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Editorial Comment

It is a thing of joy for us to be able to collectively execute this newsletter project after a long wait and pedantic resolve on the matter. Coordinating member centers to facilitate the timely production of this material was as demanding as it was interesting. We profoundly appreciate all those that had time to help drive this project. I particularly appreciate Centre Leaders of FOOD4WA for their commitment and support for this vision. This is a sign that we can actually achieve so much together as a team. Now I know that there is power in unity and staying committed to a cause is the sure path to greatness.

As a maiden edition of the newsletter, we had expected that all member Centers would feature in it however; some of our members could not follow-up keenly given the nature of their schedules and other unforeseen circumstances. Nevertheless a significant number of us were able to meet up with the deadlines for publication hence the production.

This edition chronicles some interesting experiences across member centers with a clear emphasis on research focus, Alumni progress report and an of course an insight into the quality of facilities across member centers. Consequent upon our francophone and Anglophone composition, it became compelling to package the newsletter in a manner that appeals to both interests. Therefore, on the one side of the newsletter, contents are captured in the English language while on the other side of the flip, we have the French version of same contents so that both our Anglophone and francophone



audiences can conveniently relish on the newsletter.

All news stories featured in the newsletter present clear pictorial and literary insight into recent breakthroughs across member centers of FOOD4WA alongside beautifully packaged adverts of upcoming events that have an international appeal.

Each page of the Newsletter is spiced with quality graphics and exciting contents to arrest and sustain the attention of our readers thus endearing them to the ACE-Agric Centers irresistibly. It has been a profound privilege working with a team of very interesting, supportive and intelligent Communication officers across the centers to help drive this vision.

Africa is richly endowed and it would be a thing of joy to strengthen research and intellectual collaborations among ACE Centers with a mandate on agriculture so as to safeguard food security and enhance agricultural value chain within the region generally.

Happy Reading

Jacob Shagbaor Suemo, PhD.,
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FOOD4WA NEWSLETTER

FOOD FOR WEST AFRICA NETWORK

In line with strengthening Inter-ACE collaborations, various thematic networks have been created under the ACE Impact Project. The Food for West Africa (FOOD4WA) is one of eight thematic networks established with the aim of advancing collaboration on cutting-edge research, to address food insecurity challenges within the region. The network's objectives are:

To establish a network between faculty and students from the participating ACEs

Create a coordination of research on priority themes related to food security

Communicate the results of research and innovation through conferences and symposia involving key actors in the agricultural sector

Create a digital platform

The network is expected to involve agriculture stakeholders within the region to strengthen food security, improve quality in agricultural products, train to increase the number of skilled agricultural workers and researchers and to develop innovative agricultural techniques to improve agricultural yields.





DESCRIPTION OF



Food For West Africa (FOOD4WA) is a network created following a call for projects from the Association of African Universities (AAU), between seven West African CEA-impact centers in the field of agriculture. FOOD4WA aims to ensure the continuity and sustainability of the various AECs working in the field of agriculture even after the end of the funding phase of the centers by the World Bank. The FOOD4WA network is created with the aim of setting up a common platform where the seven African Impact Centers of Excellence (AECs) dedicated to agriculture and other like-minded associations or groupings will work together to achieve training, research and partnership objectives around food and nutrition security in

Africa.

The objectives of FOOD4WA are: (i) to set up a network between professors and students of the different CEA-Impact members, (ii) to create a coordination of research on priority themes related to food security, (iii) to popularize the results of research and innovation through conferences and colloquia involving students and teachers as well as the farming world and key actors in the orientation of development policies such as national and regional institutions such as UEMOA, ECOWAS, etc. (iv) create a digital platform and communication activities, (v) draft common projects.

The network had its statutory constitutive general assembly on

December 16 and 17, 2021. During this assembly the founding members of the network present were

- Regional Center of Excellence on Poultry Sciences (CERSA) of Togo,
- Regional Center of Excellence on Pastoral Productions: Meat, Milk, Hides and Skins (CERPP) of Niger
- Center For Food Technology and Research (CEFTEP) of Nigeria
- African Center of Excellence in Dry Land Agriculture (CDA) of Nigeria
- African Center of Excellence in Agriculture

- for Food and Nutritional Security (AGRISAN) of Senegal
- African Center of Excellence on Climate Change, Biodiversity and Sustainable Agriculture (CEA-CCBAD)
- West Africa Centre for Crop Improvement (WACCI) of Ghana amended and validated the statute governing the operation of the network. They also set up in accordance with the validated statute and put in force the coordination office of the network. This office is composed of:
 - Professor TONA Kokou of CERSA/University of Lomé, President of the office elected for a period of one year renewable once;
 - Professor METOWOGO Kossi of CERSA/University of Lomé, Administrative Secretary elected for a period of two years, renewable once,
 - Professor IKYO Achakpa Barnabas, Member
 - Professor MARICHATO Hamani, Member
 - Professor DANQUAH Eric Yirenkyi, Member
- Professor JIBRIN Mohammed Jibrin, Member
- Professor SYLLA Eh Samba Ndao, Member
- Professor KONE Daouda, Member

This coordination office is assisted by

- the communication officer of CERSA, Mr. TONA Agbéwoannou whose task is to communicate on all the activities of the network and to animate the network platform;
- the CERSA financier, Mr. SOEDJEDE Yawovi Agbélenko who ensures the financial management of the resources allocated to/generated by the network.

FOOD4WA is officially recognized according to the Togolese law of association/network creation under the number 694 of 03/08/2022 of the Ministry of Territorial Administration, Decentralization and Development of Territories (MATDDT). The address of its website is : <https://www.food4wa.org> .

We are convinced that training, research and innovation will contribute to the achievement of the network's main objective, which is food security. To this end, the network works for a

synergy of action between member centers through the exchange of teachers and students, the training of tomorrow's managers, and the capacity building of professionals along the entire agricultural value chain. The network facilitates the development and implementation of joint projects. It addresses any issue affecting the entire agricultural value chain from production to consumption in order to address the problem of food security in the West African sub-region. Convinced that funding for research will be the basis for innovation, the network has taken on the mission of advocating to national (public and private) and international financial institutions. We are also ready to offer our expertise in solving food insecurity problems in the context of climate change.

The network has set up a newsletter that is a powerful outreach tool to reach all segments of African agriculture. We are convinced that if we dare, we will be able to feed our growing populations even in a hostile climate environment.

FOOD4WA administrative secretariat



PROF JIBRIN FROM NIGERIA SUCCEEDS PROF KOKOU TONA AS CHAIR OF THE FOOD FOR WEST AFRICA NETWORK

Professor Jibrin Mohammed Jibrin of the Center of Excellence for Dryland Agriculture (CDA) has just been elected by his peers to head the Food for West Africa Network. He succeeds Prof. Kokou Tona, Director of CERSA. This took place at the end of the second general assembly of this network which was held in mixed mode (physical and virtual meeting) on December 1, 2022, at Abuja, Nigeria.

“I will do my utmost to accelerate the activities of the network in order to achieve our objectives. I know that there are many challenges ahead of us, but with everyone's commitment, we will overcome them,” said the network's newly elected president, Prof. Jibrin.

