

# Inspiring™ UG



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# AGRICULTURAL COMMERCIALISATION PATHWAYS: COCOA AND PALM OIL



Prof. Joseph Yaro



Dr. Fred Dzanku

Agriculture is the single largest employer of labour in Ghana, particularly in rural areas. The poverty reduction potential of agriculture depends, in part, on boosting incomes and generating inclusive growth in Ghana's rural areas by accelerating processes of agricultural commercialisation.

There are multiple pathways to commercialisation, each with its unique and potential benefits and costs for different groups. However, evidence of which pathways are more 'pro-poor', support the empowerment of women and girls or enhance food and nutrition security is limited. Clarifying which pathways to agricultural commercialisation are most effective at reducing rural poverty and inequality, improving nutrition and food security is a subject of interest for **Professor Joseph Yaro** (Regional Institute for Population Studies) and **Dr. Fred Dzanku** (Institute for Statistical, Social and Economic Research).

To address this question, Prof. Yaro, Dr. Dzanku and other researchers at UG are engaged in a five-year research project, as part of a multi-country research under the Agricultural Policy Research in Africa (APRA) consortium funded by the Department for International Development (DFID), UK.

The APRA project is being carried out under several Work Streams (WS). The Ghana component encompasses ongoing field research under two work streams. WS1 aims to understand the outcomes of different models of oil palm commercialisation in South Western Ghana, and why farmers choose or are excluded from the different types of commercialisation models, while WS2 explores, through the lens of cocoa production, how different pathways of agricultural commercialisation have evolved over time.

While cocoa is the single most important non-food cash crop for Ghana, oil palm was Ghana's

first internationally traded cash crop with most of the country's export revenue accruing from the crop in the 1880s. Oil palm has an extensive domestic value chain with potential impact on employment and poverty reduction.

Preliminary findings from WS1 includes the following:

- **High commercialisation rates:** Farming in oil palm producing areas of South Western Ghana are highly commercialised due to increased levels of specialisation in non-food cash crops. This translates into moderately high per capita incomes, although this is not always associated with better food security and nutritional outcomes.
- **Highly stratified oil palm economy:** The nature of participation and benefits accruing from engagement in the oil palm economy is extremely stratified, and potentially perpetuates inequality—the relatively wealthy are able to benefit from value addition while the poor are at the mercy of oil palm companies.
- **High levels of informality:** The commercial relationship between farmers and oil palm companies is very informal, with highly unbalanced power relations that sometimes translate into unfair prices received by farmers, particularly women who are more likely to be resource poor.
- **The importance of trust:** Breakdown of trust among participants in the oil palm economy of western Ghana, results in serious market friction.



# ASSESSING RISK POSED BY UNCONVENTIONAL RECYCLING OF ELECTRONIC WASTE

Global patronage of electrical and electronic technology creates a significant stream of waste in electrical and electronic equipment (WEEE). The plethora of WEEE presents many challenges for society, especially in the area of recycling and disposal.

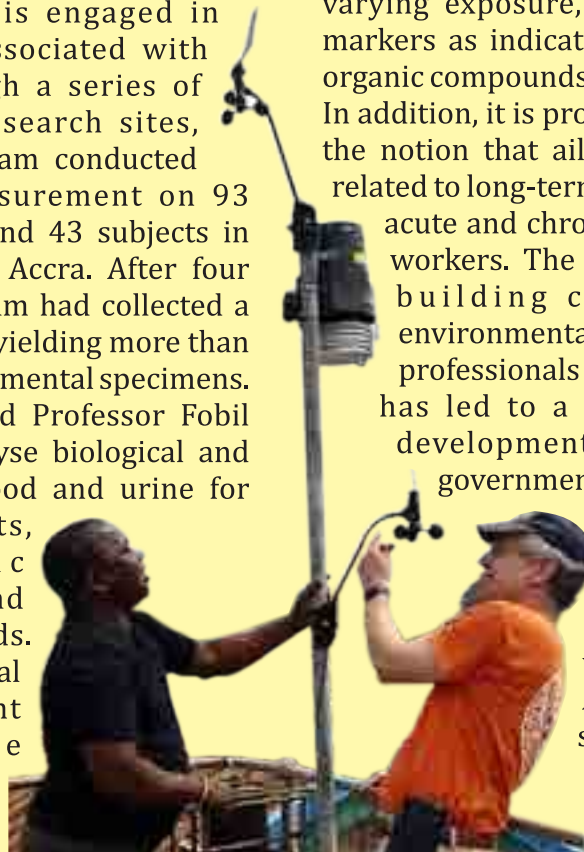
In West Africa, where unconventional techniques are used to recover components considered valuable from WEEE, concerns have been raised about the adverse environmental effects on human health. The West African Global Environmental and Occupational Health (GEOHealth) project has established a Hub for environmental and occupational health, that seeks a multi-disciplinary understanding of the environmental and occupational health (OH) risks associated with the recycling of WEEE in the Agbogbloshie scrapyards in the Western part of Accra.

**Professor Julius Fobil**, Dean of the School of Public Health, leads the West African Hub of the GEOHealth project and is engaged in exploring the dangers associated with electronic waste. Through a series of sampling mop-ups in research sites, Professor Fobil and his team conducted multiple rounds of measurement on 93 subjects at Agbogbloshie and 43 subjects in Madina-Zongo, suburbs in Accra. After four rounds of sampling, the team had collected a total of 608 person-rounds yielding more than 2,400 biological and environmental specimens. These assessments allowed Professor Fobil and his colleagues to analyse biological and organic compounds in blood and urine for metals, flame retardants, polycyclic aromatic hydrocarbons (PAHs), and dioxins-related compounds. They also deployed personal air-monitoring equipment that used real-time measurements and filter-



based size-specific sampling techniques to identify and quantify airborne contaminants. Other data collected include: carbon dioxide (CO<sub>2</sub>) levels, temperature, humidity, measure of volatile organic compounds (VOCs) in the air and assessment of environmental health variables; they also collected particle matter, temperature, humidity and other climatic variables.

The Hub is identifying work-related, time-varying exposure, and assessing biological markers as indicators of exposure to metals, organic compounds and combustible products. In addition, it is providing evidence to support the notion that ailments such as cancer are related to long-term exposure, and also lead to acute and chronic respiratory illnesses in workers. The Hub is also committed to building capacity for both its environmental and occupational health professionals and its study subjects. This has led to a partnership with GIZ, a development agency of the German government. The combined efforts of the Hub and GIZ resulted in the opening of the old Fadama Clinic and Training Facility for e-waste workers at the Agbogbloshie e-waste scrapyards in Accra.



