboratory is funded by the Kirkhouse Trust to ensure increased capacity of UZ students and staff in the application of basic molecular biology methods applicable to many scientific disciplines. The project is centered around very basic molecular biology techniques such as DNA extraction, gel electrophoresis, the polymerase chain reaction (PCR), protein expression and purification. The Taq DNA polymerase is purified from a recombinant *Escherichia coli* (*E. coli*) clone and used to train students in the theory and practice of the PCR. The long-term goal is to ensure sustainable capacity building in molecular biology in Zimbabwe.

**CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION**

The Project will contribute to the Food Security and Nutrition Cluster of Zim Asset through the improvement of crop and livestock production systems by using advanced tools for molecular breeding, pest and disease diagnostic approaches.

**TITLE OF PROJECT**

*Establishment of an Agricultural Information Kiosk for farmers through Innovative Information Products and Services*

**RESEARCHERS/TEAM MEMBERS**

A.Chikonzo and T.Mataranyika

**PROJECT DESCRIPTION**

The University of Zimbabwe Library, in conjunction with the Faculty of Agriculture and African Languages Research Institute is partnering with the Ministry of Agriculture's departments of Agricultural Extension services and Mechanization in establishing an Agricultural Information Kiosk at Domboshava Training Centre in Domboshava. The overarching aim of the Agricultural Information Kiosk is to close the information asymmetries that

exist between the producers and custodians (researchers and extension providers) of agricultural information and the consumers of that information (farmers), through repackaging agricultural information into forms and formats that are contextually suitable to the needs of farmers.

### **CONTRIBUTION TO ZIM ASSET: FOOD SECURITY AND NUTRITION**

According to Zim Asset, the 'Quick wins' to be implemented within the Food Security and Nutrition cluster include "investing in research, science and technology for agricultural development" and the strategies for achieving this centre around improved networks and linkages between farmers, researchers, agro-dealers, extension and input suppliers. The Agricultural Information Kiosk provides a one-stop shop for customized information services and products.

### **TITLE OF PROJECT**

*Environmental Impacts of Natural and Man-made Hydraulic Structures  
— Case Study of Middle Zambezi Valley, Zimbabwe.*

### **RESEARCHERS/TEAM MEMBERS**

I. Nhapi, S.Shumba, W.Gumindoga, A.Mhizha, E.Mashonjowa

### **PROJECT DESCRIPTION**

This study sought to investigate the soil moisture and nutrient dynamics in relation to natural and man-made flood occurrence in the Middle Zambezi valley of Zimbabwe for the improvement of the livelihoods of people in the district. Results show that flooding is experienced at least once a year in the study area. Back waters from the hydropower structure at Cahora Bassa increase the moisture content of the soil above the field capacity and provide nutrients to the soil. The backwaters and residual moisture are important in increasing crop yields thereby reducing poverty for the communities.

### **CONTRIBUTION TO ZIM ASSET**

The target beneficiaries of the project are the riverine communities in the Mbire District of Zimbabwe. The study seeks to analyse impacts of flooding on soil moisture distribution and nutrient deposition and to analyse the viability of riverbank and riverbed cultivation. These are important for maximizing the water use efficiency and increasing productivity in the floodplain communities of the Mbire District.

**TITLE OF PROJECT**

*Towards sustainable utilization of fallows (Shona makura, Ndebele ifusi) in Zimbabwean communal lands*

**RESEARCHERS/TEAM MEMBERS**

E. Manzungu, S. Ncube, L. Mtali

**PROJECT DESCRIPTION**

In Zimbabwe 80% of developed water resources and over 50% of the land area are used by agriculture. How these important national resources are used and managed is critical — poor usage and management can negatively impact, not just agricultural production in both the short and long term, but also the environment which provides essential goods and services.

**CONTRIBUTION TOWARDS ZIM ASSET**

Overall the project contributes to MDG1 (ensuring food security) and MDG 7 (ensuring environmental sustainability), which in this project are shown to be inextricably linked.