The general assembly through the administrative secretary of the network, Prof. Kossi Métowogo, presented the activities and the financial reports, and the election of the new president of the network. During the round table discussions, the participants present at the assembly insisted on the ways and means to be adopted to accelerate the execution of the various activities assigned to the centers.

The assembly of agricultural ACEs organized on the sidelines of the second edition of the congress the promotion of local African products and the mitigation of problems related to post-harvest losses organized by the Center of Excellence for Food Technology and Research (CEFTER) of the Benue State University, Makurdi, Nigeria.

This edition was dedicated to local African foods, most of which are neglected, poorly preserved and vastly underutilized, despite their crucial role in food security, nutrition, medicinal values and income generation for humanity,” stated the organizers. According to them, “the promotion of these local dishes, especially amongst the rural dwellers, will not only help to sustainably fight against hunger in Africa but also to gain inclusion in the global food system”.

A special panel was devoted to the Food for West Africa network. It was a great opportunity for its leaders to present the objectives, missions, and actions of the network in favor of food sovereignty in Africa.

As a reminder, Food For West Africa is a group of seven centers (7) of excellence in Africa dedicated to the



PROF JIBRIN

agricultural sector. The seven centers that make up the network are :

Regional Center of Excellence for Poultry Science (CERSA) of Togo; Regional Center of Excellence on Pastoral Production (CERPP) in Niger;

Centre For Food Technology and Research (CEFTER) of Nigeria; Climate Change, Biodiversity and Sustainable Agriculture (CCBAD) of Côte d'Ivoire;

African Center of Excellence in Dry Land Agriculture (CDA) of Nigeria; African Center of Excellence in Agriculture for Food and Nutritional Security (AGRISAN) of Senegal; West Africa Center for Crop Improvement (WACCI) of Ghana.

CERSA

A CENTER STRONGLY COMMITTED TO RESEARCH TO PROMOTE THE POULTRY SECTOR

By: Fernand A. TONA

CERSA



CERSA main building seen from the side and from the front

Created in 2014, the Regional Center of Excellence on Poultry Sciences (CERSA) of the University of Lomé is strongly committed to training but above all research to promote the poultry sector in Africa. The center of excellence has not only contributed to increasing scientific research capacity, but it has a considerable impact on the poultry sector through productivity.

At the beginning, CERSA was the firm will of a group of men and university institutions determined to give more impetus to the production and consumption of poultry products in West and Central Africa. And for good reason. Over the past twenty years, the world production of poultry products has increased by 3.9% per year for eggs, and has contributed to significantly improving the coverage of protein needs for the world

population. Africa's share is 48% in this production. Consequently, the annual consumption of eggs per inhabitant and per year, on the continent is on average 45 eggs against 145 for the world average. The situation is more critical in Togo where consumption is on average 13 eggs per inhabitant per year. Since its creation in 2014, CERSA has set itself the priority areas of research, the production and processing of poultry products. In its production dimension, the center is mainly interested in the production of day-old chicks (incubation), breeding and feeding. In its processing dimension, the CERSA deals with the processing of poultry products (meat and eggs) and the upgrading of poultry by-products.

Attractive curricula

CERSA offers six (6) specialties of the Research Master's Program:

- Poultry production techniques;
- Processes for the Transformation of Poultry Products;
- Biosecurity and Bio-Security in the Poultry Sector;
- Biotechnology and Poultry Genetics;
- Marketing and socio-economics of the poultry sector.
- Bioethics and welfare of domestic animals.

The center also offers many interesting themes for doctoral research.

From 2015 to the end of 2021, a period of intense activity for

CERSA, hundreds of Masters and Doctorate students of around fifteen nationalities were trained. To this number are added more than 1,500 poultry technicians from short-term training in poultry farming, and ready for employment in the following countries: Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali, Senegal and Togo. In terms of scientific publications, the center is just as prolific with nearly fifty scientific articles published.

Substantial means

In terms of resources, CERSA is mainly financed by the World Bank through funds allocated to African Centers of Excellence. To carry out its research activities, this center of the University of Lomé has invested more than 1.5 billion CFA francs in research equipment.

In terms of equipment, to date, the center has multi-purpose laboratories and well-equipped specialized laboratories, hatcheries, experimental units, a mini-abattoir with a slaughter capacity of 200 chickens/hour and of an animal feed production unit. It also has state-of-the-art equipment to measure the nutritional value of ingredients and the quality of egg products.

CERSA also has partners who make their farms available to it for research. The actors of the research at the level of the center are especially the students in master and in thesis supervised by the teacher-researchers of the University of Lomé and the partner universities (University of Abomey Calavi, University of Wageningen, Poultry Research Unit of Tours, in France...). Apart from the



funding provided by the World Bank, CERSA now has fairly solid and diversified partners who contribute substantially to research. Among them are Hendrix Genetics, ORFFA, Vencomatic. In addition, in order to ensure its sustainability, CERSA generates income through the provision of services and the revaluation of research residue.

A good place for the development component in research

CERSA conducts basic and applied research. In its applied research dimension, the CERSA makes development its hobbyhorse. Thus, certain themes developed at the level of the center emanate directly from the actors of the sector and the results obtained are directly applicable by these actors who are at all the links of the chain in research. All new CERSA students must go through an internship on the farms of CERSA partners. At the end of these courses, they can identify shortcomings or difficulties experienced by the operators.

These problems are translated into themes that the students will elucidate within the framework of their master's or thesis research work. These results will directly benefit the target farm.

On the other hand, CERSA organizes short-term professional training courses leading to the issuance of a poultry technician certificate. These trainings are requested directly by the actors as part of their capacity building. The contents of the training modules come directly from the results of research conducted at CERSA.

Concretely, the results are palpable in poultry farms. "Previously, if a poultry farm harvested ten trays of eggs a day, with the training of CERSA, you can end up with twelve to fourteen trays of eggs daily," says Mr. Georges Sanvee, poultry producer.

"I learned to drive chicks to cull age," Akou said after a short training session in poultry farming.

The center also organizes



Two students working in the lab

symposia or workshops to which industry players and decision-makers are invited. During these meetings, research findings are discussed. The interesting results are above all the successful substitution of fish meal by soldier fly larvae meal.

This species of fly has the particularity of being harmless, not a vector of disease and above all capable of developing on a ubiquitous substrate, in this case millet spent grain, corn, wheat, etc. Chickens fed with these larvae have their improved performance compared to those fed conventional food. These results make it possible to

reduce the cost of feed, the production of larvae being much cheaper than fishmeal. And today, CERSA has a production unit for soldier fly larvae and supports partner farms in setting up their own unit. In terms of acclimatization, CERSA, in collaboration with a European partner, studied the capacities of certain chicken strains offered by the partner in the tropical climate. To date, CERSA has substantial data on the adaptation of these strains.

Encouraging innovations

CERSA intends to rely on local natural resources by drastically reducing the use of chemicals in poultry farming. Thus,

medicinal plants are increasingly incorporated into poultry farming and their impact on poultry health assessed. For example, papaya seeds have been successfully evaluated for their anthelmintic and nutritional properties.