Prof. Fobil & Prof. Batterman (University of Michigan) mounting a weather monitoring station.



# FORTIFICATION: A PROVEN PILLAR FOR ADDRESSING HIDDEN HUNGER



Prof. Matilda Steiner-Asiedu

Malnutrition, which manifests as overnutrition, undernutrition and hidden hunger (micronutrient deficiency), remains a challenge globally: despite decades of efforts to address the situation. Hidden hunger puts individuals at risk in several ways, leaving them vulnerable to morbidity, pregnancy and birth complications, poor birth outcomes and birth defects, and even death. Vitamin A and iron are two micronutrients of global health importance, deficiencies in these micronutrients affect all segments of the population, but are skewed especially towards women of child-bearing age and children under five years of age. The Cost of Hunger in Ghana report in 2016 revealed that an estimated GH¢4.6 billion was lost to the economy because of hidden hunger in children. This translated into a 6% loss of national per capita income that year, exacerbating an already adverse situation.



Against this backdrop, **Professor Matilda Steiner-Asiedu**, of the Department of Nutrition and Food Science, is collaborating with colleagues at the University of Ghana, Washington State University, and the International Institute of Tropical Agriculture (IITA) in an effort to address the phenomenon. Other stakeholders include industry players in food production, such as Nestle Ghana, the Hershey Company, (USA), and Project Peanut Butter (Ghana).

The team has carried out bio-fortification of cassava, a staple food of most communities in Ghana, using breeding techniques to produce bio-fortified yellow-fleshed Cassava (YFC) varieties with high carotenoid content. The carotenoid content of fresh cassava roots, processed products (gari and kokonte) from the roots, including the iron and zinc contents of the cassava leaves has been profiled and further work is ongoing on their bio-availability. Now bio-fortified, the cassava has the potential to contribute significantly to food and

nutrition security because of the additional advantage of its edible leaves. The leaves serve as an excellent source of protein, vitamins (B<sub>1</sub>, B<sub>2</sub>, C) and essential minerals (iron and zinc).

Professor Steiner-Asiedu extends the impact of this work by collaborating with the Ghana School Feeding Programme (GSFP), a governmental initiative that provides free meals to children in public schools. The fortification of peanut-based snacks (VIVI™) with vitamins and minerals as an adjunct to the Feeding Programme comprised an intervention to improve the general nutrition of school children, with special emphasis on combatting anaemia. This work was funded by the Hershey Company (USA) and carried out in collaboration with the GSFP, Ghana Education Service, the Ghana Health Service and Project Peanut Butter; children enrolled in the GSFP were fed with an additional daily ration of a highly fortified peanut-based snack for 8 months. The findings showed that the fortified snack, VIVI™, improved the haemoglobin concentrations, reduced the prevalence of anaemia, improved cognition as well as some anthropometric indices of the study participants.

Professor Steiner-Asiedu has been involved in another research project targeting complementary feeding among children, quantifying the effect of iron-fortified infant cereal on improving the nutritional status of children 6-18 months of age. The primary outcome was improved haemoglobin levels, in a study that took place in four peri-urban communities in the La Nkwantanang District of the Greater Accra Region. The iron-fortified infant cereal significantly increased the mean haemoglobin concentrations from baseline to endline. The findings indicated significant reduction in the prevalence of anaemia among the children receiving the fortified cereal. Evidently the iron-fortified cereal has the potential to mitigate anemia deficiency among children.

## Akan Body Part Expressions Related To Pragmatic and Cognitive Semantics

Two aspects of the field of linguistics that have generated interest around the world are pragmatics and cognitive semantics. The strong interface between linguistics and cognitive psychology has been expressed in a book entitled *Akan Body Part Expressions: A Cognitive Semantics and Pragmatic Approach*. **Professor Kofi Agyekum**, Acting Dean of the School of Performing Arts, uses verbs of perception and their associated parts-of-the-body metaphors to delve into the Akan worldview regarding the interconnectedness between mind, body, and language in Akan social interaction. The book draws readers' attention to Akan words for body parts and verbs of perception as rich sources of data for the understanding of Akan language, emotions and worldview. Professor Agyekum notes that in cognitive linguistics, pragmatics and metapragmatics, parts of the body, and verbs of perception are productive in word formation, metaphoric and metonymic derivations.

The metaphors associated with parts of the body provide a window to observe Akan concepts of behaviour, and attitudes to life situations and emotions, especially *happiness, anger, patience, peace, disgrace and honour, cruelty, kindness, stress, relief, glory, dignity, civilisation, hope, vision, obedience, stubbornness, and punishment*.

Professor Agyekum's research indicates that body parts also provide expressions for *honesty, eloquence, yoke, satisfaction, forgetfulness, sorrow, confidence and comfort*. Other emotional concepts in the book that are derived from Akan body parts include *humility, pride, shock, beauty, swiftness, repentance, sacrifice, freedom, confidence, bravery, compassion,*



**Prof. Kofi Agyekum**

*representation, contentment and discontentment, attraction and repulsion, as well as luck and ill-luck.* Such body part metaphors also reflect the Akan philosophies about life and the lenses through which they observe and judge human and non-human actions.

In Akan, the body part expressions and bodily functions are employed in language, pragmatics, metaphors, idioms, media, politics, judiciary, religion, anthropology, sociology, public health, mental health, psychology, psycholinguistics, music, dance and theatre, as well as in our daily conversations.

The book is a pacesetter in lexicology, cognitive semantics, ethno-semantics and ethno-pragmatics of Akan studies from the “inner cultural perspectives”. It argues a strong relationship between bodily, conceptual, environmental and cultural experiences, and their linguistic systems.

According to Professor Agyekum, the deeper he delves into this area, the more he cherishes the Akan language and is encouraged to probe even further. He notes that he still does not understand how the ancestors of the Akan language conceptualised these words around the body parts, and used the body parts in proverbs, as well as in *adinkra* and other textile symbols.



# DEVELOPING YOUTH ENTREPRENEURSHIP THROUGH SPORT

The development agenda for Africa has witnessed cycles and models aimed at harnessing the wealth of resources that have largely been underutilized. A vital component of Africa's human capital regards the teeming youth who make approximately 50% of the continent's population.

The last two decades have seen a surge in policy frameworks, programmes, and research targeted specifically at African youth development. These interventions are driven by concerns about youth unemployment, underperforming education systems, low transition rates to college and, in many cases, youth despondency. With the fears of youth disaffection and a high threat of radicalization, sporting activities, a dominant pastime for African youth, promises to be a potential outlet valve.