**TITLE OF PROJECT: FOOD SECURITY**

*Pre-incubation of Zimbabwe graduate livestock feed manufacturing enterprises*

**RESEARCHERS/TEAM MEMBERS**

P. H.Mugabe, S. Ncube, J. Mutambara , B. Chaderopa , M. Nyahangare, E Halimani.

**PROJECT DESCRIPTION**

This one-year project addressed agriculture graduates' unemployment and their inability to generate agribusiness enterprises. Pre-incubation of livestock feed manufacturing enterprises was done with 15 incubatees. Entrepreneurial skills needs were identified through surveys, a self administered baseline questionnaire, plenary brainstorming and discussions feedback. After the training activities, the incubatees produced business plans, 57% of which were rated as bankable. Project success factors were multi-stakeholder partnership and continuous skills needs assessment. This business incubation intervention can solve agriculture graduates unemployment if the scope of enterprises is broadened.

**CONTRIBUTION TO ZIM ASSET: VALUE ADDITION AND BENEFICIATION; SOCIAL SERVICES AND POVERTY ERADICATION**

Zimbabwe's education system has often been criticized for preparing students for white-collar jobs in the formal sector, and failing to equip them with technical and entrepreneurial skills. The project rationale was thus the need to move away from over-reliance on the traditional employment sectors of agriculture to being proactive in developing "brain-based activities". The project sought to use the gap in commercial livestock feed production as an opportunity for entrepreneur development among unemployed young agriculture graduates.



# 3. INFRASTRUCTURE AND UTILITIES



**TITLE OF PROJECT**

*Site Investigation and Design of a Grade Separated Intersection in Harare*

**RESEARCHERS/TEAM MEMBERS****PROJECT DESCRIPTION**

With the increase in traffic there is need for an improved intersection at the Seke and Cripps/Dieppe intersection. An interchange is appropriate for this intersection since grade intersections can no longer accommodate the current traffic, let alone the future traffic. There is hence a need to study and find out the most appropriate grade separated intersection layout and design so as to reduce congestion at this intersection.

**CONTRIBUTION TO ZIM ASSET: INFRASTRUCTURE AND UTILITIES**

In trying to improve the road networks in Zimbabwe, this project contributes directly to one of Zim Asset's sector outputs i.e. Harare-Mutare road project, as this intersection is along the most used route connecting western suburbs to Mutare road. It also ensures some of the result areas of the transport sector are met namely road safety, public property safety and security.

**TITLE OF PROJECT**

*Microcontroller Based Energy Billing System That Controls Loads Using GSM.*

**RESEARCHERS/TEAM MEMBERS**

M. Munyaradzi, T. Chikwama

**PROJECT DESCRIPTION**

This project aims at developing a GSM based energy meter reading system and load control through SMS. The Electricity department sends employees to take meter readings every month, which is an expensive and time consuming exercise. The project provides a reliable and efficient way of avoiding this type of inconvenience. It uses a standard digital energy meter to deliver output pulses to a microcontroller that performs counting on receiving a command and then switches the loads ON and OFF.

**CONTRIBUTION TO ZIM ASSET: INFRASTRUCTURE AND UTILITIES**

It help enhance service delivery by the power utility. Remote control of and automation of devices always help save fuel for the power company which means that a lot of money is subsequently saved.

**TITLE OF PROJECT**

***GIS Based Tools For Wastewater Management in Upper Manyame Catchment***

**RESEARCHERS/TEAM MEMBERS**

W. Gumindoga, H. Parichi, A. Mhizha, D.T. Rwasoka

**PROJECT DESCRIPTION**

Wastewater management in Upper Manyame Catchment is problematic and has resulted in the pollution of Lake Chivero and Lake Manyame that also happen to be sources of water for Harare. A new paradigm to the treatment and disposal of Harare's wastewater is presented through the use of canals that takes the sewage from the current treatment plants and deposit it in constructed pastures and wetlands downstream of the Chivero and Manyame dams. GIS and remote sensing techniques are thus adopted in this project in choosing the best route (least-cost-paths) of this wastewater pipeline. This solution maintains healthy reservoirs for Harare metropolitan and in addition it promotes farming activities where the wastewater is also diverted to pastures.

