COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH - GHANA

CSIR NEWS

VOLUME 4 2024 Edition

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THE CSIR SCIENCE FOR IMPACT FUND (CSIF)

The CSIF is to generate a consistent and stable flow of financial resources to support scientific research and technological innovation to drive social inclusion and sustainable socio-economic development through the implementation of technology transfer and developmental projects towards wealth creation in industries and local communities.

The Fund has a target of Twenty Million US Dollars **(US$20 million)** and the tag line is "Supporting Science, Transforming Communities.

NEWS HIGHLIGHTS

CSIR launches CSIR Science for Impact Fund (CSIF) with a $20 million target

Over GH¢800,000 realised at the Fundraising Dinner for CSIR Science for Impact Fund

First Bank Donates to CSIF

Antimicrobial Resistance Education and awareness creation amongst residents of Tabitha Care Home, Pokuase

CSIR-IIR Empowers Stove Manufacturers to Combat Household Pollution

FROM THE DG'S DESK

Prof. Paul Bosu

AD 2024 is slowly but certainly crouching to a close, and along with it all of the euphoria, hope and expectations that ushered it in. As we patiently await the stroke of midnight on the 31st of December, 2024, the least we can do as mere mortals is to express gratitude to the God of Heaven for His care and the bountiful blessings he bestowed on us. I still wonder how we spent the time, whichever way you look at it.....12 solid months...or 52 weeks...or 366days...or 8,784 hours...or the 31,622,400 precious seconds! Wow! How did we (CSIR) spend it all?

Pod Borer Resistant Cowpea

The unveiling environmental release this year of the pod borer resistant cowpea for cultivation by Ghanaian farmers is perhaps the most notable of all our R&D outputs of the year 2024. The PBR cowpea is the first ever genetically modified crop to be released in Ghana for cultivation. It has taken CSIR 12 years to get to this stage. Let me be quick to say that, while the actual event i.e. the introduction of the cryAB gene into the original gene of the cowpea did not occur in the CSIR labs here in Ghana, the processes, laboratory and field tests that led on to get this GM crop released had been done in the CSIR-Savanna Agricultural Research Institute (CSIR-SARI), under strict regulation by the National Biosafety Authority (NBA). The release of the PBR cowpea to farmers is a significant milestone indeed. Ghana thus becomes the second country in the sub-region after Nigeria to release this crop to farmers. I take this opportunity to commend the Director and staff of CSIR-SARI for this work. I commend Director Dr. Francis Kusi and the Principal Investigator of the Project Dr. Jerry Mboyine, for the good work done. I need to add, and quickly too, that the story of the PBR cowpea has not come this far on a silver platter. The potential of CSIR scientists to do more research in support of the nation is far higher than one can imagine. But, scientists are faced with severe constraints, financial, logistical, and others. The ultimate goal of scientific research is to bring development to society and this can only be achieved in its fullest measure if society pays attention to science and in particular government's support to science and scientists.

CSIR Endowment Fund

I do not have the space to outline the many other outputs and products churned out by CSIR in the year 2024. However, it is worth noting that these have been achieved under very difficult financial and logistical constraints. The CSIR Science for Impact

Fund (CSIF) has been created to ensure sustainable funding for R&D in the CSIR. This is not new per se; however, the commitment of CSIR staff to contribute 1% (one percent) of their monthly salary into the fund for five years is what makes it unique. This commitment by CSIR staff has been hailed as unprecedented and will continue to inspire future generations to come. The USD 20 million target appears herculean but we are confident that we will hit our target, perhaps go beyond it in the not too distant future. I take the opportunity to express sincere gratitude to all CSIR staff, donors, contributors and well-wishers for their support. I appeal to everyone who believes in science and development to donate to the fund.

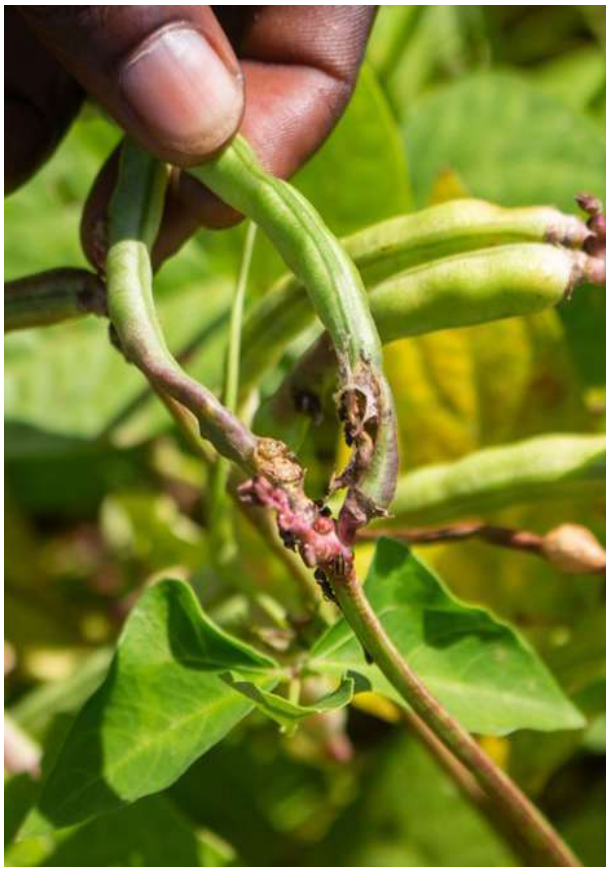
CSIR Lands

A.D. 2024 is a landmark year for CSIR lands. It has been most eventful and adventurous. The problems of encroachment, snatching or annexation of lands set aside by our visionary forefathers persist, regrettably. The story of CSIR lands is a whole book on its own and I believe we will write it someday. For the moment, I would like to say that in the year A.D. 2024 CSIR witnessed significant progress with the acquisition of titles to several of our landed properties. I take the opportunity to extend the gratitude of the Management and staff of CSIR to the Governing Council for their resolve in ensuring that CSIR lands are well documented and secured for the nation. I also thank our directors and all CSIR staff across the 13 institutes and, in particular the leadership of the CSIR Labour Unions for supporting management to protect and secure our lands. On behalf of the Governing Council of CSIR, Management and CSIR, I wish to extend our heartfelt appreciation to our numerous stakeholders, friends, well-wishers and multitude of Ghanaians who supported us in diverse ways to bring us this far.