At the Department of Physical Education and Sports, success in sporting activity is being harnessed into development through a project titled *The African Alliance for Youth Sport and Entrepreneurship (AAYSE)*. The project is a sport-based positive youth development (PYD) programme to nurture life skills and entrepreneurial mindsets in youth in Ghana, Botswana, and Tanzania. **Professor Reginald Ocansey** and **Dr. Clement Adamba** of the School of Education and Leadership are working with colleagues, from Michigan State University, (Dr. Leapetswe Malete and Dr. Daniel McCole), University of Dar es Salaam (Dr. Cyprian Maro and Ms. Juliana Machuve) and University of Botswana (Dr. Tshepang



Prof. Reginald Ocansey



Dr. Clement Adamba

(Tshube and Mr. Thuso Mphela) to inspire youth of Africa to assume entrepreneurial mindsets and life skills through sports.

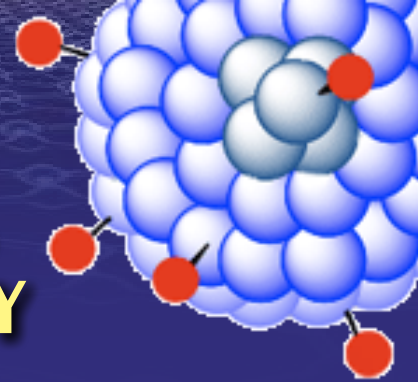
This project makes a case for a sport-based PYD approach to nurturing life skills and entrepreneurial mindsets in youth because:

1. Sport is ubiquitous, offers health benefits, and numerous transferable life skills that overlap with entrepreneurial mindsets, such as resiliency, creativity, goal setting, and risk taking.
2. Youth unemployment and the skills mismatch are significant, with limited attention paid to entrepreneurial mindset development in education systems across Africa.
3. The fourth industrial revolution and constantly shifting job markets underscore the importance of softskills and entrepreneurial mindsets.

The cross-cultural context of the project that links college-level student learning to the research process and the retention of participant entrepreneurial mindset behaviours and life skills, underscores the strength of this study.



# DEVELOPING pH SENSITIVE NANOCARRIERS FOR DRUG ENTRAPMENT AND DELIVERY



The efficacy of drugs and precision of remedial effects are key considerations in the choice of medication. Drug entrapment and the efficiency of targeted release constitute important aspects of overall health care and longer-term recovery.

Disease resistance to drugs and the side effects associated with drug uptake provide new avenues for developing nanocarriers. Nanocarriers improve drug efficacy by presenting as vehicles for targeted release through the blood stream to sites where the drugs are most needed. Sustained and controlled release of a drug is considered a most effective way of treating diseases, as it enables the drug to maintain its efficacy by resisting degradation, and release to other non-targeted tissues. Thus, encapsulating a drug into bio-compatible materials can reduce “burst release”, a common phenomenon where an initial high dose of a deliverable drug is made available to tissues and organs upon first contact, and forments reduced efficacy through degradation within a short period.

**Dr. Elvis Tiburu and Dr. Bernard Asimeng** of the Department of Biomedical Engineering are leading a group of scientists developing different nanoparticles with locally-sourced biopolymers from bacteria, fungi and algae. They are testing drug uptake and release profiles towards selected cell models. The team includes scientists from the Department of

Materials Science and Engineering, (Dr Emmanuel Nyankson), the Department of Biochemistry, Cell and Molecular Biology, as well as the West Africa Center for Cell Biology of Infectious Diseases (WACCBIP), (Dr Lilly Paemka, Dr Patrick K. Arthur and Prof. Gordon Awandare). Together, they are engaged in the synthesis of nanocarriers using biopolymers such as chitosan, cellulose, gelatin and selected clay minerals. To use the nanocarriers for therapeutic purposes, the drug is either weakly bound on the particle surface or is incorporated into the matrix of the particle. They are examining the loaded nanocarriers to investigate cell growth upon drug release, based on either pH or external stimuli. The drug release rate from the polymer-coated nanocarriers will be tested at stomach pH (1.3) and intestine pH (7.4) conditions.

The University of Ghana's Research Fund (UGRF) administered through the Office of Research, Innovation and Development (ORID), provided initial funding for the research, with additional support from the Wellcome Trust and the World Bank.

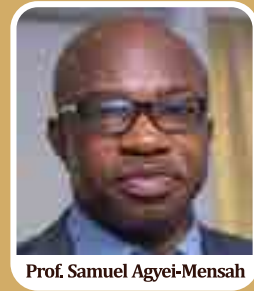
The outcome of the work will lead to the development of effective drug delivery technologies for both infectious and chronic disease treatment using the pH sensitive probes. The success of nanoparticle-based drug delivery, however, relies on further studies to understand the stability of nanocarriers in the body.



**Dr. Elvis Tiburu** (second from left) & **Dr. Bernard Asimeng** (second from right)



# CREATING PATHWAYS TO EQUITABLE HEALTHY CITIES



The focus on air and noise pollution as public health risks in sub-Saharan African cities like Ghana's capital, Accra, has gained currency in recent times due to increasingly high levels of pollution. In this regard, scientists are exploring innovative strategies to reduce the harmful levels of pollution to the barest minimum.

At the University of Ghana, **Professor Samuel Agyei-Mensah**, Professor of Geography and Provost of the College of Humanities, together with an international consortium of academics is working on the collection and analysis of city-wide data on the causes, localities and patterns of pollution levels as part of the *Pathways to Equitable Healthy Cities* project. The project seeks to improve health and reduce inequalities in the cities of Vancouver, Accra, London, Tehran, Dhaka and Beijing through innovative pathways.

From the project's activities, relevant scientific evidence will be generated on the management and structure of urban development in a more sustainable way. With funding from the Wellcome Trust through the *Our Health, Our Planet Scheme*, Professor Agyei-Mensah's team has designed and is implementing an innovative measurement campaign to collect and evaluate data on the sources of air and

noise pollution across over 100 diverse locations in the Greater Accra Metropolitan Area (GAMA). The *Pathways* team in collaboration with residents in the project sites, has installed robust and environmentally friendly monitors to capture weekly periods of noise and air pollution (PM2.5) levels, and to collect audio for types of urban sounds and imagery to indicate sources of pollution.

The team employs audio recorders and machine learning models to categorise different types of sound and to differentiate between, for instance, birds and cars. Innovative transport engineering techniques have been adopted, using small time-lapse cameras to record sources of pollution and how these vary over space and time. Out of the exercise, a modelling and mapping prototype for air and noise pollution will be generated and sources of pollution identified across the entire Greater Accra Metropolitan Area.

These maps will assist in strategic intervention and policy planning by enabling the identification of the precise location and time of rampant air and noise pollution, and the most affected areas, both of which should facilitate development of mitigation plans and policies to improve the health and well-being of residents at the project sites.