Whey has been successfully used as a probiotic in chicken farming. It emerged that whey improved the immune status of chickens and therefore their performance was increased. Other natural resources such as Moringa oleifera and cassava leaves are used at CERSA. CERSA students have thus been able to develop biscuits made from poultry meat, egg powder that can be mixed with infant flour, eggshell-based syrup as part of calcium supplementation, or mixing soldier fly maggot meal with poultry feed.

Research at CERSA leaves marks in the poultry industry. From now on, the center is committed to accelerating and developing the popularization of its results and the adoption of the fruits of its research by players in the poultry sector. The challenges are certainly many, but the commitment to succeed is there.



Soldier fly and its larvae intended to be mixed with poultry feed

CERSA ALUMNI

AN ARMY OF AMBASSADORS FOR THE POULTRY SECTOR IN AFRICA

By: Fernand A. TONA
Communication Officer for the Centers of Excellence of Togo.



View of the official platform and participants during the launch of Alumni CERSA

The association of former students of the Regional Center of Excellence on Poultry Sciences (CERSA) of Lome University was officially launched on August 19. Given the role and the challenges that await them, students graduating from CERSA are true ambassadors of the poultry sector.

The Alumni CERSA association, which brings together former students who have obtained their Master's and/or Doctorate at the Regional Center of Excellence in Avian Sciences (CERSA) of Lome University was officially launched on August 19, 2021.

Alumni CERSA has dozens of members from fifteen countries in East, West and Central Africa

distributed in the following countries: Benin, Burkina-Faso, Burundi, Cameroon, Ivory Coast, Gambia, Ghana, Mali, Nigeria, Niger, Senegal, Chad and Togo.

The association has drawn up an action plan articulated around seven main strategic axes, including the official registration of the network, the coordination of activities in all the countries where members reside who will play the role of focal points in the event of need. In addition, there is support for Alumni in their professional integration, the establishment of a framework for drafting poultry projects and the organization of scientific and/or commercial meetings.

The Director of CERSA, Professor Kokou TONA, has always supported the association. "CERSA is determined to continue in the same dynamic by doing research and providing cutting-edge training focused on solving the problems facing the poultry industry".

According to the president of Alumni CERSA, the Togolese Bamelamawoulom TOKOFAÏ "the vision that drives Alumni CERSA is that of a Professional Network of international reference at the service of quality professional poultry training, open to all and working for the integration professionalism of graduates, and for sustainable development and the fulfillment of all".



Members of the Executive Bureau and officials pose during the official launch ceremony of Alumni CERSA

“The general objective of the network is to facilitate the professional integration and mobility of graduates by putting them in contact with each other in a continuous and mutually enriching way, with partner companies, then allowing them to support and inform each other. on the evolution and innovations of the poultry sector”.

In order to encourage them to self-employment, the members

of the association have often been encouraged to "engage in poultry entrepreneurship, and to initiate innovative projects in order to become their own employers, and create jobs for other young people.

Synergy between CERSA and Alumni

For a good follow-up of its former students, CERSA has a database via Google Forms. As part of its operation, the Association of former CERSA

students called Alumni CERSA has statutes and internal regulations.

(Link: The Alumni CERSA association officially launched. <https://cersa-togo.org/actualite/la-association-alumni-cersa-officiellement-lanca-e-189.html>)

CERSA keeps in touch with its students, through telephone contact, note, email, WhatsApp or other means of communication and regularly invites them to scientific events such as conferences, symposiums, workshops or colloquia. Similarly, calls for applications or job offers from various national or international institutions are made available to them.

Contact between former CERSA students and the parent company is very well maintained. Some students are often asked to conduct tutorials and/or lead short training courses. Those who are promoters of farms receive CERSA students for internships in their companies. As part of the short-term training organized in the sub-region, former regional students are asked to work in their country of origin. This was already the case with students from Ghana and Benin.

Continue to improve its teachings

In its policy of continuous improvement of its teaching, CERSA has set up a system for collecting information from former students and their employers on their employability. This policy has the advantage of confronting the teachings of the center with the



Mawoulom TOKOFAI, President of Alumni CERSA gives an interview to the press



Mawoulom TOKOFAI, President of Alumni CERSA

world of employment and of leading, if necessary, to the updating of certain teaching programs. Former students who assist the teachers in the supervision of students, help in the management of laboratories and other infrastructures of CERSA and participate in the research activities of the center. In view of a fairly marked impact on the poultry sector, CERSA has, in its action plan,

envisaged supporting former students through advisory support or financial support according to criteria and methods.

In terms of capacity building for actors in the sub-region, CERSA also relies on alumni to raise awareness among actors in the sector and organize short-term training in their respective countries. This policy arouses

great motivation among students. CERSA also relies on its alumni to attract new students to the centre for studies.

CERSA is a member of the World Poultry Science Association (WPSA). In addition, several former CERSA students at the national and regional level are also members of this organization. As such, CERSA in collaboration with WPSA organized the first Pan-African Poultry Conference (CAP) in Togo in May 2019 in which former students were strongly involved (for example: participation in the organizing committee, prize competition, communication, etc.).

The center supported the CERSA Alumni professional network in setting up its bodies and operating it. In return, the members of this network serve as ambassadors for the centre.



The Alumni staff with the director of CERSA



An alumni gives a short training on the processing of poultry products

During fairs and other information and/or awareness-raising meetings, former students are invited to take part in debates and present their innovations. CERSA undertakes to receive members of the Alumni network in recycling.

Win-win networking

Alumni CERSA will benefit from support in setting up entrepreneurship projects to boost the poultry sector. Alumni

C E R S A sets up multidisciplinary projects, in collaboration with CERSA, to be submitted to Technical and Financial Partners (PTF). Members of Alumni CERSA are registered on a WhatsApp platform called 'Alumni CERSA'. The association also has a section on the CERSA website (<https://cersa-togo.org/actualite/alumni/>) where documents relating to their activities and events are

posted. The association has also created a Facebook page (<https://www.facebook.com/Alumni-CERSA-104633012134777>) and LinkedIn (<https://www.linkedin.com/company/alumni-cersa/about/?viewAsMember=true>) both called 'Alumni CERSA' which are interaction platforms between members for sharing experiences and information.

All this bodes well for good collaboration between CERSA and its former students. CERSA takes advantage of this synergy to improve its actions at the regional and international level. Like true ambassadors, the alumni are responsible for proclaiming the good news or carrying out good actions for the development of the poultry sector at the national, regional and international level.



Voting session during the general meeting of Alumni CERSA

CERSA

HAS AN EDUCATIONAL COMPLEX AND HIGH-PERFORMANCE RESEARCH UNITS

By Fernand A. TONA
CERSA communication specialist



An imposing and adapted educational and research complex

The Regional Center of Excellence on Avian Sciences (CERSA) of the University of Lomé, created in 2014, was funded to the tune of eight (8) million dollars in its first phase. It is one of the six CEAs in the agricultural sector. A second phase called CERSA IMPACT funded to the tune of \$4 million has been implemented since January 2020.

Its vision is to contribute to

developing and improving productive capacities in the agricultural sector in general and in poultry farming in particular in order to contribute to consolidating food security in West and Central Africa. Its missions include research and development, training, support and advice to poultry farmers, the promotion of poultry by-products and the strengthening of collaboration between partners.