Looking Beyond!

We look forward to the coming Year 2025 with much hope and determination, especially as we anticipate the budding, and in some cases, fruiting of some of the initiatives and actions we sowed over the course of the past few years. We will continue to pursue the objectives and targets set in our Corporate Strategic Plan (2023 – 2027), ensuring that the mandate for which CSIR was established is fully realized. I cease the opportunity to remind all CSIR staff and our numerous stakeholders of the four key strategic thrusts in the plan i.e. i) Private Sector Driven R&D and Technological Innovation, ii) CSIR Re-Branding and Visibility Improvement, iii) Financial Resource Mobilization, and iv) CSIR Staff and Systems Performance Improvement. Ultimately, we seek to improve on efficiency of scientific research delivery in Ghana's foremost science and technology institution to make more impact on society. I call on all scientists, staff, friends and our numerous stakeholders to continue to believe in CSIR as we strive to make science and technology the true engine of development of our nation.

Our mission still lives on....Using the transforming power of Science, Technology and Innovation (STI) for wealth creation through research and the creation of innovative technologies for industrial development.



Maruca pod borer damaged cowpea pod

GENERAL NEWS

CSIR SCIENCE FOR IMPACT FUND LAUNCHED TO RAISE $20 MILLION FOR RESEARCH AND INNOVATION

The Director-General explaining the symbolism of the CSIF logo. Looking on are the Deputy Director-General and the Chairman of the CSIF Planning Committee / Director of CSIR-WRI

The Council for Scientific and Industrial Research (CSIR) has launched an ambitious endowment fund, the CSIR Science for Impact Fund (CSIF), with a target of raising $20 million over the next five years to boost scientific development in the country. The fund was launched at a press conference at the CSIR head office in Accra.

This initiative is designed to identify and support impactful research projects and technological innovations that can drive industrial growth and promote sustainable economic development. The decision to set up this fund stems from the need to ensure adequate resources for scientific research.

Prof. Mike Osei-Atweneboana, Chairman of the CSIF planning committee and Director of CSIR-Water Research Institute, elaborated on the significant funding challenges CSIR faces. According to the Chair, despite receiving some government funding and modest contributions from donor agencies and internally generated funds, the financial support has been insufficient over the years.

He stated that the CSIR Act of 1996 (Act 521) was amended to encourage private sector involvement and incorporate market principles into CSIR's operations through research commercialization. However, the difficult economic climate has made securing adequate financing a persistent issue. "We face limited funding for R&D infrastructure, human resource capacity development, and operations," he noted.

Also speaking at the launch ceremony, Professor Paul P. Bosu, Director-General of CSIR, highlighted the importance of increasing collaboration between academia, industry, and government to foster innovation and community development. "We are committed to fostering increased collaboration between academia, industry, and government to drive innovation and community development," he said.

Prof. Paul Bosu, DG

He further urged corporate bodies and individuals to support the Council in fulfilling its mission effectively. He expressed his gratitude to staff who have shown their commitment by voluntarily agreeing to contribute 1% of their monthly salaries to the initiative. This fund, he believes, will enable CSIR to reach new heights in research and technological development.

The $20 million fund aims to advance

research and develop technologies that support socio-economic progress. Although the government provides salaries, it does not have the resources to fully support all research activities.

The fund's tagline "Supporting Science, Transforming Communities," is to encourage and elicit support from individuals, industry, and organizations to join hands and push forward scientific advancement that will better serve the communities within which it operates.

Source: Corporate Affairs Division

OVER GH¢800,000 REALISED AT FUNDRAISING DINNER FOR CSIR SCIENCE FOR IMPACT FUND

The Council for Scientific and Industrial Research (CSIR) has organized a dinner as part of activities towards creating awareness and raising funds for the CSIR Science for Impact Fund (CSIF). The fundraising dinner, held at the Labadi Beach Hotel was attended by key industry leaders, traditional rulers, directors of the 13 CSIR research institutes and other distinguished guests.

Some distinguished guests at the dinner

Speaking at the dinner, Professor. Paul Bosu, Director-General of CSIR, underscored the challenges of reliance on external funding sources and elaborated that, external donors typically fund areas like climate change and biodiversity and rarely support research in engineering, manufacturing, electronics, and robotics, which are critical for national development. Regarding priority research areas, he pointed out the need for advancements in science and technology to address food insecurity. "We need to develop technologies for increased agricultural production, such as improved irrigation schemes, food processing and preservation techniques.

"For real scientific impact that benefits our society and industries, we need domestic funding," he stressed. Professor Bosu then called on industrial and corporate entities, as well as the general public, to contribute to this fund to support essential research.

In his welcome address, he stated that although the Ghana National Research Fund Bill has been enacted, the government is yet to allocate adequate resources to make the fund operational, which is essential for advancing science, technology, and industrial research to address critical national challenges.

"We call on the government to operationalize the National Research Fund and allocate sufficient resources. This will enable CSIR, research institutes, universities, and other scientific institutions to draw from it and contribute to the country's development", he stated

The fund is meant to support not only CSIR but also the broader scientific community.

The urgent need for the research community to be self-reliant, forms the basis for the development of the CSIR Science for Impact fund. The fund has an ambitious target of USD$20 million dollars (GHc320 million) over the next 5 years to support science and technology for community impact. A total sum of GH¢875,000 was raised in support of

the fund at the dinner.

Professor Bosu expressed his gratitude to donors who have supported the fund and appealed to the government to commit resources to industrial research that addresses the country's most urgent needs.

In a show of support and leadership by example, staff of CSIR have committed 1% of their basic salary to the CSIF.

The Director-General (5th from right) with distinguished guests at the dinner

FIRST BANK GHANA DONATES CSIF

Chairman of the CSIF delivering his address

First Bank Ltd has donated an amount of GHS 50,000.00 to the CSIR Science for Impact Fund (CSIF). The donation was made by Mr. Semiu Lamidi, the Executive Director and Chief Financial Officer on behalf of the management and staff of the Bank.