# Towards the Development of Synthetic Tetraoxane for a Single Dose Cure for Malaria



Malaria remains a hazard for SSA populations, with little hope of its total eradication. Despite knowledge of how the disease manifests and the countless remedies proffered, malaria persists as a silent killer, with two million reported cases of infection in 2017.

**Dr. Richard Amewu** of the Department of Chemistry, and colleagues at the University of Liverpool (UoL) and the Liverpool School of Tropical Medicine (LSTM), are collaborating with a global network of scientists, to develop a molecule that has the potential to become a fully-synthetic, single-dose treatment for malaria.

Semi-synthetic artemisinin combination therapies (ACTs) are currently the mainstay for the treatment of malaria. However, artemisinin resistance in *Plasmodium falciparum* is threatening their application. Full-blown artemisinin resistance could lead to complete treatment failure, resulting in a global health catastrophe. Recently, it has been established that mutation in the gene encoding a protein located in a portion named kelch K13 is the primary marker of artemisinin resistance in *Plasmodium falciparum* malaria. This development threatens the long-term clinical utility of artemisinin-based combination therapies, the cornerstone of modern-day malaria treatment. Kelch proteins are involved in a variety of protein-protein interactions. These mutations allow the parasite to survive exposure to drugs at the early-ring stage of red blood cell infections, even at supra-pharmacological drug concentrations.



**Dr. Richard Amewu**

The team of researchers, whose work is supported by Medicines for Malaria Ventures (MMV) and partners, is seeking an alternate drug that would retain its effectiveness against parasites with the known genetic markers of resistance while maintaining fast-acting properties. The structure of artemisinin (obtained from the Chinese plant *artemisia annua*) contains a peroxide bond (**O-O**) that has been established to be responsible (pharmacophore) for its biological activity. The new drug candidate (purely synthetic, and prepared from commercially available materials in the laboratory) was designed to mimic the peroxidic (**O-O**) bond in artemisinin by incorporating two peroxide moieties (**two war-heads**) to give it a better chance to kill the malaria parasite faster.



*Artemisia annua* (google image)

Through medicinal chemistry optimization the researchers have discovered a new drug candidate with excellent stability, potency and pharmacokinetics. The drug candidate is effective against parasites expressing the key genetic marker PfK13-C580Y for artemisinin resistance in *in-vitro* studies.





# AGRICULTURAL EXPANSION: IMPACTS AND TRADE-OFFS



**Dr. Dora Neina**

The rising food demand and changes in consumption patterns due to rapid population growth and high rates of economic development in sub-Saharan Africa (SSA) exceed those of other regions of the world. It is estimated that 25% of the forest decline in SSA between 2000 and 2010 was due to the conversion of forests to arable land. This has adverse effects on above-ground and below-ground biodiversity, which is critical for the relatively fragile soils and the impacts of climate change in SSA.

*Dr. Dora Neina*, of the Department of Soil Science, is exploring the decision-making and advocacy required to better understand the risks and trade-offs relating to the socio-economic and environmental dimensions of agricultural development, principally in light of the projected regional climate changes.

In particular, the role of biodiversity in delivering vital ecosystem services to people and agriculture, needs a better co-articulation against the backdrop of food production in Africa. Research, to date has addressed these dimensions in isolation, and it is now critical to integrate research efforts across relevant disciplines. This will be achieved through the Sentinel Project (Social and Environmental Trade-offs in African Agriculture) a collaborative inter-disciplinary research project under the UKRI's Global Challenges Research Fund, led by the International Institute for Environment and Development, UK. Sentinel is implemented in Ethiopia, Ghana and Zambia and works with a wider network of

stakeholders and universities across Africa to share lessons and build capacity. The project's goals are to:

1. **Generate new knowledge** on the impacts, risks and trade-offs within and between social, economic and environmental dimensions of different agricultural development pathways related to SDGs 2, 10 and 15.
2. **Strengthen collaborative research partnerships**, to maximize responsiveness to development challenges and foster a deeper understanding of sustainable development in sub-Saharan Africa.
3. **Enhance the research capacity** of UK and African researchers to investigate sustainable development challenges.

Sentinel is implemented by a partnership of 10 organizations in the UK and Africa. Dr. Neina is Lead Researcher for the Ghana component of the project. In the past two years, the project has conducted a contextual analysis of agriculture development in Ghana; engaged with stakeholders from government, private sector, civil society, and researchers through scenario development workshops which produced four alternative futures (scenarios) of Ghana's agricultural development. The scenarios were built using two indirect drivers i.e. (Climate variability and Quality of governance). The four scenarios are: Scenario 1 - Agricultural Livelihoods on the Edge, Scenario 2 - Crisis in Paradise, Scenario 3 - Honey Bee, Scenario 4 - Nsem ara nko ('a lot of issues').

# “Sitting on a

In recent times the rampant spread and mechanization of illegal artisanal mining (*Galamsey*) has been a subject of consternation to Ghanaians, gaining considerable public attention because of the lasting damage to the environment.

In response to this menace, colleagues at the university created the 'University of Ghana Mining Research Group (UGMRG)'. The multi-disciplinary team includes **Professor Chris Gordon** and **Dr. Jesse Ayivor** (Institute for Environment and Sanitation Studies); **Professor Nana Aba Appiah Amfo**, **Dr. Gladys Nyarko Ansa** and **Dr. Jemima Asabea Andersen** (School of Languages) as well as **Dr. Nene Kuditcher** and **Dr. John Kusimi** (School of Social Sciences). The group has been working with a team from the University of York, (UK) led by Professor Henrice Altink (Modern History and the Interdisciplinary Global Development Centre).

The researchers are engaged in a project titled: *'Managing small-scale mining: Assessing the potential for a more environmentally-sustainable and socially-inclusive small-scale mining industry in Ghana'*. The project is funded by the Global Challenges Research Fund (GCRF) UK, through the University of York.

This project explores the historical spread of small-scale mining (SSM), assesses contemporary issues, and offers two scenarios of the future: governance adjustment versus 'business as usual'. The project offers training and mentoring to student researchers.

Gold mining in Ghana is often associated with heavy excavating machines, explosives, and the degradation of vast tracts of land. The devastating effects of both legal and illegal mining activities on the environment, such as



Fig 1: Metal detector in use in Kyebi, Eastern Region (April 2017)



# Gold Mine”



the pollution of water bodies and loss of arable land including cocoa farms, are very vivid and create deprivation in local communities as people lose their means of livelihood.