In terms of objectives, CERSA wants in particular to i/develop and improve the quality of poultry products and strengthen the development of the poultry sector in Togo and in the sub-region; ii/develop a regional training and research program for masters and doctorates in avian sciences and iii/develop a modular and/or short-term professional training program for poultry professionals but also for young people wishing to enter the sector.



A PhD student working in the lab...

The inauguration on November 1, 2019, of the imposing main building of CERSA called the Educational and Research Complex was attended by four ministers from the Togolese government, several personalities from the World Bank. This denotes the importance of the center.

CERSA educational and research complex at the University of Lomé, Togo

This complex contains a well-equipped laboratory available for researchers from Togo, the sub-region and even internationally. This infrastructure is worth 677 million FCFA for the work and about 1.5 billion FCFA for the equipment. It includes, among other things, a conference room

with 200 seats, two classrooms with 40 seats each, six specific laboratories, two multi-purpose laboratories, a library, around twenty offices and a meeting room with 50 seats. Clearly, the center has given itself the means to achieve its ambitions in terms of the quality of training and applied research.

State-of-the-art equipment and materials

To enable researchers to carry out their mission in the best possible conditions, CERSA has equipped itself with state-of-the-art laboratory equipment. We thus note the presence of the Kjeldahl Set to measure the nitrogen content, the bomb calorimeter for metabolizable energy. Added to this is a multitude of equipment for versatile laboratories with -80, -

40 and -20 degree freezers, Stomacher, Bi-Water Distiller, Centrifuge, Binocular Microscope, Fluorescence Microscope and Rotary evaporator.

There are also specific laboratories which are the Physico-chemical laboratory (ICP-MS Content of specific minerals, Soxhlet to measure raw fat), the Microbiology laboratory, the Molecular biology laboratory to measure the amount of DNA, RNA, without forgetting the electrophoresis device (Tank, generator, trans-illuminator) and the gas analyzer among others.

Specialized and diversified units CERSA's slogan is "The poultry sector from A to Z". To respect this motto, the center has specialized and diversified units. This is how we distinguish the experimental unit serves as a framework for various experiments for students. In particular, crossbreeding of different strains of poultry takes place there. The hatchery is the unit closely linked to the experimental unit and has a storage capacity of around 20,000 eggs to incubate.

The mini-abattoir with a capacity of 200 chickens/hour. Students learn and practice slaughtering and cutting techniques.

The composting platform intended for the agronomic recovery of poultry by-products such as shells, litter, feathers and others. These products thus transformed into green manure are also used by students from the Ecole Supérieure



the chicken coop of CERSA seen from above

d'Agronomie for their experiments in the production of various foodstuffs such as vegetables, corn, peppers, carrots, etc.

Another not least platform is dedicated to the production of maggots, black soldier fly larvae. These maggots are incorporated into poultry feed as a source of animal protein to replace fishmeal. Dozens of people have already received training in this niche that entrepreneurs could seize to put their investments there.

Efficient connectivity

Always with the aim of facilitating research for students, a point of honor was given to the connectivity of the center.

Thus, the internet subscription that took place from the launch of the project was reinforced with fiber optics so that the training sessions take place in very good conditions. To top it all off, the center has installed videoconferencing equipment in conference rooms, meeting rooms and smart classrooms where learners can take lessons and interact with teachers online.

CERSA facilities are open to the community under certain conditions to ensure their sustainability. This is how the conference room with a capacity of two hundred seats serves as a setting for conferences, workshops or thesis defenses. To support everything, in terms of energy, CERSA has relied on the energy mix including the conventional source of electricity, solar and the generator.



CERSA mini-slaughterhouse



Learners in the platform of maggot production



Telecom technicians during the installation of optical fiber at CERSA



A class session in one of the smart classrooms

Seed coating with mycorrhizas and PGPR bacteria: a simplified process of biological fertilization and a tool for seed protection strategy from insect damage



SENE Godar, Thiao Mansour, MBAYE Mame Samba, SYLLA Samba Ndao
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Maize (*Zea mays* L.) and sorghum (*Sorghum bicolor*) are among the main crop cereals in Senegal and play an important role in feeding populations and livestock. In the southern and eastern parts of the country, maize and sorghum constitute the basic food for a large part of the population and were among the crops promoted in a special food production package to ensure food security in Senegal. However, crop yields are continuously decreasing mainly due to a loss of soil fertility. Microbial inoculants are known to be an alternative to the use of chemical fertilizers and a mean to maintain or improve the soil fertility. Many lines of scientific evidences prove not only improved crop yield and resistance of mycorrhizal and/or nodulating plants to environmental factors but improvement of many food quality properties, such as increased contents of desirable antioxidants, vitamins and mineral elements (Sene et al., 2010; Calvo et al., 2014; Rocha et al., 2019). These soil microorganisms are now being promoted as smart fertilizers for a new green revolution in the

21st century.

On the other hand, smallholder farmers face challenges related to the conservation and storage of maize and sorghum seeds. Indeed, their production can be infested and damaged by a variety of primary and secondary insects during the storage. Stored maize and sorghum seeds are vulnerable to various insect pests. The maize weevil *Sitophilus zeamais* (Coleoptera: Curculionidae) and the lesser grain borer *Rhyzopertha dominica* (Coleoptera: Bostrichidae) are among the most destructive cereal pests in sub-Saharan Africa. Populations in stores can build up rapidly and losses by the insects can reach 40% within 6 months of storage. Hence producers often apply synthetic pesticides despite their known adverse effects such as health hazards, selection of resistant insect pest strains and negative environmental impacts. Limited work has been done in Africa to manage the cereal pests using environmentally sound control methods.

Driven by the need for sustainable and

environmentally friendly farming practices and safer and healthier food, the demand for microbial inoculants is rising. Our hypotheses were that the seed coating would be a tool for delivering beneficial microorganisms to agricultural crops and that this pre-culture technique would significantly contribute to increase seed resistance against insect aggressors.

Based on the above considerations, laboratory and glasshouse experiments were conducted to formulate a seed coating process with AM fungal spores (*Rhizophagus fasciculatus* and *Rhizophagus aggregatus*) and *Leifsonia* sp. Plant Growth Promoting Rhizobacteria (strain ORS3454). Moreover, two additional experiments were conducted to assess whether the coated products can be stored without losing viability for guaranteed period and whether the coatings can reduce the damages caused by the insect bioaggressors.

Overall, this work demonstrated that maize and sorghum seed coating with arbuscular mycorrhizal spores and Plant

G r o w t h P r o m o t i n g
Rhizobacteria fertilizers is feasible using a 10% Arabic gum solution without obscuring the seed and mycorrhizal fungal germination capacities. Moreover, the results indicated that the coated seeds can be stored for up to 4 months at 6°C conditions, without losing the seed germinability and coated microbial inoculant efficacy. Meanwhile, beyond a certain threshold, the gum dose acted negatively on the germinating characteristics of sorghum seeds and fungal spores. Lastly, the results showed that the coating reduced significantly the damage caused on the seeds by *Sitophilus zeamais* and

Rhizopertha dominica insects. We recognize this work is the beginning of a lengthy process and many issues will need to be addressed. Further studies will be conducted to explain potential science mechanisms of seed protection through coatings and assess the benefits of seed coatings under a wide range of soil and climatic conditions.