Speaking at the donation ceremony, Mr. Lamidi appealed to public and private sectors to lend their support towards the fund as this, he believes, will address economic challenges. 'We believe so strongly that if we can transfer the

outcomes of research into practice, the economy will evolve, especially the SMEs' he stated.

He commended the entire staff of CSIR for voluntarily donating 1% of their basic salary towards the fund and described the gesture as a commendable demonstration of leadership.

For his part, Prof. Mike Atweneboana, Director for CSIR-Water Research Institute and Chairman of the CSIF committee, on behalf of the management and staff of the Council, expressed his gratitude to the bank for their grand display of support. He stressed that one of the fund's primary objective is to leverage existing technologies to support the Corporate Social Responsibility (CSR) initiatives of Ghanaian industries.

He explained that the monies are not only intended for research but to ensure that communities that are under resourced also benefit from the science through technology transfer. "We are looking at communities that are less endowed and we will see how we can use our technologies to improve them" he emphasized. through technology transfer. "We are looking at communities that are less endowed and we will see how we can use our technologies to improve them" he emphasized.

About the Fund:

The CSIF is an endowment fund set up by Council for Scientific and Industrial Research to mobilize financial resources to undertake innovative, demand-driven research to drive community and industry development.
The CSIF seeks to raise $20 million to advance research and develop technologies that support socio-economic progress. The fund's tagline "Supporting Science, Transforming Communities," is to encourage and elicit support from individuals, industry, organizations to join hands and push forward scientific advancement that will better serve the communities within which it operates.

About First Bank Ghana:

FirstBank Ghana Limited is committed to delivering the gold standard of value and excellence to our customers.

Source: Corporate Affairs Division

Managemnt of CSIR receiving the cheque from officials from the First Bank Ghna

CSIR

Science for Impact Fund

DONATE TODAY!

With your support, we transform communities

Dial short code *887*2# on all networks

1. Select : "donate"
2. Enter code "CSIF"
3. Follow prompts

BANK AND MOMO TRANSFER DETAILS

MTN Mobile Money

Account No.:**0530539003**

Account Name: CSIR

CBG CONSOLIDATED BANK GHANA

Account No.: **2257949100001**

Account Name: CSIR Science for Impact Fund

Supporting Science, Transforming Communities

PUSHING THE BOUNDARIES OF S&T

Growing wheat in Ghana is possible !!!

In the heart of Ghana, a story of triumph is being written in the golden grains of wheat. The Council for Scientific and Industrial Research- Crops Research Institute (CSIR-CRI) has embarked on a groundbreaking journey to revolutionize wheat production in the country. This initiative, funded by ARIMA-FARMS from India, spans across the Forest, Transition, and Guinea Savannah agroecological zones of Ghana.

The research team, led by the dynamic duo of Dr. Felix Frimpong and Dr. Kennedy Agyeman, operates under the guidance of Prof. Moses Brandford Mochiah and his deputy, Dr. Maxwell Darko Asante. Their mission? To enable Ghana to grow and produce its own wheat flour for bread, baked products, and poultry feed, reducing the country's dependence on foreign imports.

Dr. Frimpong, the principal investigator emphasized the significance of this research, stating, "The relevance of the wheat research in Ghana is to be able to grow and produce our own wheat flour for bread and other baked products and poultry feed by Ghanaian farmers without solely depending on foreign importation."

The team's aspirations don't stop there. They aim to evaluate the performance of wheat varieties from India across Ghana, with the goal of releasing and registering new varieties. This ambitious endeavour seeks to transform Ghana's agricultural landscape and boost its self-sufficiency.

Dr. Felix Frimpng in the farm

However, the path to success is not without its challenges. The team has made an urgent appeal for funding and resource support from well-meaning Ghanaians, private companies, international donors, banks, science-based institutions, embassies of various countries, and the government of Ghana. This support will aid in the expansion of the initiative and the breeding of more wheat varieties

This is a story of innovation, resilience, and the relentless pursuit of self-sufficiency. It's a testament to the power of scientific research and international collaboration in shaping a nation's future. And as the wheat fields of Ghana begin to flourish, so does the hope for a more sustainable and prosperous tomorrow.

Dr. Felix Frimpong
Research Scientist
CSIR-Crops Research Institute, Kumasi

THE SCIENTIST FOR THIS EDITION

Dr. Maxwell Darko Asante: A Leading Light in Rice Breeding Research

Dr. Maxwell Darko Asante, Chief Research Scientist and immediate past Deputy Director of the Council for Scientific and Industrial Research (CSIR)-Crops Research Institute (CRI), has been a driving force in Ghana's quest for self-sufficiency in rice production. With a storied career spanning over two decades, Dr. Asante has made significant contributions to the development of high-yielding, climate-smart rice varieties.

Research and Impact

As the Rice Breeding Lead at CSIR-CRI, Dr. Asante has been instrumental in the release of over 20 rice varieties, many of which are now being cultivated by farmers across Ghana. Notably, these varieties cover approximately 90% of Ghana's rice-growing area, revolutionizing the country's rice production landscape. His research focuses on developing rice varieties that are tolerant to major biotic and abiotic stresses, with consumer-preferred grain qualities. He employs conventional, DNA marker-assisted, and transgenic approaches in his breeding work.

Dr. Asante's breeding program is the largest and most modernized at CSIR-CRI, renowned for its international visibility. This has attracted over a dozen interns and graduate students from Nigeria, Togo, Benin, Burkina Faso, Mali, Uganda, France, and Australia in the last five years.

Global Engagement

As a well-traveled scientist, Dr. Asante has attended conferences, workshops, and training programs in over 20 countries across the globe, expanding his expertise and networking with international peers.

Collaborations and Partnerships

Dr. Asante collaborates with esteemed international institutions to enhance his breeding work, including:

- AfricaRice
- Korea-Africa Food and Agriculture Cooperation Initiative (KAFACI)
- International Rice Research Institute (IRRI)
- CGIAR Genetic Innovations Science group (GI)

As a consultant for the CGIAR GI, Dr. Asante works to modernize breeding programmes in Ghana and other African countries. He has been the Principal Investigator for over 10 rice projects, securing funding from prominent donors incudiing:

- United States Agency for International Development (USAID)
- Bill & Melinda Gates Foundation (BMGF)
- AGRA (formerly known as Alliance for a Green Revolution in Africa)
- International Fund for Agricultural Development (IFAD)
- Rural Development Administration (RDA, Korea)

Attracting Funds and Infrastructure

Notably, Dr. Asante has been instrumental in attracting funds and infrastructure worth over US$5 million to CSIR-CRI, further solidifying his legacy as a leading researcher and leader in his field.