**CONTRIBUTION TO ZIM ASSET: INFRASTRUCTURE AND UTILITIES**

This project reduces water treatment costs for Harare City authorities and thereby reducing water bills to the consumers. The agriculture supported by this innovation reduces the headaches of importing food for the government thus channeling resources to other developmental projects in the country for more wealth creation.

**TITLE OF PROJECT**

***Construction of Wind Resource Atlas for Zimbabwe***

**RESEARCHERS/TEAM MEMBERS**

T. Hove and L. Madiye

**PROJECT DESCRIPTION**

A wind resource atlas was produced using hourly measured wind speed data. The vital statistics generated are the map-presented values of the parameters of the Weibull probability distribution function for modeling

wind speed frequency distribution and the wind power density map for Zimbabwe.

### **CONTRIBUTION TO ZIM ASSET: INFRASTRUCTURE AND UTILITIES**

The data for wind resource spatial distribution over the country will provide useful information for design, energy performance evaluation and economic analysis of wind energy delivery systems. Wind energy at the levels obtainable in Zimbabwe can contribute to Zim Asset through water pumping for irrigation. Potential users of our data are design engineers, energy planners and investors in wind energy-based systems.

### **TITLE OF PROJECT**

*Improving the Accuracy of Solar Radiation Data for Zimbabwe through Merging Satellite and Ground Measured Information*

### **RESEARCHERS/TEAM MEMBERS**

T. Hove and T. Mushiri

### **PROJECT DESCRIPTION**

The purpose of the present display is to present, with the aid of the software Surfer", live digital maps (accuracy 3%) of monthly average global radiation derived from the Hove et al procedure and to demonstrate how the data can be used to model the insolation received by solar energy collectors of any tilt and azimuth, at any time of the day and at any location in Zimbabwe. An accurate knowledge of spatial and temporal distribution of the solar resource is vital in the accurate design, performance prediction of solar energy delivery systems in Zimbabwe.

### **CONTRIBUTION TO ZIM ASSET:INFRASTRUCTURE AND UTILITIES**

Solar energy is an indigenous resource that is ubiquitously distributed and can be utilised at a decentralised level for local energy needs or at a more centralized level for national power production in an environmentally friendly and sustainable manner.

### **TITLE OF PROJECT**

*Analyzing the economic feasibility of a solar-aided transformer oven drying system through measuring and modelling drying kinetics*

## RESEARCHERS/TEAM MEMBERS

S. Gondora, T. Hove

## PROJECT DESCRIPTION

The study aims at analysing the economic feasibility of the drying system of a solar-aided transformer oven. The project looks at developing a model which simulates the hourly drying performance using thin layer drying concepts for a conventional system which takes advantage of the harnessing of solar energy. For this to be a success 12 laboratory experiments were carried out in order to determine the variation of the drying constant of transformer insulation paper (cellulose) with air velocity and air temperature. This data enabled a detailed investigation of the drying kinetics which takes place in the oven during drying. The model was skillfully designed with an appreciation of Linear Regression Modelling. The drying time was found to be 12 hours and the energy required to dry was 1.04MWh. System economic indicators such as the NPV, Payback period and the profitability index are included in this project in order to study the economic viability of the system.

## CONTRIBUTION TO ZIM ASSET: INFRASTRUCTURE AND UTILITIES

The utilization of solar energy to provide the energy needed for transformer drying can go a long way in reducing national energy consumption, abating greenhouse gas emissions and result in financial savings for the transformer manufacturing industry. This contributes to ZIMASSET by value addition to the indigenous solar resource and economical provision of infrastructure services.