While community level authorities, like District Assemblies and Traditional Councils, are still grappling with how to deal with the effects of gold mining on the environment, a new method of gold mining, metal-detecting mining, has emerged in some rural communities in the Eastern Region of Ghana. An example of this, was found in the township of Akyem Senkubense in the Atiwa West District, inhabited predominantly by peasant farmers living on the margins of the poverty line.

In the passageways of the town, within the crevices between mud houses and in farms and scrublands around the town, gold is being actively extracted using this new method. This has provided jobs for youth who have no qualifications, making it appear acceptable to both community members and local authorities.

This new method of prospecting for gold was introduced to the area in 2017 by West African nationals from Guinea, Niger and Burkina Faso. It involves portable metal detector devices referred to as *kw3nkw3n* in Akan, after the beeping sound the device generates upon the detection of metal; it detects not only gold but also iron and other metals. This detector is effective only when the metal is within the depth of about half a metre from the surface. (Figure 1.). The method itself is known in Akan as *bɔhwehwɔ*, the Akan translation of “hit and search”.

As no reclamation measures are put in place and no one is held accountable, gold mining by metal detectors leaves evidence of mining activities in most parts of the township. There are visible sites of haphazard excavation of residential areas, open spaces and demolished backyards, which pose a threat to residents and their dwellings, with shallow holes up to one metre deep around some of the structures (Figure 2). Farmlands are not spared as miners dig anywhere gold is detected (Figure 3).

Clearly, the illegally mining sector is rapidly evolving and it is important to use interdisciplinary scoping to assess its socio-economic and environmental impacts.



Fig. 2



Fig. 3



**Dr. Adelina Mensah**

# BUILDING *RESILIENCE* OF *LAKE BOSUMTWI* TO CLIMATE CHANGE

Climatic changes create opportunities for scientific investigation to ameliorate economic and living conditions in communities across the globe. To many fishing communities in Ghana, the adverse effects of climate change on livelihoods forebode the inevitable consequences of inaction. At Lake Bosumtwi (or *Bosomtwe*), in the Ashanti Region of Ghana, the gradual depletion of fish stocks has been precipitated by climate-driven disruptions in the ecosystem, as well as by bad fishing practices as communities make desperate efforts to adapt to declining fish yields.

The Building Resilience of Lake Bosumtwi to climate change (RELAB) is a five-year project that seeks to resolve critical knowledge gaps to promote sustainable management of the lake. The work is being executed through six work packages (WP's) that are integrating lake ecosystem, watershed and fisheries models and livelihood dynamics frameworks. **Dr. Adelina Mensah** of the Institute of Environment and Sanitation Studies, is engaged in this multi-disciplinary project investigating the impact of climate change on Lake Bosumtwi. Funded by DANIDA, the project is undertaking detailed measurements of lake physics, biogeochemistry, primary production, fisheries, land use changes, sedimentation and livelihood adaptive mechanisms, all linked to climate projections.

Lake Bosumtwi, is Ghana's only natural lake. In 2016, it became the country's third reserve listed in the World Network of Biosphere Reserves (WNBR). The lake was formed by the impact of a crater more than a million years ago and has a unique ecological ecosystem that contains the endemic tilapia species (*T. discolor*) as well as well-preserved historical records of ecological and climate change in West Africa and the tropics.

The Lake is a hydrologically-closed basin, meaning that rainfall is the main source of input and the water level fluctuates based on the balance between precipitation (rainfall) and evaporation. These characteristics influence the lake's seasonal physical and chemical conditions that promote fish productivity. In the coolest months of the year (usually in July/August and sometimes in January), ,

a phenomenon known as overturn, where anoxic (oxygen-free), but nutrient-rich, bottom waters mix with the surface waters. This leads to massive fish kills which the fishermen harvest. This also fertilizes the water with accumulated nutrients from the deeper waters and sustain the fish throughout the year with stable food supply.

Over the last decade, however, there has been no significant overturn capable of maintaining the critical coupling between the regular internal nutrient-supply and fish productivity. This has resulted in no fish kills, nutrient deficiency, and a consequent disruption to the onset of the fish growing season. This in turn has impacted negatively on the livelihoods of the 24 surrounding communities with a total population of about 150,000. Due to the low catch, many fisherfolk are resorting to using non-selective fishing gear and toxic chemicals to increase exploitation of the already limited fish stock. In addition, there is increasing pollution and sedimentation in the lake caused by intensified farming activities on surrounding land and expanding tourism facilities, all in a bid to adapt to the low fish catch.

Over the years, many local and international initiatives have attempted to improve the management of the lake though various educational programmes, capacity building in alternative livelihoods, enhancing the tourism potential of the lake, etc. However, successes have been limited due to their inadequate understanding of the individual and/or synergistic effects of climate change and anthropogenic stressors on the lake. Models that link climate, forged with the hydro-dynamics of the lake, fish productivity, and land use, can provide managers with better and more accurate information and tools to understand the resilience of the lake under different scenarios.

Dr. Mensah's partners on the RELAB project include the University of Energy and Natural Resources (UENR), Sunyani, Ghana, as the host institution, Aarhus University, Denmark, and the Helmholtz Centre for Environmental Research (UFZ), Department of Lake Research, Germany.



# FUNDING NEWS

1<sup>ST</sup> JUNE TO 30<sup>TH</sup> SEPTEMBER 2019

| FUNDER  | UG LEAD   | ORIGINATING UNIT  | PROJECT TITLE   | BUDGET ALLOCATED TO UG |
|---|---|---|---|------------------------|
| African Academy of Sciences                                     | Dr. Daniel Nukpezah                                     | Institute for Environment and Sanitation Studies  | Advancing Redd+ Implementation in Ghana and Cameroon  | USD 84,300.00          |
| Andrew Mellon Foundation  | Prof. Kodzo Gavua                                       | Department of Archaeology and Heritage Studies  | Remaking Societies, Remaking Persons: A Supranational Forum for Museums, Heritage and Memory Work (RSPP Forum)            | ZAR 2,540,079.83       |
| Andrew Mellon Foundation  | Prof. Dzodzi Tsikata                                    | Institute of African Studies  | Decolonisation, the Disciplines and the University  | USD 287,273.00         |
| Andrew Mellon Foundation  | Dr. Mjiba Frehiwot                                      | Institute of African Studies  | Afro-Asian Futures Past   | USD 93,370.00          |
| Andrew Mellon Foundation  | Prof. Akosua Adomako Ampofo<br>Dr. Irene Appeaning Addo | Institute of African Studies (IAS)  | Entanglement, Mobility and Improvisation: Culture and Arts in Contemporary African Urbanism and Its Hinterlands           | ZAR 1,598,498.22       |
| Bill and Melinda Gates Foundation                               | Prof. Dorothy Yeboah-Manu                               | NMIMR   | Do Seasonal Changes in the Pharyngeal Microbiome Influence the Risk of Epidemic Meningitis in the African Meningitis Belt | CAD 8,610.00           |
| British Museum's Endangered Material Knowledge Programme (EMKP) | Prof. Kodzo Gavua                                       | Department of Archaeology and Heritage Studies  | Research and Digitization of Indigenous Gold Forging in Ghana   | GBP 15,000.00          |
| CHEMONICS International Inc.                                    | Dr. Samuel Dery<br>Dr. Roger Atinga                     | Department of Biostatistics<br>Department of Public Admin. & Health Services Management | USAID Global Health Supply Chain Program- Procurement and Supply Management (GHSC-PSM)                                    | GHS 552,075.00         |
| Crick African Network (CAN)                                     | Prof. Gordon Awandare                                   | West Africa Centre for Cell Biology of Infectious Pathogens (WACCBIP)                   | The Orpharyngeal Microbiome Dynamics and Invasive Bacterial Diseases  | USD 145,000.00         |