Dr. Asante at KOPIA rice seed farm

Awards and Recognition

Dr. Asante's outstanding contributions have earned him numerous prestigious awards, including:

- 2023: Special Recognition Award for Best Breeding Award by KAFACI
- 2023: Special Recognition Award for Most Influential Alumni Award by WACCI at the University of Ghana
- 2018: Best Agricultural Scientist Award at the 34th National Farmer's Day in Tamale
- 2017: Overall Best Scientist at the CSIR-CRI

Publications and Teaching

With over 70 scientific publications to his name, Dr. Asante is a respected authority in his field. He serves as:

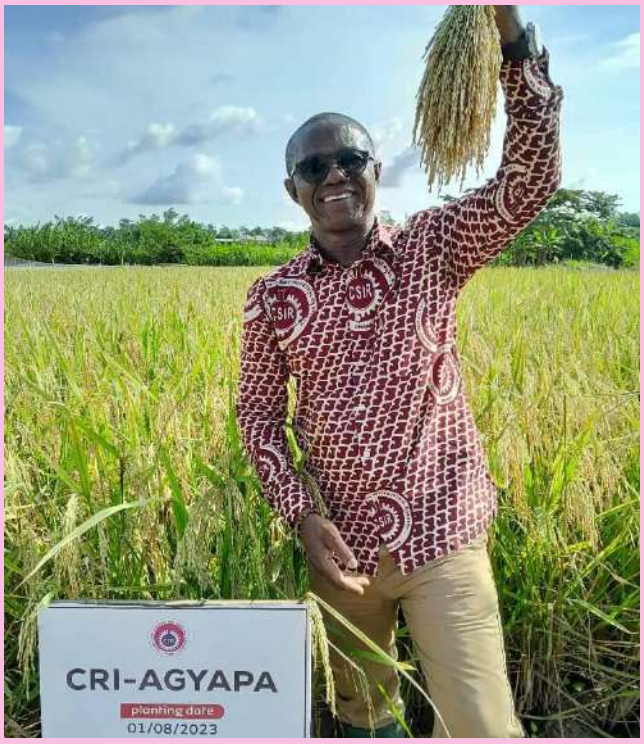
- Associate Professor in Plant Breeding and Genetics at the CSIR College of Science and Technology (CCST), Kumasi, Ghana
- Guest Lecturer at the Pan African University Life and Earth Sciences Institute (PAULESI), University of Ibadan, Ibadan, Nigeria
- Associate Faculty Member at WACCI

Academic Achievements

Dr. Asante holds a BSc. in Agriculture and a Diploma in Education from the University of Cape Coast (1998), an MSc. in Plant Breeding from the Kwame Nkrumah University of Science and Technology, Kumasi (2004), and a Ph.D. in Plant Breeding from the West Africa Centre for Crop Improvement (WACCI), University of Ghana, Legon (2012)

Personal Life

Dr. Asante is a devoted family man, married with three children. He is also a practicing Christian, deeply committed to his faith and values. Outside of his professional pursuits, Dr. Asante cherishes time spent with loved ones and engaging in community service.



Dr. Asante with CRI-Agyapa rice seed

GOING THE EXTRA MILE

Mr. Emmanuel Ahiabor

Emmanuel Ahiabor was employed at the CSIR-Food Research Institute on 9th September, 2020 as an Accounting Assistant, having completed his National Service at the Institute. He is attached to the Commercial Division and his main duties include liaising with the Heads of the Laboratory Divisions for early delivery of clients analytical reports, drafting of credit sales reports, identifying, nurturing and deepening relationships with loyal customers, helping in addressing clients' complaints, etc. He is a team player, works cordially with his superiors, colleagues and subordinates and in doing so, he demonstrates good initiative and persuasive skills and high level of confidentiality. He has a great personality and would always go the extra mile to help achieve the objectives of his Division and the Institute at large. Due to his assiduity, the Institute adjudged him the Overall Best Worker in the year 2023.

CSIR - Food Research Insitute

R&D NEWS

ANTIMICROBIAL RESISTANCE EDUCATION AND AWARENESS CREATION AMONGST RESIDENTS OF TABITHA CARE HOME, POKUASE

Antimicrobial resistance (AMR) continues to be a major setback to disease control in medicine. Data suggest that the elderly are among the main reservoirs of multidrug-resistant organisms (MDROs). While research on AMR surveillance among the aged is extensively done in hospital settings, nursing homes have received little to nothing of this research focus. Researchers from the Biomedical and Public Health Research Unit of the Water Research Institute-CSIR-Ghana undertook a surveillance of uropathogens amongst the aged living in Ghanaian care homes.

They also investigated the resistance pattern of these organisms as well as the resistance genes they harbored. The research revealed an alarming rate of MDR amongst the study populations. With this backing, the researchers embarked on an AMR awareness campaign so as to educate study participants as well as their health care professionals and home managers on ways to reduce the occurrence of AMR in these homes. The outreach was organized in Tabitha Home Care, Pokuase and brought together 80 elderly persons from four different nursing homes. Experts spoke extensively on the maintenance of personal hygiene and indiscriminate use of antibiotics, over- the-counter medications amongst others.