## TITLE OF PROJECT

*Design of an improved wood cookstove*

## RESEARCHERS/TEAM MEMBERS

A. Y. Mahachi; T. Mushiri

## PROJECT DESCRIPTION

Most people still rely on the use of the traditional methods of cooking which results in large amounts of heat being lost without being utilized. The one pot cookstove is not meeting the customer needs as more time is spent cooking, which can be used for other economic activities. Smoke emissions

are causing respiratory infections leading to a great number of deaths each year. In order to solve this problem, a portable two pot cookstove with a chimney was designed by analysing the performance of other stoves. Information was gathered in the literature review section and technical specifications were given to help come up with concepts. Three concepts were generated and the best was selected using the decision matrix method. The best solution was further developed by analysing each component separately. It is recommended that experiments of the stove be done in both the laboratory and field conditions to evaluate the performance of the stove before it is marketed.

### **CONTRIBUTION TO ZIM ASSET: INFRASTRUCTURE AND UTILITIES**

The design of an improved wood cookstove for the entire Zimbabwe is of great help in the development of modern infrastructure and utilities, adding value to resources like firewood and beneficiation and also in the reduction of poverty to rural population and also to some urban ones that can use the woodstove.

### **TITLE OF PROJECT: INFRASTRUCTURE AND UTILITIES**

*Design of energy optimising electric vehicle drive train*

### **RESEARCHERS/TEAM MEMBERS**

N. B. Moyo; S. Chinguwa; T. Mushiri

### **PROJECT DESCRIPTION**

The love for green technology has been the drive to this project and has appreciated a lot in this field, electric car might be a big step for a country that is from the greatest depression in history and initiative towards this line is essential. Conventional vehicles are powered by the internal combustion engine (ICE) hence called internal combustion engine vehicles (ICEVs) whereas when wheels are powered by an electric motor, the vehicle is called the electric vehicle (EV). A combination of the two gives a vehicle named the hybrid electric vehicle (HEV). Electric vehicle have been around for more than a century now but have been failing emerge from the surface and make it into the market, but due to the recent increase in energy demand and prices, environmental management systems (EMS) and the ISO 14000:2004, electric vehicle have been the new kid in the block promoting new companies to enter the car manufacturing industry. Global standards and government policies have been in favor of this new

line of car manufacturing as some countries are offering capital investments to this industry.

The heart of every vehicle is its drivetrain hence before the big picture of an electric vehicle comes into play it is the drivetrain of an electric vehicle that is important because that is what differentiate it from the internal combustion engine cars. The transition of electric cars from internal combustion engine cars (gasoline cars) is simply a transition of their drivetrains meaning in the quest of designing an electric vehicle we have to design a drivetrain everything else left out is similar to that of an internal combustion engine vehicle.

### **CONTRIBUTION TO ZIM ASSET**

The thermal efficiency of internal combustion engine (ICEs) ranges from 25%-30%, this means that about 70%–75% of the energy is lost as heat in the combustion cylinders which will later be lost to the atmosphere via the exhaust gases and the radiator. The efficient of the combustion engine is low such that a greater percentage of what we pay for is not useful to us. The ICE converts about 17%-21% of the energy in the gasoline to the power the wheels whereas electric vehicle convert 57%-61% of the electricity in the grid to power the wheels. The electric car will contribute to value addition and beneficiation and utilities. Poverty can be eradicated as well as people can afford a car with more kilometres to move without recharging.

### **TITLE OF PROJECT**

*The design of a rocket wood stove operating on twigs*

### **RESEARCHERS/TEAM MEMBERS**

C. Musora; S. Chinguwa

### **PROJECT DESCRIPTION**

As a way to cope with unpredictable electricity power cuts that are undoubtedly a defining characteristic of the ongoing socioeconomic crisis in Zimbabwe, many Zimbabweans living in both urban and rural areas have resorted to the use of alternative cooking method , water and even space heating and to a lesser extent for lighting purposes. These include the Rocket Wood Stove (tsofso, in Shona) which on the record is known to require less labour with some considerable energy saving characteristics.

Traditionally rural locals as well as low-income households have always relied on fuel wood using the open fire system (three stone fires), which usually chews up loads of firewood, thereby jeopardising the environment as compared to the Rocket Wood Stoves. Also in urban areas firewood is scarce and is usually bought at exorbitant prices.