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Table 1. Seed germination rates (%) obtained from coated seeds with the consortium of fungal spores and PGPR bacteria using 10%, 15% and 20% gum concentration and uncoated seed controls. The seed germination capacities were controlled just after coating and after four (4) months of seed storage at room temperature (25°C) condition.

Arabic gum concentration	Seed germination rates (%)							
	Just after coating				After 4 months of seed storage at room temperature (25°C)			
	<i>Zea mays</i>		<i>Sorghum bicolor</i>		<i>Zea mays</i>		<i>Sorghum bicolor</i>	
	lab condition	glasshouse condition	lab condition	glasshouse condition	lab condition	glasshouse condition	lab condition	glasshouse condition
Control (0%)	100 ± 0.0a	100 ± 0.0a	100 ± 0.0a	100 ± 0.0a	100 ± 0.0a	100 ± 0.0a	100 ± 0.0a	100 ± 0.0a
10%	100 ± 0.0a	100 ± 0.0a	100 ± 0.0a	100 ± 0.0a	100 ± 0.0a	95.4 ± 4.6ab	75.3 ± 5.9b	60.3 ± 5.4b
15%	100 ± 0.0a	100 ± 0.0a	97.3 ± 3.7ab	85.3 ± 5.2b	100 ± 0.0a	87.7 ± 5.9b	65.6 ± 5.1bc	51.4 ± 4.7bc
20%	100 ± 0.0a	100 ± 0.0a	95.2 ± 4.5b	75.6 ± 4.9b	100 ± 0.0a	85.4 ± 4.8b	60.4 ± 5.7c	47.2 ± 5.3c

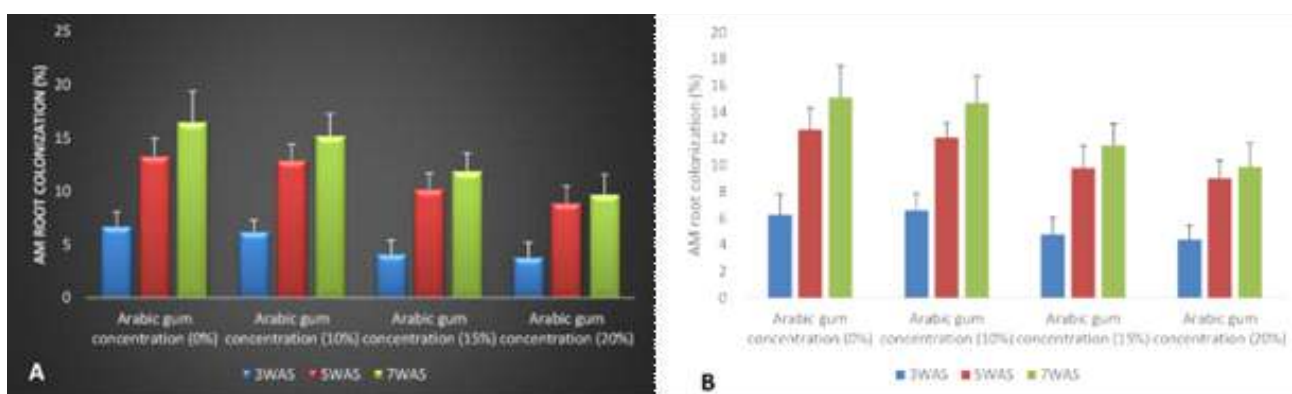


Fig. 1. The germination capacities of arbuscular mycorrhizal (AM) spores (expressed by AM colonization (%) in the roots of *Zea mays*-A and *Sorghum bicolor*-B) after coating seeds using 10% Arabic gum concentration, 15% Arabic gum concentration and 20% Arabic gum concentration as glue materials. Coated and uncoated seeds were sown just after the coatings.

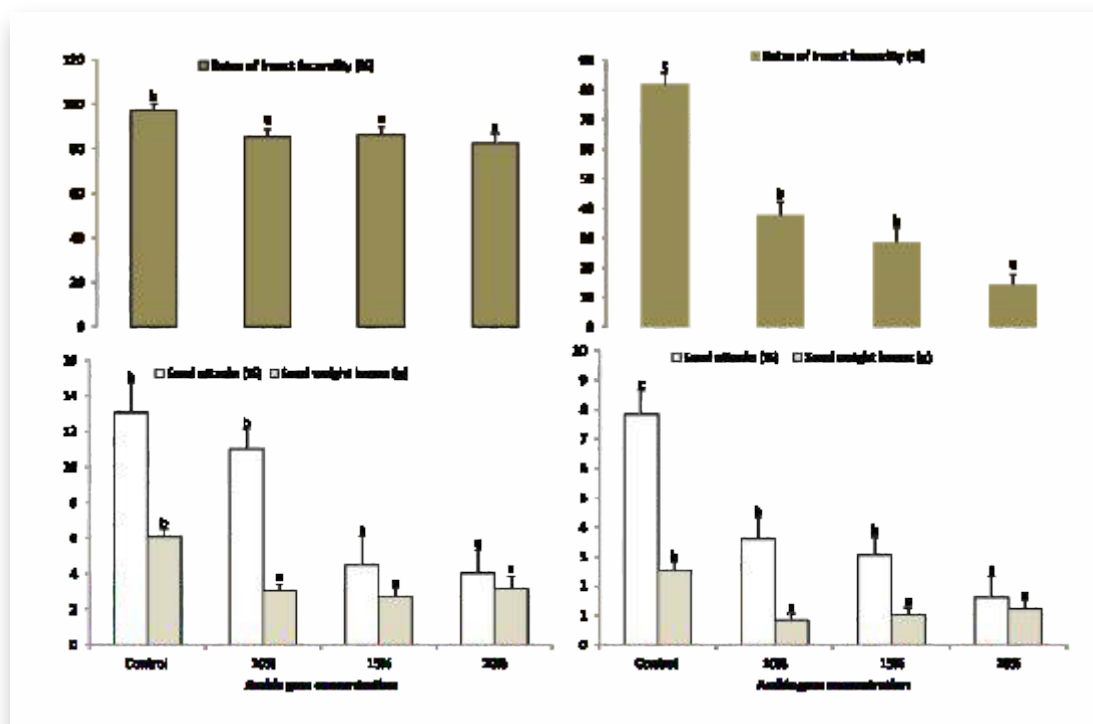


Fig. 2. Damage and losses caused by *Sitophilus zeamais* and *Rhyzopertha dominica* in the different treatments (uncoated vs coated seeds with the consortium of arbuscular mycorrhizal fungal spores and PGPR bacteria using the Arabic gum solutions of 10, 15 and 20%) after 40 days of infestation. At the right (Maize) and at the left (Sorghum).