Team Members

Emmanuel Armah Principal Investigator
Dr. Lawrencia Osae-Nyarko Supervisor
Dr. (Med) Akpene Nyamadi Medical officer
Isaac Ohene Agyapong Member
Kwame Mawuko Ahiabu Member

A cross-section of study participants

Teaching session

The PAR team with managers of Tabitha Home Care

Reported by:
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CSIR-SARI PARTNERS WITH CIMMYT THROUGH THE AFRICAN DRYLAND CROPS IMPROVEMENT NETWORK (ADCIN) TO ENHANCE THE BREEDING OF DRYLAND CROPS IN GHANA

The Accelerated Varietal Improvement and Seed Delivery of Legumes and Dryland Cereals in Africa (AVISA) project is a partnership between the International Maize and Wheat Improvement Center (CIMMYT) and National Agricultural Research Programs in nine African countries. The project seeks to increase demand-driven, gender-equitable, and timely access to quality seed of dryland crops and other inputs by small-scale producers through large-scale promotional activities, strengthened links among seed producers, farmers, and agricultural research and extension systems. In Ghana, the project is implemented by the Council for Scientific and Industrial Research – Savanna Agricultural Research Institute (CSIR-SARI). The project began in 2021 and focuses on groundnuts, sorghum, and millet (dryland crops) with socioeconomics as a cross-cutting theme to identify impact pathways for delivering genetic improvements from breeding programs to farmer's fields.

The implementation of the AVISA project began with the formation of product design teams (PDT) for each of the focused crops. The product design teams comprised researchers (CSIR-SARI and CIMMYT staff) from different disciplines that contribute to crop improvement and private individuals along the crop value chain. Through PDT meetings, market segments were defined for groundnuts, sorghum, and millet in Ghana.

For each defined market segment, a target product profile was described to set the guidelines for developing new and improved varieties for the crops of focus. Breeding schemes for population improvement and product development have been developed and optimized for each crop to address the question of genetic gains in breeding programs. This was achieved through the close collaboration of plant breeders from CSIR-SARI and quantitative geneticists, plant breeders, and biometricians from CIMMYT. Currently, the groundnut, sorghum, and millet program have established their respective crossing blocks, which are developing new populations from which new and improved market-preferred varieties of the crop will be released. Again, CIMMYT, in collaboration with Intertek Sweden as part of the project, provides genotyping service for quality assurance (QA) of the parentals and quality control (QC) of the resulting progeny in the population improvement. This ensures that only true F1s are advanced and thus enhances the efficiency of the program through effective utilization of resources and product selection.

One of the important pillars of the AVISA project is the formation of the African Dryland Crops Improvement Network (ADCIN), which is made up of the different crop improvement networks in Africa, with CIMMYT providing anchorage. Through the ADCIN, various capacity developments have been implemented as part of the AVISA project in Ghana. In terms of infrastructure, there has been a supply of -20^{0}C freezer, 50 C oven, punchers, and mats to support the genotyping services. In groundnut, the project has provided a net house for raising artificial cultures for groundnut rosette disease (GRD) screening. In Millet, a new fence has been constructed on a 1-hectare field to aid downy mildew screening. For sorghum, fencing and irrigation facilities are being constructed for off-season nurseries. In all the programs, the digitization of operations has been implemented with the adoption of field books on Android tablets provided by the project. On the human capacity front, the AVISA project through ADCIN has provided a PhD scholarship for an Assistant Research Scientist and a Visiting Scientist position for the sorghum breeder.

Through the socio-economic team, impact pathways for technology scalability have been described. The project supports multi-location trials and on-farm testing through TRICOT to generate robust data for varietal release. Early generation seed

production for groundnut, millet, and sorghum and their supply to seed companies is an integral component of the project and is in progress. Training for seed producers and farmers has been conducted. Promotional activities such as field demonstrations and field days have been undertaken to popularize new varieties and improve adoption and utilization. Since the beginning of the activities in the project, more than 2000 farmers have been reached across the different crops, with approximately 47% female representation.

The contribution of the AVISA project to CSIR-SARI towards achieving its mandate is crucial. The socio-economic team is led by Dr. Edward Martey, the sorghum team is led by Mr. Keneth Opare Obuobi, and the millet team is led by Dr. Peter Anabire Asungre. Dr. Richard Oteng-Frimpong leads the groundnut team and serves as the country coordinator of the project.

Production of early-generation seeds

Popularization of new varieties through field days

THE ESCALATING CRISIS OF ILLEGAL MINING (GALAMSEY) IN GHANA: A CALL FOR URGENT AND DECISIVE ACTION

Galamsey has caused extensive degradation to Ghana's natural environment, particularly affecting water bodies, forests, and agricultural lands. Research conducted by some of our members has identified alarming consequences, including:

- Water Pollution: Almost all our river systems, such as the Pra, Daboase, Ankobra, and Offin, just to name a few, have been heavily polluted with toxic substances, especially mercury and cyanide. This has rendered several water sources unusable for domestic purposes, affecting millions of Ghanaians who rely on these rivers. Recent studies reveal that over 60% of water bodies in mining areas suffer from contamination.
- Deforestation and Habitat Destruction: Large tracts of forest land have been destroyed to make way for galamsey activities, leading to the loss of biodiversity and contributing to climate change, with approximately 50,000 hectares of forest lost annually.
- Soil Degradation: The destruction of topsoil and the use of hazardous chemicals in mining operations have rendered vast areas of fertile agricultural land unusable for farming. This endangers Ghana's food security and exacerbates rural poverty. The destruction of arable lands resulting in the loss of 1.2 million hectares of farmlands has led to an estimated 30% reduction in cocoa production in affected areas, threatening the livelihoods of thousands of farmers

HEALTH AND SOCIAL IMPLICATIONS

The effects of galamsey extend beyond environmental damage and have dire consequences on public health and social wellbeing:

- **Health Risks:** Chemical and heavy metal contaminants such as Mercury, Cyanide, Arsenic, and Lead used for galamsey operations are highly toxic and are known to cause acute poisoning and lead to serious health problems. When released into the environment, they contaminate water bodies, the soil, and are recorded in the food chain. Ghana is at a point where the existence of its people is highly threatened by exposure to these hazardous elements, either through direct contact, inhalation, or consumption of contaminated food, fish, or water. Chronic exposure to Mercury, Cyanide, Arsenic, and Lead have been associated with serious health problems, including neurological disorders, kidney damage, respiratory problems, and an increased risk of developing cancers due to their genotoxic effects. The activities of galamsey operations contribute to the environmental factors that lead to Ghana recording over 24,000 cancer cases annually. The World Health Organisation (WHO) indicates that at high levels of exposure to these contaminants, the brain and central nervous system can be severely damaged. Children who survive severe poisoning from Mercury, , Arsenic, and Lead may be left with permanent intellectual disability and behavioral disorders. The potential risk of exposure to radon gases from the galamsey sites is also a risk for developing lung cancers among galamsey workers. Communities near mining sites suffer from increased incidences of respiratory diseases, skin conditions, and other health issues due to exposure to hazardous chemicals. Studies show that mercury levels in some communities are five times higher than the World Health Organization's recommended limits.