### **CONTRIBUTION TO ZIM ASSET: INFRASTRUCTURE AND UTILITIES**

The design of a rocket wood stove for the entire Zimbabwe is of great help in the development of modern infrastructure and utilities, adding value to resources like firewood and beneficiation and also in the reduction of poverty to rural population and also to some urban ones that can use the stove.

### **TITLE OF PROJECT**

*Investigating the biogas potential from the anaerobic digestion of food waste at the University of Zimbabwe main campus*

### **RESEARCHERS/TEAM MEMBERS**

P. Mutekwa, Z. Hoko; S. N. Misi

### **PROJECT DESCRIPTION**

With a large student population residing on campus, the University of Zimbabwe produces a lot of waste, most of which is organic in nature and can potentially be used to produce biogas, a useful form of energy which can be used for cooking and heating. During Semester time, the UZ campus produces on average 1500-2000kg of food waste daily. Most of this is currently disposed of at the Pomona dumpsite, contributing to the burden on the dumpsite. It has been said that up to 120m<sup>3</sup> of biogas can be produced from the anaerobic digestion of 1000kg of food waste, indicating the potential to produce more than 200m<sup>3</sup> of biogas from the campus waste on a daily basis. While biogas production from animal waste or sewage sludge is proven technology; however research on the anaerobic digestion of food waste in Zimbabwe is still ongoing. Thus, this project sought to investigate the potential of producing biogas from the anaerobic digestion of food waste at UZ. The waste was characterized and digested in batch and continuous reactors under different conditions to determine the optimum operational parameters for digestion, It was concluded that with proper operational control of the digesters, there is great potential for harnessing biogas from the food waste at UZ. A 200m<sup>3</sup> fixed dome

digester was designed for the campus. If implemented, this project has the potential to supplement the fuel for cooking at UZ.

### **CONTRIBUTION TO ZIM ASSET: INFRASTRUCTURE AND UTILITIES**

This project contributes to the several aspects of the Zim Asset blueprint. It demonstrates the production and use of bio-fuels (biogas), assists in the management of pollution and waste, and promotes the increased usage of alternative and renewable energy forms of energy. The implementation of a full scale plant at UZ would contribute towards the Biogas digesters programme for institutions which Zim Asset calls for.

### **TITLE OF PROJECT**

*Algae removal from drinking water by a Dissolved Air Flotation (DAF) system. A case study of Lake Chivero water*

### **RESEARCHERS/TEAM MEMBERS**

F. Mwaisowa, Z. Hoko; S. N. Misi

### **PROJECT DESCRIPTION**

Algae, the green aquatic plant found in water exposed to sunlight, is one of the main pollutants that need to be removed during the treatment of water for drinking purposes. The lysis or breaking down of algal cells during conventional water treatment can release toxins, which may have health implications on the consumer of the treated water. In recent years, Lake Chivero, the main source of drinking water for Harare the capital city of Zimbabwe, has experienced high algal blooms due to the high pollution (eutrophication) levels in the lake, which have resulted mainly from sewage discharges within the lake's upstream catchment. The poor raw water quality has resulted in increases in water treatment chemical doses at Chivero's Morton Jaffray (MJ) Water Treatment Plant (WTP), which is reported to be spending about US\$3 million per month in chemicals for water treatment. While various methods- among them the use of Alum and algaecides- have been applied at MJ, in an attempt to easily and cheaply remove algae during drinking water treatment, most methods have either been too expensive or were found to be not effective. The main objective of this study was to investigate the use of the dissolved air flotation (DAF) system to remove algae during drinking water treatment. Raw and treated water was characterised in terms of turbidity, pH, conductivity, TDS and Chlorophyll a concentration. Test runs were carried

out in a 60 litre bench scale DAF model, which included a hydraulic float removal method. Key parameters such as the coagulant dosage, the recycle rate and the bubble size were investigated to determine the optimum conditions for algal removal. Results showed a 65% turbidity removal and a 95% removal of chlorophyll  $\alpha$ . The bench scale DAF model showed a significant algae removal. Design of a full scale DAF system for MJ was attempted. This incorporated flotation after the flocculation and coagulation stage within the treatment scheme. It was concluded that a DAF system can significantly be incorporated to remove algae at MJ WTP, and this would have various advantages over the current system.