The West Africa Centre for Crop Improvement (WACCI), a World Bank Africa Centre of Excellence (ACE), was established in 2007 through a partnership between the University of Ghana (UG) and Cornell University with funding from the Alliance for a Green Revolution in Africa (AGRA) to train plant breeders at the PhD level at the University of Ghana. In 2015, under the ACE project, WACCI introduced an innovative MPhil programme in Seed Science and Technology to address the challenges facing the seed sector in Africa. Currently, the Centre has enrolled 160 PhD and 80 MPhil students from 20 African countries. WACCI has over the years transitioned from a single donor to a multi-donor funded institution with over US\$ 40 million of committed funds.

RESEARCH FOCUS

Soybean Improvement at WACCI for Increased Productivity in Ghana

Project Lead:

Dr John S.Y. Eleblu

Soybean [*Glycine max* (L.) Merr.] is a major protein and oil crop cultivated worldwide. Soybean seeds can be eaten green as a vegetable or mature seed or processed into soymilk and tofu for many culinary uses for protein-rich diets. The seeds are typically processed for oil and meal after harvesting if not used for culinary purposes. Soybean has approximately 40% protein and 20% oil on a dry weight basis. Soybean oil has many uses, the soybean meal is used in many food and industrial products for animal feed formulations. Soybean, like other legumes, is important not only because of their high nutrient content but also because their cultivation leads



to increased soil nutrient quality through atmospheric nitrogen fixation in soils that can result in higher productivity of all other subsequent crops. Soybean production has great socio-economic potential and could become an essential component of Ghanaian diets, provide feed for animals, oil and other confectionery products for industry. However, the productivity of soybean in Ghana is limited by numerous abiotic (heat, droughts, salinity)

and biotic constraints (seed and soil-borne diseases, leaf diseases and insect pests). The introduction of new soybean genotypes in the country can increase genetic diversity, thereby facilitating the development of new varieties that can address some of the constraints. This research work is a partnership between the University of Ghana, Legon and the University of Illinois at Urbana-Champaign, USA. In this project, key traits essential for the accelerated development of the soybean industry in Ghana, considering farmers and consumers' needs, have been identified and will be targeted for improvement now and in the near future. This initiative is supported by the Soybean Innovation Lab to select genotypes from the USDA Soybean Germplasm Collection that has been shared with WACCI and Savannah Agricultural Research Institute (SARI), for the development of superior varieties. The objectives of this study are to:

- assemble and characterize a diverse panel of soybean germplasm for adaptation to the two major agro-ecologies (the Guinea Savannah and the Coastal Savannah) in Ghana
- evaluate the soybean genotypes for key target traits including yield, and yield-related traits, as well as pests and disease resistance

Establishment of Cowpea Tissue Culture Platform in sub-Saharan Africa

Project Lead:

Dr John S.Y. Eleblu
Throughout sub-Saharan Africa (SSA), cowpea (*Vigna unguiculata*), popularly known as beans in Ghana is an important multi-functional legume crop consumed as grain (seed crop), vegetable (leaf crop) and feed for livestock (fodder crop). As a hunger-season crop, harvested before staple cereal crops, it is an important component of smallholder food security and over 90% of cowpea production occurs in the semi-arid regions of Africa. Although a very important crop, yields remain low due to a myriad of biotic and abiotic constraints on-field and after harvest. Under this project, we are working towards improving the productivity of

cowpea under these constraints by screening indigenous West African varieties of cowpea for amenability to tissue culture and plant transformation techniques as a first step towards addressing some of these issues that require genetic engineering. The main objective is to develop platforms for the genetic improvement of cowpea in Ghana for the SSA region which will serve as a major resource for training, research and developmental projects.

Biofortification of Cassava (*Manihot esculenta* Crantz) Storage Roots for Nutritional Enhancement with Farmers Preferred Traits

Project Lead:

Dr. Daniel K. Dzidzienyo



Despite the importance of cassava (*Manihot esculenta* Crantz) as a major starchy staple crop in various developing countries in Africa, Asia and South America, its typical meal-size portion (a 500g meal) provides only 30% of the minimum daily requirement of iron and zinc and 10% of the daily pro-vitamin A. This is of grave concern as the majority of the growing areas have high incidents of micronutrient deficiencies with children and women of child-bearing age being the worst affected. Biofortification of crops with high macro and micronutrient density has been proposed as a cost-effective, efficient and sustainable way of combating malnutrition. Apart from the human nutrition deficits problem of cassava to consumers, its production also suffers from, systemic diseases caused by viruses, phytoplasmas, bacteria, fungi

among other factors that limit the yield potential of cassava genotypes resulting in drastic yield reductions. A sustainable production of cassava, therefore, depends on the availability and use of disease-free planting materials; and their prompt delivery for increased productivity. Using new and adapting appropriate and innovative tools, technologies and methodologies to engage relevant stakeholders and to speed up breeding and accelerate genetic gains, the project is expected to identify, improve, pilot, and disseminate appropriate genotypes of cassava varieties with high available micronutrients (high total carotenoid, iron, zinc and protein) with complementary high dry matter and starch content and other farmer-preferred traits and new products. The release of these superior cassava varieties in

Ghana and the collaborating countries will significantly improve the health and nutritional status of the poor and vulnerable groups, particularly children and women.

Grafting for Disease Resistance Against *Fusarium oxysporum* f. sp. *Lycopersicae* in Tomato Genotypes

Project Lead:

Dr Seloame Tatu Nyaku

Tomato production in Ghana is limited by the fungus *Fusarium oxysporum* f. sp. *lycopersicae*, which causes Fusarium wilt, which if not managed early, ultimately leads to complete plant collapse and death. The grafting technology, where susceptible tomato genotypes to *Fusarium oxysporum* are grafted onto other resistant *Solanum* rootstocks, has the potential of higher yield production. This technology can



be utilized both in open fields and in the greenhouse systems, however, is yet to be fully explored by tomato farmers in Ghana. The aim of this research is to access the response of grafted tomato genotypes to Fusarium and to determine the incidence and severity of Fusarium wilt, on fruit quality, palatability, and storability of grafted tomatoes. Compatible tomato scions and eggplant rootstocks combinations for tomato production will be identified. The specific objectives are to:

- determine the compatibility of widely grown tomato cultivar (Pectomech) grafted onto Solanum rootstocks (Solanum torvum, MongalT-11 and Solanum macrocarpon) using splice grafting technique.
- screen other potential rootstocks for Fusarium wilt resistance.
- assess the response of grafted tomato genotypes to Fusarium infestation and plant yield in pot and field environments.
- determine the impact of grafting on incidence and severity of Fusarium wilt, on fruit quality, palatability and storability of grafted tomatoes.
- train farmers in grafting technique, Good Agricultural Practices and Envirodome greenhouse technology.