Contaminated water sources lead to the bioaccumulation of toxins in the food chain, posing long-term health risks to the population.

- **Displacement and Livelihood Loss:** Farming communities are being displaced for illegal mining activities, leading to a loss of livelihoods and increasing rural poverty. This economic displacement fuels illegal migration and the growth of social vices, such as crime and substance abuse, particularly among the youth.
- **Threat to Public Infrastructure:** The siltation and pollution of water bodies resulting from galamsey operations have severely strained water treatment facilities, leading to increased operational costs for the Ghana Water Company Limited (GWCL) and frequent interruptions in water supply, impacting both urban and rural areas. GWCL is grappling with significant challenges from the elevated turbidity levels, which not only complicate the treatment of potable water but also cause damage to their pumps due to the current state of our rivers.

ECONOMIC CONSEQUENCES

The long-term economic costs of galamsey far outweigh the short-term gains:

- **Decreased Investment in the Mining Sector:** Legitimate mining companies are withdrawing from certain regions due to the instability caused by illegal mining, leading to job losses and reduced foreign investment in the sector
- **Burden on Healthcare Systems:** The public health crises caused by mercury poisoning and water pollution are straining Ghana's already overburdened healthcare systems, with significant long-term economic impacts

OUR DEMANDS AND PROPOSED SOLUTIONS

In light of these pressing issues, we, the RSA of GAEC and CSIR, call upon the Government of Ghana to take urgent, decisive, and sustained action to address the Galamsey menace. We put forward the following demands:

1. **Immediate suspension of all illegal small-scale mining activities in Ghana until there is Support for Sustainable Mining Practices.** We call on the government to immediately suspend all illegal small-scale mining activities in the country for a period not less than one year until the government invests in promoting sustainable, eco-friendly mining practices by providing technical and financial support to small-scale miners. This will help formalize the sector and reduce the reliance on destructive mining methods thereafter. Just as the sea is closed for a month each year to allow for a bumper harvest when it reopens, this, in our considered view, would be tackling the galamsey menace with the urgency it requires. The current state of our water bodies demands vigorous action, as the consequences of illegal mining, if left unchecked, will be disastrous for the nation's environmental and public health.
2. **Immediate recall of Parliament to repeal the Environmental Protection (Mining in Forest Reserves) Regulation 2022 (L.I. 2462):** We further demand that Parliament be urgently recalled to immediately repeal the Environmental Protection (Mining in Forest Reserves) Regulation 2022 (L.I. 2462), which permits mining in forest reserves. If Members of Parliament can be recalled to grant tax exemptions for companies they believe bring substantial investments,

they should act with similar urgency to address the galamsey crisis. This issue is a ticking time bomb, threatening to derail all the economic gains and investments made by the nation, and thus an immediate action is needed.

3. **Restoration of Degraded Lands and Water Bodies:** We urge the government to initiate a comprehensive national program for the reclamation of lands destroyed by galamsey. This should include reforestation initiatives and the restoration of polluted water bodies, with priority given to communities most affected by the environmental damage. The government must collaborate with research institutions like GAEC and CSIR to employ innovative technologies in land reclamation and water purification.
4. **Creation of Livelihood Alternatives for Mining Communities:** The government must prioritize the creation of alternative livelihoods for those involved in illegal mining, particularly youth and displaced farmers. Job creation programs, vocational training, and access to financial services for small businesses should be expanded in galamsey-affected areas.
5. **Collaboration with Traditional Authorities and Civil Society**: We call for wider collaboration between the government, traditional authorities, and civil society organizations in the fight against illegal mining. Chiefs and community leaders should be empowered to take active roles in preventing illegal mining in their jurisdictions.
6. **National Stakeholder Dialogue:** We urge the government to convene a national dialogue that includes researchers, environmentalists, mining companies, traditional leaders, and civil society organizations to develop a sustainable solution to the illegal mining crisis. The sector should be regularized to lessen its impact on the environment and human safety while also utilizing its potential to alleviate poverty. Formalization through strong regulations and strict implementation of current regulatory frameworks.
7. **Strict mini-Environmental Impact Assessment (EIA) for small-scale artisanal mining projects:** EIA is a precautionary principle well-articulated in the AGENDA 21 document that serves as the blueprint for sustainable development in the 21st century. It is actually the principle number 15 among the outline of 27 principles that guide every developmental project. Thus, we argue an at least a mini-EIA should be applied and conducted for small-scale mining projects from the initiation phase to the closure phase.
8. **Self-regulation to reduce illegalities in the artisanal and small-scale gold mining sector:** In public policy, whenever something becomes difficult to govern, self-regulation could be a way out. Here, we mean the small-scale miners associations could be used to police their own activities. Here, the people police their own resources and activities. In that way, they listen more than using the military sent by the government to chase them. Thus, self-regulation may reduce the illegalities in the artisanal and small-scale gold mining sectors. This means relying on the artisanal miners themselves to police their operations, i.e., through the employment of small-scale miners' associations.
9. **Education and training on sustainable mining techniques for communities near mining sites:** Here, the miners could be trained on methods of reclaiming the land, basic accounting and commerce, effects of the mining activities on their communities, post-mining land use options, the use of the gold 'katcha' machine that extracts the gold without the use of mercury,

safe methods of mining wastes disposal, etc. this can be achieved by employing and deploying graduates from say the UMAT during their national service to registered small-scale mining sites.

10. **Incentives, improved resource access, and regular information about mining norms:** We suggest exploring more creative and long-lasting ways to regulate the sector, get lot more of the artisans to apply for licenses, and use the sector to combat poverty in mining towns. Additionally, comparable tax holidays and exemptions should be provided to the unofficial small-scale artists in order to enhance, stimulate, and increase their output.

CONCLUSION

The illegal mining menace poses an existential threat to Ghana's environment, public health, and economy. The time for rhetoric has passed; urgent and sustained action is needed now. As scientists, we are committed to working with the government and other stakeholders to find lasting solutions to this.