### **CONTRIBUTION TO ZIM ASSET: INFRASTRUCTURE AND UTILITIES**

Zim Asset promotes a renewed thrust towards the rehabilitation and rejuvenation of infrastructure and utilities especially in the water and sanitation sector. This project contributes to the rehabilitation of the Harare water supply and wastewater treatment plants which is specifically mentioned under the Infrastructure and Utilities Cluster in Zim Asset. It is known that poor water quality has constrained many utility providers, including the City of Harare, because the lack of confidence from consumers has resulted in unwillingness to pay for water. Once treatment plants are rehabilitated, revenue generation by the water utility providers will be boosted.

### **TITLE OF PROJECT**

*Comparison of Different Coagulants for Treating Chivero Water and Design of a Prototype Coagulation-Flocculation System for Morton Jaffray Water Works*

### **RESEARCHERS/TEAM MEMBERS**

L. Manganye, Z. Hoko; S. N. Misi

### **PROJECT DESCRIPTION**

Lake Chivero, the main source of drinking water for Harare the capital city of Zimbabwe, is a highly polluted lake, mainly due to upstream sewage discharges. The growth of algae resulting from excessive pollution has become problematic. Consequently, this has led to large increases in water treatment chemical demand, especially that of alum, at Chivero's Morton Jaffray (MJ) Water Treatment Plant (WTP). This has manifested as a general deterioration of drinking water quality for consumers in Harare. While

aluminium sulphate (alum), has traditionally been used as the main coagulant at MJ WTP, it is known that the current high demand for alum has largely contributed to high water treatment costs, not mentioning the environmental and human health implications of its use. This study investigated the use of alternatives coagulants which have been reported to be used elsewhere for heavily polluted water, such as that found in Lake Chivero. The study sought to compare different coagulants available on the market, so as to recommend the most suitable coagulant for treating Chivero water. The study then sought to design a prototype coagulation-flocculation-sedimentation system for Morton Jaffray water treatment plant and to test the performance of the most suitable coagulant in the prototype. Experiments were carried out on four selected coagulants, namely *PAC*, *Primco 100*, *Zetafloc 4030*, and *APAC*. *Alum* acted as the control. Flocculation tests were carried out using flocculators in batch and continuous flow modes. Critical parameters such as turbidity, pH, colour, electrical conductivity (EC) and total solids (TS) and algal concentrations were monitored for the raw and treated water. Results showed that all the four proposed chemicals had an advantage over Alum in that, unlike alum, *Primco 100*, *Zetafloc 4030*, *APAC* and *PAC* did not alter the pH of the raw water, thereby doing away with the need for pH adjustment chemicals that are traditionally used together with alum, thus ultimately reducing treatment costs. It was found out that *Primco 100* performed the best in treating raw water from Lake Chivero, with the optimum dosage being 30 mg/L. It was concluded that *Primco 100* would be the most suitable coagulant for treating Lake Chivero water, and that MJ WTP should consider its use as an alternative to alum.

### **CONTRIBUTION TO ZIM ASSET: INFRASTRUCTURE AND UTILITIES**

Zim Asset calls for urgent and immediate attention to be given to, among others, the key infrastructural areas of water and sanitation. This project contributes to the revamping of Harare's water supply. The costs of water treatment will be reduced, thus improving the financial position of the water utility.

### **TITLE OF PROJECT**

*Development of a mines information system prototype*

### **RESEARCHERS/TEAM MEMBERS**

K.K. Nyandoro, R. Maruziva, F. Chikomf

## PROJECT DESCRIPTION

The current paper based system that is being used for storage of data is prone to wear and tear thus not a sustainable means of storage of mine records. It also involves problems of double title allocation and overlapping of mine claims thus reinforcing the need to come up with a more advanced GIS solution for claim record keeping.