| FUNDER  | UG LEAD  | ORIGINATING UNIT   | PROJECT TITLE  | BUDGET ALLOCATED TO UG |
|---|--|--|--|------------------------|
| Defense Advanced Research Projects Agency (DARPA) | Dr. Joseph Bonney<br><br>Dr. Osbourne Quaye<br><br>Dr. Richard Suu-Ire | NMIMR<br><br>Department of Biochemistry, Cell & Molecular Biology<br><br>School of Veterinary Medicine | Preventing Emergence and Spillover of Bat Viruses in High-Risk Global Hotspots   | USD 271,700.00         |
| Economic and Social Research Council (ESRC)       | Prof. Joseph Osafo   | Department of Psychology   | Using Collaborative Visual Research Methods to Understand Mental Illness, Coercion and Restraint in Ghana and Indonesia                              | GBP 36,296.00          |
| Environment for Development (Efd)                 | Prof. Peter Quartey  | Institute of Statistical, Social and Economic Research (ISSER)   | Collaborative Programme on the Sustainable Management of Marine Resources  | CAD 27,189.00          |
| European Union/Commission                         | Prof. Joseph Teye  | Centre for Migration Studies   | Social Transformation Research   | EUR 332,403.00         |
| European Union/Commission                         | Dr. Ibrahim Bedi   | Department of Accounting   | Enhancing Skills Intelligence and Integration into Existing PhD Programmes by Providing Transferable Skills Training through an Open Online Platform | EUR 1,000,000.00       |
| Fondation Botnar                                  | Dr. Benedict Woebong   | Department of Social and Behavioural Sciences  | Reaching Adolescents with Health Services: A Multi-Country Study of Adolescent Health Check-Ups in Low and Middle-income Countries                   | USD 299,770.00         |



| FUNDER  | UG LEAD                    | ORIGINATING UNIT  | PROJECT TITLE   | BUDGET ALLOCATED TO UG |
|---|----------------------------|---|---|------------------------|
| Fondation Botnar  | Prof. Joseph Osafo         | Department of Psychology  | Additional Funding for Follow-up Assessments on the Evidence of Better Lives Studies  | GBP 2,413.00           |
| Fuji Oil Holdings Inc.                                    | Prof. Firibu Saalia        | Department of Food Process Engineering                                | Improvement of the Quality and Yield of Shea Butter   | USD 9,212.00           |
| Gerda Henkel Foundation                                   | Dr. Wazi Apoh              | Department of Archaeology and Heritage Studies                        | Salvaging Endangered Slave Relics at the Three-Towns of Denu-Hedzranawo and Adafianu in the Southern Volta Areas of Ghana         | EUR 90,000.00          |
| Ghana West Africa Program to Combat AIDS and STI (WAPCAS) | Prof. Augustine Ankomah    | Department of Population, Family and Reproductive Health              | Mapping and Size Estimation of Female Sex Workers Biological and Behavioural Survey for FSWS and their Intimate Partners in Ghana | USD 1,379,888.00       |
| Global Challenges Research Fund (GCRF)                    | Dr. Kwabena Frimpong-Manso | Department of Social Work   | Building Positive Futures: A Cross-Country Pilot Study on Youth Transitions from Out-Of-Home Care in Africa                       | GBP 5,937.00           |
| Global Challenges Research Fund (GCRF)                    | Prof. Gordon Awandare      | West Africa Centre for Cell Biology of Infectious Pathogens (WACCBIP) | Developing and Testing of a Novel Rapid Malaria Diagnostic Linking Detection and Surveillance                                     | GBP 29,325.00          |
| Global Challenges Research Fund (GCRF)                    | Dr. Theresa Gwira          | West Africa Centre for Cell Biology of Infectious Pathogens (WACCBIP) | Tsetsetnet: Developing Scientific Capacity through an Interdisciplinary International Network for Tsetse Fly Research             | GBP 18,738.20          |
| Google LLC  | Dr. Kwesi Amissah-Arthur   | Department of Surgery   | Octane Validation Data Access - Ghana   | USD 20,000.00          |



| FUNDER   | UG LEAD                     | ORIGINATING UNIT  | PROJECT TITLE   | BUDGET ALLOCATED TO UG |
|--|-----------------------------|---|---|------------------------|
| International Food Policy Research Institute (IFPRI) | Dr. Richmond Aryeetey       | Department of Population, Family and Reproductive Health              | Transform Nutrition – West Africa: Ghana Stories of Change  | USD 60,064.50          |
| International Science Council                        | Dr. Austin Ablo             | Department of Geography and Resource Development                      | Urban Water Futures: Delineating Public Perceptions for Re-use Planning in Accra and Johannesburg                     | EUR 37,140.00          |
| Medicines for Malaria Venture (MMV)                  | Dr. Yaw Aniweh              | West Africa Centre for Cell Biology of Infectious Pathogens (WACCBIP) | Screening Collaboration against Non-Falciparum Series   | USD 26,000.00          |
| National Institutes of Health                        | Prof. Gordon Awandare       | West Africa Centre for Cell Biology of Infectious Pathogens (WACCBIP) | Hearing Impairment Genetics in Africa - Hi-Genes Africa   | EUR 44,747.00          |
| National Institutes of Health                        | Dr. Amos Laar               | Department of Population, Family and Reproductive Health              | NYU-UG Research Integrity Training Program  | EUR 81,555.00          |
| Network of African Science Academics                 | Dr. Dzidzo Yirenya - Tawiah | Institute for Environment and Sanitation Studies (IESS)               | Cleaning from the Bottom Up: Inclusive Stakeholder's Participation for Integrated Waste Management in Accra and Lagos | EUR 39,870.00          |