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BRIDGING THE GAP BETWEEN TECHNOLOGY AND END USERS

CSIR-IIR EMPOWERS STOVE MANUFACTURERS TO COMBAT HOUSEHOLD POLLUTION

In many African households, the traditional method of cooking using biomass stoves remains a cornerstone of daily life. While these stoves offer a convenient and affordable cooking solution, they often come with significant health and environmental drawbacks. The incomplete combustion of wood fuel releases harmful pollutants, including particulate matter and carbon monoxide, into the air. These pollutants not only pollute the environment but also pose serious health risks, particularly for women and children. his article highlights a significant intervention by the CSIR-Institute of Industrial Research, Ghana. The institution organized a training program aimed at empowering stove manufacturers and liner producers to design and produce improved biomass cookstoves. By focusing on fundamental design principles, testing protocols, and laboratory techniques, the training aimed to reduce harmful emissions, enhance efficiency, and improve the overall safety of biomass stoves. This initiative has the potential to significantly impact the health and well-being of millions of people who rely on biomass for cooking.

Village setting kitchen and firewood sales point

Prolonged exposure to smoke from biomass stoves can lead to respiratory illnesses such as bronchitis, pneumonia, and asthma. The particulate matter in the smoke can irritate the eyes, causing redness, itching, and impaired vision. Exposure to carbon monoxide, a colorless and odorless gas, can reduce the oxygen-carrying capacity of blood, leading to heart problems and other cardiovascular diseases. Some studies suggest a link between exposure to air pollution from biomass stoves and an increased risk of lung cancer. In addition, the widespread use of biomass stoves contributes significantly to deforestation, as the demand for fuelwood leads to the clearing of forests. This not only depletes natural resources but also contributes to soil erosion, biodiversity loss, and climate change. Deforestation and the burning of biomass release carbon dioxide into

the atmosphere, contributing to climate change.

To mitigate these health and environmental risks, it is crucial to promote the adoption of cleaner and more efficient cooking technologies. This can be achieved through a combination of strategies, including: encouraging the use of cleaner cookstoves that are more efficient and produce fewer emissions, expanding access to cleaner fuels, investing in research to develop innovative and affordable clean cooking solutions. To address these issues, the

Biomass cookstoves manufacturers training

CSIR-Institute of Industrial Research (CSIR-IIR) in Ghana, a renowned research institution, has taken a proactive step to improve the design and performance of biomass stoves. In collaboration with the Ministry of Energy and the Energy Commission of Ghana, CSIR-IIR recently organized a six-day training program for selected stove manufacturers and liner producers. The training aimed to equip participants with the necessary knowledge and skills to design and produce cleaner and more efficient biomass stoves. The curriculum covered a wide range of topics, including: **Understanding the Basics: Heat Transfer, Fluid Dynamics, and Material Selection in Stove Design**

To design effective and efficient biomass stoves, a solid understanding of fundamental principles is crucial. These principles, including heat transfer, fluid dynamics, and material selection,

Training participants modelling their stoves

play a significant role in determining the stove's performance, emissions, and durability. Heat transfer is the process by which thermal energy moves from a region of higher temperature to a region of lower temperature. In the context of biomass stoves, understanding heat transfer mechanisms is essential for optimizing combustion and heat utilization. Conduction is the heat transfer through direct contact between materials. In stoves, heat is conducted from the fire to the cooking pot through the stove's walls and the cooking pot's base. Convection is the heat transfer through the movement of fluids (gases or liquids). In stoves, hot gases rise from the fire and transfer heat to the cooking pot and the surrounding environment and radiation is heat transfer through electromagnetic waves. In stoves, heat is radiated from the fire to the cooking pot and the surrounding environment.

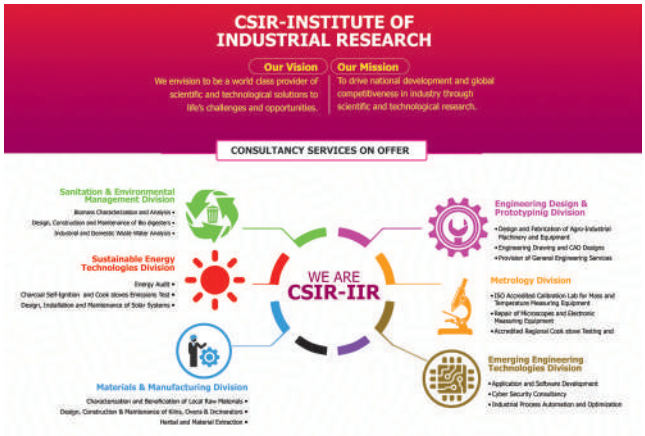
Another significant principle is the fluid dynamics. Fluid dynamics is the study of the motion of fluids, such as air and water. In the context of biomass stoves, understanding fluid dynamics is important for optimizing combustion efficiency and reducing emissions. The

flow of air through the stove affects the combustion process. Proper airflow ensures adequate oxygen supply for complete combustion, reducing the formation of harmful pollutants. During combustion the rise in temperature within the cookstove creates a pressure difference between inside and outside of the stove. A well-designed stove should have a balanced draft to maintain efficient combustion.

The choice of materials used in stove construction significantly impacts its performance, durability, and cost. Key factors to consider in material selection include: heat resistance, where the materials should be able to withstand high temperatures without deteriorating. The materials should have good thermal conductivity to efficiently transfer heat from the fire to the cooking pot and should be durable and resistant to wear and tear. To ensure the quality and performance of biomass stoves, standardized testing protocols are essential. These protocols allow for the evaluation of various aspects of stove performance, including efficiency, emissions, and user safety.