The Mines Information System prototype would manage claim records digitally whilst linking each record to its spatial information. This system enables checks in claim entry that are meant to solve the problem of overlapping and double allocation of claims. Decentralization of data on claims was accomplished through the published public mines map that disseminates data from the web. The database can be accessed over a network which aids maintenance from a central point but is still accessible to different departments of the ministry of mines which makes administration easier.

## CONTRIBUTION TO ZIM ASSET: PUBLIC ADMINISTRATION, GOVERNANCE AND PERFORMANCE MANAGEMENT SUB-CLUSTER

Basically the desired system would allow the ministry of mines to serve their clients in a faster and more accurate manner and at the same time making sure the records are sustainable for future generations. Data of claims can be accessible from all places in the country thus saving travel money and time. This provides improved control of mining activities in the country.

## 4. BENEFICIATION AND VALUE ADDITION



*Several projects under Food Security and Nutrition also fall under this category*

**TITLE OF PROJECT**

*Scientific Evaluation and Validation of Efficacy for Medicinal Plants from Zimbabwe.*

**RESEARCHERS/TEAM MEMBERS**

B. Moyo, S. Sithole, R.V. Mautsa, T. Chimponda, E. Chirisa, T. Chitemerere, R. Mangoyi and S. Mukanganyama

**PROJECT DESCRIPTION**

Zimbabwe is a rich source of plants that are used to treat many ailments but is also a high burdened country with regards to HIV/AIDS infections and has the second highest mortality TB rate in the world. This project is designed to provide a scientific basis to the plants already used for traditional purposes as well as probe for new anti-infective constituents so as to make new medicines. The main thrust of the research is to investigate the interaction of cellular biomolecules with a variety of chemical species that include drugs, novel plant medicinal compounds, carcinogens and environmental pollutants.

**CONTRIBUTION TO ZIM ASSET: VALUE ADDITION AND BENEFICIATION**

Medicinal plants are being evaluated for their potential benefits as a source of herbal remedies. These are natural flora of Zimbabwe that risks the danger of becoming extinct due to human activities in resettlement areas. Once the important medicinal plants have been identified, their phytochemicals will be evaluated for biological activities (antibacterial, anticancer, antifungal etc) in the laboratory. This type of research is relevant to Zimbabwe where most people use herbal and medicinal plants, but do not document cases of efficacy and toxicity. Investigating the efficacy of herbal and medicinal plants is a value addition and beneficiation for our natural resources.

**TITLE OF PROJECT**

*Pelletised Phosphate Blends Fertiliser Project*

**RESEARCHERS/TEAM MEMBERS**

L Mlambo, E Mbwera and T Masiya,

## PROJECT DESCRIPTION

Most communal and small-scale, and resettled farmers in Zimbabwe face perennial problems of soil fertility. These farmers cannot afford the expensive chemical fertilizers in the market, and rely on organic (mainly cattle) manure. Unfortunately, cattle manure is deficient in important plant nutrients. The Pelletized Phosphate Blends fertilizer works through improving the status of (cattle, poultry, pig and compost) manure.

## TITLE OF PROJECT

***Wealth Creation through Indigenous Medicinal Plant research. From Poison to Medicine: The Boophone Project***

## RESEARCHERS/TEAM MEMBERS

D Tagwireyi, L Gadaga, W Pote, T Tirivangani, P Kadare, P Maposa

## PROJECT DESCRIPTION

Zimbabwe has a rich flora of plants with potential medicinal effects. *Boophone disticha* (Munzepete in Shona; Ingchotho in Ndebele) is a well known toxic plant that has resulted in documented cases of poisoning and indeed death in humans after ingestion of its extracts. However, the plant has also been associated with medicinal use in southern African Traditional medical practice including in Zimbabwe. In this work, using pharmacological and toxicological methods, we highlight how we 'turned' this potentially lethal plant into a medicinal product with potential for use in the management of various neuropsychiatric illnesses including anxiety disorders, depression and memory loss. This project aims to provide a possible blue-print for the development of herbal medicines from indigenous plants of Zimbabwe. Through this work, we intend to show that it is possible to come up with our own home-grown medicinal plant products which have undergone scientific scrutiny.