| FUNDER                            | UG LEAD                              | ORIGINATING UNIT  | PROJECT TITLE   | BUDGET ALLOCATED TO UG |
|-----------------------------------|--------------------------------------|---|---|------------------------|
| PATH                              | Prof. George Armah                   | NMIMR   | Clinical Trial Agreement  | USD 4,259,354.00       |
| Solidaridad                       | Dr. Lucas Damoah                     | Department of Materials Science and Engineering                       | Palm Oil Production Optimization: Energy, Environment, Health and Climate Change                          | EUR 25,000.00          |
| SouthSouthNorth Projects (Africa) | Prof. Samuel Codjoe                  | Regional Institute of Population Studies (RIPS)                       | Empowering Women and Transforming Gender Relations in the Volta Delta, Ghana                              | USD 59,616.00          |
| University of Bergen              | Prof. Joseph Yaro<br>Dr. Austin Ablo | Department of Geography and Resource Development                      | Scholarship for Master's Students   | USD 11,143.35          |
| World Bank                        | Prof. Gordon Awandare                | West Africa Centre for Cell Biology of Infectious Pathogens (WACCBIP) | West Africa Centre for Cell Biology of Infectious Pathogen and Non-Communicable Diseases (WACCBIP + NCDs) | USD 5,500,000.00       |
| World Bank                        | Prof. Eric Danquah                   | West Africa Centre for Crop Improvement (WACCI)                       | West Africa Centre For Crop Improvement (WACCI)   | USD 5,500,000.00       |
| World Bank                        | Prof. Solomon Ofori-Acquah           | West Africa Genetic Medicine Centre (WAGMC)                           | West Africa Genetic Medicine Centre (WAGMC)   | USD 6,400,000.00       |
| World Health Organisation (WHO)   | Prof. Richard Adanu                  | Department of Population, Family and Reproductive Health              | TDR Supported Postgraduate Training Scheme with a Focus Implementation Research                           | CAD 287,220.00         |
| World Health Organisation (WHO)   | Prof. Richard Adanu                  | Department of Population, Family and Reproductive Health              | TDR - Supported Postgraduate Training Scheme with a Focus on Implementation Research                      | USD 105,270.00         |

# AWARDS/ Appointments



Distinguished faculty inducted as Fellows of the Ghana Academy of Arts and Sciences, (November 2019).  
From L-R: **Prof. George Obeng Adjei** (*Director of Research, ORID*), **Prof. Gordon Awandare** (*Director, WACCIP*), **Prof. Julius Fobil** (*Dean, SPH*) and **Prof. Daniel Asiedu** (*Provost, CBAS*)



**Professor Henrietta J.A.N. Mensa-Bonsu**, Professor of Law, has been elected President of the Ghana Academy of Arts and Sciences (GAAS) for a two-year term. By her appointment, Prof.

Mensa-Bonsu becomes the third female and first alumna of the University of Ghana to be elected to the high office of GAAS President.



**Professor Christopher Gordon**, former Director of the Institute for Environment and Sanitation Studies has been appointed Convener of International Organization for Standardisation (ISO/TC 207/SC

2/WG 7). Prof. Gordon will serve as Chair of the Technical Committee on Environment. **Professor Christopher Gordon** has also joined the Earth Commission by Future, a team of experts tasked with producing a peer-reviewed synthesis of the latest science to underpin science-based targets. The Earth Commission is part of the Global Commons Alliance.



*Ms. Schemm presenting the award to Dr. Bawah*

**Dr. Ayaga Agula Bawah**, Senior Lecturer at the Regional Institute for Population Studies (RIPS), has been presented with the Elsevier Atlas Award for best published article in the month of January 2019. Ms. Ylann Schemm, Director of Elsevier Foundation presented the award to Dr. Bawah at a short ceremony at ORID, UG. The Elsevier Award is given to authors of the best published paper selected from research published across Elsevier's



**Professor Daniel Bruce Sarpong**, Dean of the School of Agriculture, has been nominated to join the Steering Committee of the High-Level Panel of Experts on Food Security and Nutrition (HLPE), of the UN-FAO. The HLPE was created as part of the reform of the international governance of food security to advise on World Food Security (CFS), the foremost intergovernmental and international platform on food security and nutrition.

## SHOWCASING SOME OF OUR LEADING RESEARCHER

Peer-reviewed publications extend knowledge and highlight developments in respective fields of study. For academics, publication in high-impact outlets is a significant endorsement of the validity of their work.

The University of Ghana is proud of its seasoned research staff and looks forward to opportunities to project its leading researchers. One metric that is a useful indicator of research excellence is the *h-index*. This metric benchmarks publication activity in a manner that relies on the balance between two fundamental aspects of performance: productivity and citation impact. Although there is no unique or universally agreed concept of what constitutes outstanding research performance, the *h-index* remains popular among academics. That said, we acknowledge the *h-index* score to be only one of the various ways of measuring research excellence.

The two tables, below, present the *h-index* scores for *full-time, non-retired* and *full-time, post retirement* scholars at the University of Ghana. The scores were culled from Scopus on July 12, 2019 and reflect publications between 2016-2018, hence do not account for subsequent changes. A second caveat worth noting regards our categorization of non-retired versus post-retired academics on the basis of university data at the end of the 2018/2019 academic year.

### Full-time, non-retired staff

| Rank | Name                        | h-index | Institute/Department  |
|------|-----------------------------|---------|---|
| 1    | Mensah, Ivy G.              | 55      | Noguchi Memorial Institute for Medical Research                 |
| 2    | Adjei, Samuel               | 35      | Noguchi Memorial Institute for Medical Research                 |
| 3    | Afoakwa, Emmanuel Ohene     | 23      | Department of Nutrition and Food Science                        |
| 3    | Dodoo, Daniel K.            | 23      | Noguchi Memorial Institute for Medical Research                 |
| 5    | Yeboah-Manu, Dorothy        | 21      | Noguchi Memorial Institute for Medical Research                 |
| 5    | Afrane, Yaw Asare           | 21      | Department of Medical Microbiology                              |
| 7    | Adongo, Philip B.           | 20      | Department of Social and Behavioural Sciences                   |
| 7    | Ofori-Acquah, Solomon F.    | 20      | Department of Medical Laboratory Sciences                       |
| 9    | Adanu, Richard Mawuena Kofi | 19      | Department of Population, Family and Reproductive Health        |
| 9    | Sakyi, Patrick Asamoah      | 19      | Department of Earth Sciences                                    |
| 11   | De-Graft Aikins, Ama        | 18      | Regional Institute for Population Studies                       |
| 11   | Abor, Joshua Yindenaba      | 18      | Department of Finance   |
| 11   | Dodoo, Francis Nii Amoo     | 18      | Regional Institute for Population Studies                       |
| 14   | Awandare, Gordon A          | 17      | Department of Biochemistry, Cell and Molecular Biology          |
| 14   | Dodoo, Alexander N.O.       | 17      | Centre for Tropical Clinical Pharmacology and Therapeutics      |
| 14   | Torpey, Kwasi               | 17      | Department of Population, Family and Reproductive Health        |
| 14   | Amewu, Richard K.           | 17      | Department of Chemistry   |
| 14   | Suu-Ire, Richard D.         | 17      | School of Veterinary Medicine                                   |
| 19   | Gyan, Ben Adu               | 16      | Noguchi Memorial Institute for Medical Research                 |
| 19   | Fobil, Julius Najah         | 16      | Department of Biological, Environmental and Occupational Health |
| 19   | Owusu, George K.            | 16      | Institute of Statistical, Social and Economic Research          |
| 19   | Bosompem, Kwabena M         | 16      | Noguchi Memorial Institute for Medical Research                 |
| 19   | Agyei-Mensah, Samuel        | 16      | Department of Geography   |