Providing Stove Testing Using Standard Protocols

There are international standards developed for conducting a series of tests on cookstoves. These standards provide a common framework for assessing the performance of different stove types, including traditional biomass stoves and improved cookstoves. Key stove testing protocols include Water Boiling Test, Controlled Cooking Test and Kitchen Performance Test: The CSIR-IIR laboratory provides a comprehensive platform for evaluating the performance of biomass stoves. By conducting a range of rigorous tests, researchers can identify areas for improvement and promote the development of cleaner and more efficient cooking technologies. By conducting these comprehensive tests, researchers at CSIR-IIR can provide valuable insights to stove manufacturers, policymakers, and consumers. This knowledge can be used to develop and promote cleaner, more efficient, and safer biomass stoves, ultimately improving the lives of millions of people in Africa and beyond. By imparting this knowledge, CSIR-IIR aims to empower stove manufacturers to develop innovative designs that reduce harmful emissions and improve cooking efficiency. These improved stoves will not only benefit the health of millions of Ghanaians but also contribute to a cleaner environment. Furthermore, the training provided an opportunity for participants to network and share experiences. This collaboration will foster innovation and knowledge exchange within the stove manufacturing industry. The successful completion of the training program marks a significant step towards promoting cleaner and more sustainable cooking practices in Ghana. By investing in research, training, and capacity building, CSIR-IIR is playing a crucial role in addressing the challenges posed by traditional biomass stoves.



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APPOINTMENTS AND MILESTONES

Dr. Kwame Antwi Oduro

Dr. Kwame Antwi Oduro a Principal Research Scientist has been appointed as the substantive Director for CSIR-Forestry Research Institute of Ghana. Before his appointment, he was the Head of the Forest Policy, Governance and Livelihoods Division.

Dr. Oduro has over 20 years of research and development experience in forestry, natural resources governance, policy and project coordination, including more than 10 years of successful experience in management, leadership and administrative positions.

He has coordinated and conducted a number of research and consultancy services for both international and local organizations and non-governmental organizations, development partners, and government institutions.

He has collaborated with numerous international and local organizations, including the World Bank, United Nations Development Programme (UNDP), the Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF), Netherlands Development Organization (SNV), International Tropical Timber Organization, Tropenbos International and the Forestry Commission, Ghana.

He has published widely and he is a reviewer for several international journals.

He holds a PhD from the Wageningen University, the Netherlands, MSc Forestry and its Relation to Land Use from the University of Oxford, United Kingdom, and BSc degree Natural Resources Management rom the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana.

Dr. Collins Tay

Dr. Collins Korbla Tay has been appointed as the substantive Director for

the Council for Scientific and Industrial Research- Soil Research Institute (CSIR-SRI). Prior to his appointment as Director, he was the Head of the Environmental Chemistry and Sanitation Engineering of the CSIR-WRI.

Dr. Tay is a consultant hydro-geochemist/ Environmental Toxicologist with over 23 years of experience as a researcher. He is currently a Chief Research Scientist. Dr. Tay has authored over 100 scientific publications including thirty (30) peer-reviewed publications in high impact local and international journals. His areas of expertise include conducting research on; the identification, characterization and prevention of pollution of prioritized pollutants such as trace/heavy metals and organic pollutants in regional water/ soil contaminated environments, the hydrogeochemical/ hydrochemistry and stable isotopes evaluation in regional water resources, drinking water safety and health risks control, and the trophic state and primary productivity in regional water environment for sustainable management.

Dr. Tay holds a PhD in Environmental Science from the University of Ghana, MSc in Environmental Resources Management, and a BSc (Hons) in Chemistry both from the Kwame Nkrumah University of Science and Technology (KNUST), Ghana. Dr. Tay also obtained Post- Graduate Diploma in Management of Water Resources and Water Services, a joint sponsorship programme from HYDROIAD- Water for Development Management Institute, the Polytechnic of Turin, the University of Turin, the SMAT S.p.A (Turin Water Utility) with the co-operation of the International Training Centre of the International Labour Organization (ITC-ILO), Turin, Italy.

He has served and still serves as a member of governing boards and management committees within and outside the CSIR. Dr. Tay currently serves as a member of the Editorial Advisory Board, Cambridge Scholars Publishing, EAB Physical Sciences (Environmental Sciences), Editorial Board- Journal of Earth and Environmental Sciences (Gavin Publishers), and Editorial Board- American Research Journal of Earth Sciences.

Dr. Tay is also an External Examiner for the College of Basic and Applied Sciences, University of Ghana, Legon, and the Graduate School of the University of Energy and Natural Resources, Sunyani.

Dr. Isaac Danso

Dr. Isaac Danso obtained a bachelor's degree in Crop Science in 2001 and a Master of Philosophy (M.Phil.) in Soil Fertility in 2009, both from Kwame Nkrumah University of Science and Technology. In 2003, He completed specialty training in Project Management from Nordic Agricultural Academy, Denmark after receiving scholarship from Danish International Development Agency. Subsequently, he graduated with a Doctor of Philosophy (Ph.D.) in Climate Change and Cropping Systems from University of Bonn in Germany in 2015 after receiving Scholarship from German Federal Ministry of Education and Research. Isaac is a product of the

school (Mfantsipim school) and belongs to MOBA 93 year group.

Dr. Isaac Danso worked as Assistant Project Manager with DANIDA in Navrongo before He joined CSIR-Oil Palm Research Institute in 15th April 2002 after his first degree. At CSIR-OPRI he has risen through the ranks from Assistant Research Scientist (2002-2009), to Research Scientist (2009-2017), Senior Research Scientist (2017-2021) to Principal Research Scientist (2021 to date). Thus, he has 22 years of experience in his research career. Dr. Isaac Danso was a former Deputy Director of the Institute. Dr. Isaac Danso has received several awards and recognitions for his professional and academic excellence. Some of his academic awards/ scholarships include: German Federal Ministry of Education and Research Scholarship, Doctoral Scholarship for PhD in Climate change (University of Bonn, Germany); DANIDA fellowship award, Republic of China Ministry of commence award, National farmers day award etc. Dr. Isaac Danso has over 80 publications including refereed journal papers in credible international peer-reviewed journals, 2 books, and 2 book chapters. His research interests include climate change impact and adaptations, plant nutrition, crop modelling and soil and water conservation. He has been part of several funded research with multidisciplinary research teams with sponsorship from European Union (EU), World Bank, Africa Development Bank, United States Development of Agriculture etc. He is a reviewer for many journals and serves on three editorial boards. Isaac serves as external examiner for Ghanaian Universities. He is a member of Ghana Science Association, Research Staff Association of CSIR and a member of German students Alumni.

GALLERY

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