## CONTRIBUTION TO ZIM ASSET: BENEFICIATION AND VALUE ADDITION, SOCIAL SERVICE-HEALTH

This project falls squarely within the Zim Asset under the Value Addition and Beneficiation Cluster, with the key cluster result area being Human Capacity Building and Development and the cluster outcome being increased indigenous intellectual property, registration and promotion of indigenous knowledge system. This project provides a blue-print on which

future projects aimed at producing herbal and other products from our indigenous plants can follow. This project will produce intellectual property from products derived from our own indigenous plants and promote indigenous knowledge systems with respect to medicinal plants in Zimbabwe.

### **CONTRIBUTION TO ZIM ASSET: VALUE ADDITION AND BENEFICIATION**

The contribution of this project to Zim Asset is in three forms: (1) improvement of soil fertility contributes to better food security and nutrition; (2) the project is instrumental in poverty reduction because the targeted beneficiary groups are mainly the poorly-resourced rural farmers; and (3) the production of the fertilizer is a process of benefiting local Dorowa Phosphate Rock and livestock manure.

### **TITLE OF PROJECT**

*Unleashing Zimbabwe's Development Potential through Value Addition and Beneficiation of Agricultural products*

### **RESEARCHERS/TEAM MEMBERS**

P. G. Kadenge, T. Mumvuma, T. J. Mukura, C. Pindiriri, R. Makoto, & E. Muhoyi

### **PROJECT DESCRIPTION**

The project seeks to demonstrate how value addition and beneficiation of agricultural products can be used as a strategy to minimize their post-harvest losses and to improve earnings whilst at the same time pushing the Zim Asset national development agenda forward.

### **CONTRIBUTION TO ZIM ASSET**

Beneficiation and Value addition of agricultural products and the establishment of high value market linkages will reduce post-harvest losses thus increasing farmers' profits. This will also increase the farmers' wellbeing through increased savings and investment. Ultimately, improved agricultural development will be enhanced.

### **TITLE OF PROJECT**

*IMR Contributing Towards Beneficiation in Mining and Minerals*

### **RESEARCHERS/TEAM MEMBERS**

L Mlambo, T Masiya and S. Kahwai

## PROJECT DESCRIPTION

The Institute of Mining Research (IMR) has been involved in various research that seek to influence policy on the mining sector in Zimbabwe, as well as activities to raise awareness on cleaner technology options in processing of gold. The research include: (1) Mineral Beneficiation: Maximizing the Benefits; (2) An Exploratory Investigation of the Economic Impact of Mining; (3) A Critical Review of the Mining Fiscal Regime in Zimbabwe: Towards an Optimal Structure; (4) Contribution of the Mining Sector to the Economic Development of Zimbabwe; and (5) A Critical Review of Mining Policy in Zimbabwe. IMR has undertaken a project on Community Awareness on Hazards of Exposure to Mercury — Cleaner Gold Processing Technologies in the Kadoma-Chakari District of Zimbabwe.

## CONTRIBUTION TO ZIM ASSET:VALUE ADDITION AND BENEFICIATION

This research contribute to Zim Asset in various ways including: (1) highlighting the technical aspects of the possible beneficiation options and strategies within the key mineral resource sectors; (2) examining the ways in which the mining sector linkages, including downstream mineral value-addition may be optimized for broad-based sustainable development of the country; (3) examining the mining fiscal regime and how it can be used to yield much needed revenue for government programmes (including exploration, mining and mineral processing) while maintaining a competitive private business environment for establishment of mines and beneficiation facilities; and (4) creating awareness among artisanal and small-scale miners on cleaner ways of extracting gold.