### Full-time post retirement staff

| Rank | Name                         | h-index | School/Institute/Department                            |
|------|------------------------------|---------|--|
| 1    | Koram, Kwadwo A.             | 42      | Noguchi Memorial Institute for Medical Research        |
| 2    | Adjei, Andrew                | 26      | Department of Pathology                                |
| 2    | Ofori Adjei, David           | 26      | Noguchi Memorial Institute for Medical Research        |
| 4    | Wilson, Michael David W.     | 24      | Department of Parasitology                             |
| 5    | Armah, George Enyimah        | 23      | Noguchi Memorial Institute for Medical Research        |
| 5    | Goka, Bamenla Quarm          | 23      | Department of Child Health                             |
| 7    | Fosu, Augustin               | 18      | Institute of Statistical, Social and Economic Research |
| 7    | Tettey, Yao                  | 18      | Department of Pathology                                |
| 9    | Aikins, Moses Ks             | 17      | Department of Health Policy, Planning and Management   |
| 10   | Nyarko, Alexander K.         | 16      | Department of Pharmacology and Toxicology              |
| 10   | Renner, Lorna Awo            | 16      | Department of Child Health                             |
| 12   | Adiku, Samuel Godfried Kwasi | 15      | Department of Soil Science                             |
| 12   | Saalia, Firibu Kwesi         | 15      | Department of Nutrition and Food Science               |
| 14   | Banoeng-Yakubo, Bruce Kofi   | 14      | Department of Earth Science                            |
| 15   | Wiredu, Edwin Kwame          | 13      | Department of Pathology                                |
| 15   | Addo, Phyllis G.A.           | 13      | Noguchi Memorial Institute for Medical Research        |
| 17   | Attah, Simon Kwaku           | 12      | Department of Medical Microbiology                     |
| 17   | Anarfi, John Kwasi           | 12      | Regional Institute for Population Studies              |
| 17   | Ohene-Yeboah, Michael O.K.   | 12      | Department of Surgery                                  |
| 17   | Sakyi-Dawson, Esther O.      | 12      | Department of Nutrition and Food Science               |

“*The University  
is Proud of its Seasoned  
Research Staff*”



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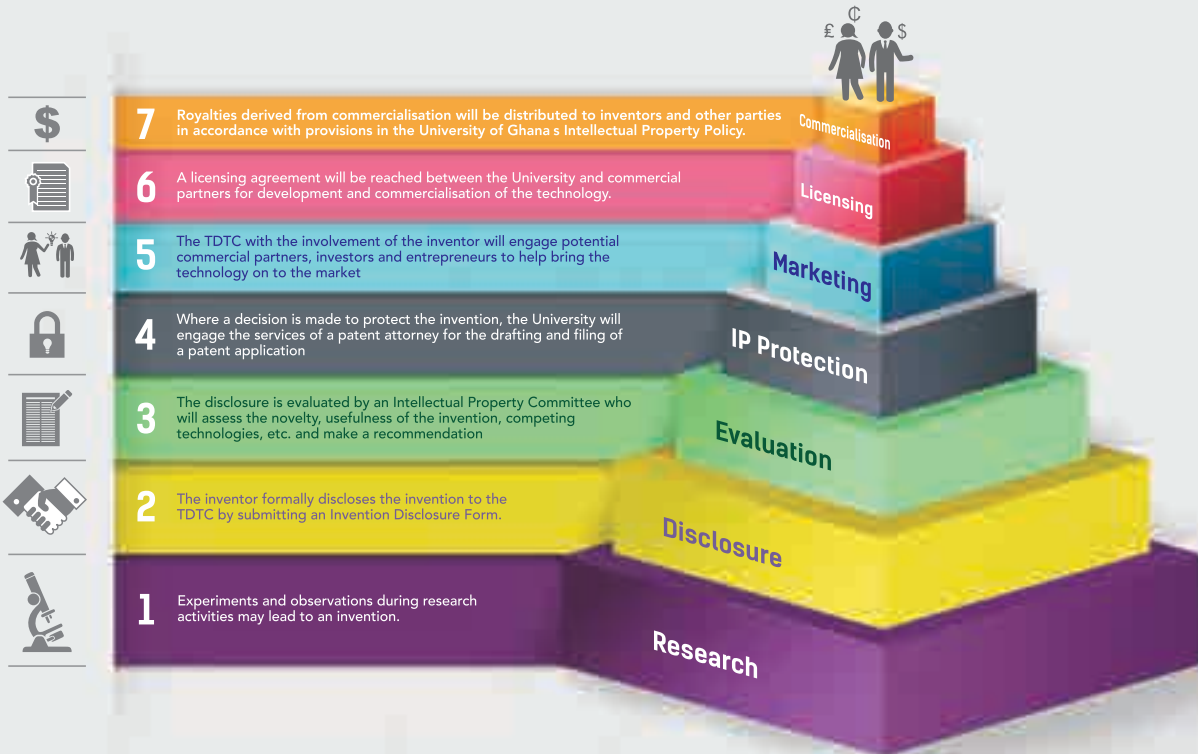
**5 working days**

STEP 1: Invention Disclosure Form (IDF) submitted to TDTC.  
 STEP 2: TDTC evaluates the IDF and recommends to the IP Committee.  
 STEP 3: IP Committee recommends to the VC.

MAX 2 DAY  
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## BASIC STEPS TO TECHNOLOGY COMMERCIALISATION



PS: These steps may vary sequentially and can occur simultaneously.



### Acknowledgements

ORID appreciates the support of the Public Affairs Directorate.

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