Developing Heat Tolerant, High Yielding and Consumer-

Acceptable Tomato (Solanum lycopersicum L.) Varieties for All-Season Production

Project Lead:

Dr. Agyemang Danquah

Tomato production in Ghana is highly seasonal corresponding to the prevailing climatic conditions in the country - specifically the fluctuating temperature and rainfall patterns during the year. Production is therefore restricted to certain times of the year. The seasonal nature of tomato production also reflects the cycle of gluts and shortage experienced within the year. Prices of fresh tomato increase considerably during scarce period and plummet during the glut period. Major production constraints encountered outside these months (off-season) include high day and night temperatures, drought and high incidence of pests and diseases. Tomato has an optimum growth within the temperatures of 18 – 28°C and thrives well under sub-tropical and tropical conditions. The off-season is characterized by high day and night temperatures which can reach as high as 40 °C and 26 °C respectively. High temperatures disrupt several morphological, physiological and biochemical processes, especially during the reproductive phase of tomato development, leading to excessive flower drop and poor fruit set which seriously affect fruit yield. The non-availability of heat-tolerant tomato varieties remains one of the main challenges of the off-season commercial tomato cultivation in Ghana. As a result, tomato production ceases during a greater part of the year. Tomato

production can therefore be sustained throughout year if genotypes with a higher degree of tolerance to heat stress are available. The objectives of this project are to:

- assemble a collection of tomato germplasm from diverse sources for conservation and use in future tomato breeding programmes
- optimize heat tolerance screening protocol for distinguishing of heat tolerant tomato genotypes
- characterize germplasm for heat tolerant traits using both morphological and molecular markers to identify suitable parental lines with superior traits such as disease resistance, high lycopene and improved fruit quality
- develop nested association mapping population of heat tolerance and other important traits
- discover and characterize important QTLs associated with heat tolerance in tomatoes using NAM populations and DNA markers
- develop superior heat tolerance cultivars of tomato for Ghana by marker-assisted breeding.

Developing Frafra Potato (Solenostemon rotundifolius) into a Major Food Crop for West and Central Africa

Project Lead:

Dr Naalamle Amissah

Frafra potato, an indigenous tuber crop has the potential to address food insecurity and provide income to producers

and collectors of its tubers, most of them women. In Northern Ghana, it is used to bridge the hunger gap during the lean season when major staple crops are not available for consumption. The tubers are a delicacy among children in Northern Ghana. Its high nutrient levels and fairly rich protein source make it a prime candidate for advancement to a major food crop. Unfortunately, most are on the verge of becoming extinct due to very little scientific support and official promotion. Key challenges to its production are the lack of improved varieties, insect pests, and high postharvest losses. Crop improvement should focus on large tuber sizes, increased yields, biofortification with micro-nutrients, and the processing of tubers into value-added products. There is the need to establish a Frafra potato breeding platform that would direct pre-breeding and future breeding efforts in the West and Central Africa sub-region. The specific objectives of the project are to:

- assess the genetic diversity and spatial distribution of a global collection of Frafra Potato accessions
- induce and generate useful mutations using gamma irradiation
- assemble and annotate the gene space of a Frafra Potato reference
- develop and functionally classify a comprehensive collection of SNPs
- enhance the resilience of Frafra potato production by integrating pre-and post-harvest management practices

- determine the speeding breeding (SB) protocol for Frafra Potato
- develop innovative products, weaning foods, new recipes, and extruded products for the promotion and the utilization of Frafra potato
- build capacity through graduate training and annual workshops to make full use of developed resources in national breeding programmes

Exploiting the genetic diversity of maize landraces for resilience to climate change

Project Lead:

Dr Pearl Abu and
Dr Beatrice Ifie

Maize is an important cereal crop in sub-Saharan Africa (SSA) because it is a major source of food and fuel for over 208 million people-especially small-scale farmers. Drought related yield losses in maize stand at 50% but could reach 90% when the drought occurs during flowering and grain-filling. Mitigating the impact of climate change on maize production requires the adoption of 'climate-smart' agricultural approaches such as the planting of climate resilient varieties. Although a few drought tolerant varieties are currently available in Africa, it is projected that by 2030 most of these varieties would become unsuitable for cultivation due to the expected increase in the severity of climate change and its impact on global food production. Hence,

it has become necessary to identify novel sources of genetic variation for drought tolerance available in diverse germplasm, especially landraces, for introgression into existing adapted elite breeding populations to broaden the genetic base and enhance the resilience to climate change. African landraces are rich genetic reservoirs of favourable alleles for drought tolerance which they have accumulated through many years of selection, resulting in adaptation to local climatic conditions. Nonetheless, landraces remain largely unexploited due to their extreme heterozygosity and high genetic load of undesirable genes. The in vivo doubled haploid (DH) maize production technique enables rapid development of inbred lines from populations by reducing the breeding cycle to 1-2 years compared to the 6-8 years of inbreeding by repeated self-fertilization. The DH technology has been successfully applied to landraces to overcome the high heterozygosity and genetic load, making the inherent diversity more easily accessible to breeding programs. Therefore, the objective of this project is to develop a diversity panel of climate-resilient maize inbred lines derived from drought tolerant Africa landraces using the DH technology.

Improving Sorghum for Yield, Earliness and Resistance to Grain Mold

Project Lead:

Dr Theresa Ankamah-Yeboah
Sorghum is an important staple

in Ghana contributing to the country's growth and development. However, farmers in the savannah zones are gradually replacing sorghum with early-maturing maize varieties. This is in response to the erratic rainfall pattern coupled with the fact that the traditional cultivars available are long in duration, low yielding and susceptible to diseases particularly the grain mold. Grain mold is caused by a consortium of pathogenic fungal species and poses a severe challenge to sorghum grain production as well as grain quality. This project is undertaking impact-driven research in sorghum to reduce hunger and poverty through the development of sorghum hybrids with resistance to grain mold. The objective of this project is to use genomics to speed up genetic gains in developing sorghum hybrids with short duration and resistance to grain mold

Commercialization Drive of the

Centre

WACCI has developed and released three high yielding hybrid maize (9-11 t/ha) and three high yielding hybrid tomato (40 – 52 t/ha) varieties that are currently under commercialization with partnership with the private sector. These varieties will transform maize and tomato industry in Ghana and reduce import

NATURE AND QUALITY OF FACILITIES

WACCI has a state-of-the-art multipurpose building which houses offices, lecture theaters, a library, research commons, board room with video conferencing facility, conference room, enterprise hub, seed science lab (seed bank, Germination Room, Seed Store, Quality Control Room, Sample reception Room), Tissue Culture Lab (autoclave room, culture room, Media Room, Changing Room, Growth Room) and Bioinformatic Lab.

The Centre has fast reliable internet service and power supply with a standby gen set. The Centre also operates a model farm with a 32-acre irrigable area for all-year round phenotyping and applied research. The Centre also has a fully automated ultramodern green house for research and product development. The Centre has also established the Kofi Annan Enterprise Hub for Agricultural Innovation (KAEHAI) with the aim of bringing together the academia, private sector, government and non-governmental actors to develop the youth into game-changers and history-makers in agri-entrepreneurship to drive innovation, new product development and adoption for the transformation of agriculture and youth employment in Ghana and the subregion.



VIABILITY OF ALUMNI HUB

WACCI has an alumni network that have become game changers and history makers across the sub-region, demonstrating the value of quality higher postgraduate programmes in Africa. Currently, the Centre has graduated 105 PhD and 30 MPhil students from 15

countries in Africa. Our PhD graduates of which 36 are Females are currently leading breeding programmes in the National Agricultural Research Systems in their home countries and have generated innovations (over 200 improved varieties and 250 publications) which are positively impacting agricultural development on the continent. They have also

attracted over US\$ 37 million to the home institutions for infrastructural development and research projects. This lends credence to the philosophy behind the WACCI project, training Africans on African crops in Africa for the future of food and nutrition security on the continent.



Tissue Culture Lab



Conference Auditorium



Greenhouse



Kofi Annan Enterprise Hub for Agricultural Innovation



PhD Graduates



ABOUT

CDA

CENTRE FOR

DRYLAND AGRICULTURE



Director CDA, Professor Jibrin M. Jibrin

The Centre for Dryland Agriculture (CDA) was established by Bayero University, Kano (BUK) in 2012 to address the development challenges of the dryland areas of the west and central Africa (WCA) region. This was borne out of the realization that addressing the myriad of problems in the WCA drylands requires the generation of knowledge and applied

research products that will produce outcomes focused on reducing poverty, improving agricultural productivity, enhancing food and nutrition security, improving natural resources and ecosystem services, mitigating the impacts of climate change, and reducing conflicts and human migration. The Centre was established using a competitively won take-off grant of \$800,000 from the

MacArthur Foundation. In 2014, the CDA won a \$7.8m Africa Centres of Excellence (ACE) grant from the World Bank to become a regional Centre of Excellence specialising in Dryland Agriculture. In 2019, the Centre won another 5-year grant of \$5m from the World Bank and AFD to consolidate its achievements and positively impact the development of the WCA

dryland region.

The CDA runs MSc and PhD programmes with 5 unique specializations: (i) Natural Resources Management & Climate Change, (ii) Dryland Crops & Cropping Systems, (iii) Natural Resources Economics, (iv) Livestock & Range Improvement and (v) Agricultural Technology. The programmes are domiciled in the academic Departments of BUK viz, Geography, Agronomy, Agricultural Economics & Extension, Animal Science, and Agricultural & Environmental Engineering, respectively. The Centre also offers a Postgraduate Diploma in Dryland Agriculture, and other specialized short courses to impart specific skills that address the practical needs of career professionals and sectorial stakeholders. The programmes of the Centre have

full national accreditation from the National Universities Commission (NUC) of Nigeria and full international accreditation from the High Council for Evaluation of Research & Higher Education (HCERES), France.

So far, the CDA has enrolled more than 350 MSc and about 100 PhD students from 13 countries of the WCA region. The Centre has also trained more than 2000 professionals in various skills through short-term courses. The short course programmes focus on professional capacity development that imparts critically needed skills in the areas of food production, processing, value addition, and the sustainable management of dryland natural resources.

The CDA has revolutionized its teaching, learning and research facilities geared towards

building capacities for a wide range of stakeholders, expanding national and regional outreach, supporting innovative research, and upgrading the teaching and research capacities of its staff and students. The Centre has a 22 ha farm for training and research in high value intensive crop production and protection using modern technologies such as drip and sprinkler irrigation, fertigation, in-field and controlled environment crop production.

The Centre has formed a strong network of partnerships with several international, regional and national academic institutions with common interests. These partners include research institutions, universities, public and non-government organizations, private sector organizations, and farmer groups.

The CDA is presently working



A CDA Postgraduate student at the Tissue Culture Laboratory



to consolidate on its previous achievements by partnering with relevant sectoral key players to develop and mount training, research and outreach programmes that will make an impact on the livelihoods of the inhabitants of the WCA dryland areas. The Centre plans to establish a Regional Innovation, Training and Entrepreneurship Platform where youth will be trained in modern intensive agriculture and bioresource entrepreneurship. This is aimed at facilitating the emergence of small and medium-scale enterprises (SMEs) that could significantly reduce drudgery, increase productivity, alleviate poverty and enhance the general well-being of peoples of the WCA region.

CDA Graduates making impact in the West African Sub region

In the last five years, the CDA has enrolled over 350 MSc and about 100 PhD students from 13 countries of the WCA sub-region. CDA is building

capacities that will lead to the achievement of improved agricultural production and livelihoods, and sustainable management of natural resources. A tracer study conducted recently with some Alumni recorded some success stories.



Abdulmajid Abubakar

Abdulmajid Abubakar is a Nigerian, an MSc graduate of Natural Resource Management and Climate Change, one of CDAs long term courses. He said that CDA molded him to become a Climate Change Activist, Environmentalist, and

a Natural Resource Manager. He Founded an NGO in Nigeria after his graduation called Eyes on the Environment Initiative. The NGO is a youth-led organization championing for sustainable future. He has more than 200 members and volunteers. The NGO has been extended to Niger republic and colleagues from Niger Republic whom he met during his studies at CDA-BUK, are handling the Niger republic wing. Abdulmajid attended COP26 in Glasgow, Scotland and several workshops and seminars in Nigeria.

Sagarr A.F Jallow from Gambia had his MSc in Crop and Cropping System from CDA-BUK and works in the University of the Gambia. He was recently promoted from an Assistant Lecturer to Lecturer II. He won a grant (3500 USDA) from UTG 2021 RESEARCH GRANT to conduct research on “Response of Groundnut Varieties (*Arachis hypogaea* L.) to Critical Period of Crop - Weed



Sagarr A.F Jallow from Gambia

Interference in West Coast Region of The Gambia”. He was selected to serve as an Acting Head of Department of Soil Science, School of Agriculture and Environmental Sciences (from 2021 to present), currently the Coordinator of the undergraduate programme at School of Agriculture and Environmental Sciences (from 2021 to Present), an Exam Officer (from 2021 to Present). He was recently contracted to serve as a supervisor for nationwide Socioeconomic Data collection at REPGAM Project which was featured on the National TV (watch it on <https://fb.watch/ekd1SWVoIO/>). He was also recently featured on AD Scientific Index - Scientist Rankings – 2022 (Gambia Scientist and University Rankings 2022), he was ranked 47 at the University of the Gambia and 71 in The Gambia (https://www.adscientificindex.com/?country_code=gm).

He is now a PhD Candidate at the University of The Gambia. He said the credit goes to CDA-BUK.



Mahamane Nassirou
from the Republic of Niger

Mahamane Nassirou from the Republic of Niger had his master's degree in Livelihood and Natural Resource Economics from CDA-BUK. After graduation, he got a job as a cash transfer and market monitoring specialist with CRS in Niger. He recently got recognition awards between February and June 2022 from CRS Country Representative of Niger. Through the program about 18,000 vulnerable households and 7000 children are being given monthly assistance.

CDA's Short Term Trainees Establish Business Enterprises, Employ Women and Youths

Centre for Dryland Agriculture (CDA), Bayero University, Kano has trained over 2,000 professionals through short term courses with a view to impacting the necessary skills and requisite knowledge in line with one of the Centre's mandates of training skilled manpower to address some of Africa's developmental challenges.

One of the trainings conducted was a need-based training by Kano, Kaduna and Kogi States under the World Bank funded Agro-Processing Productivity Enhancement and Livelihood Improvement Support Project (APPEALS), where the Centre was engaged to train 1400 women and youths in rice, poultry, and aquaculture value chains. The Centre recently conducted a tracer study focusing on the trainees from the APPEALS project. It was discovered that many of the graduate trainees have received their grants and established successful business enterprises in the various agricultural value chains of rice, aquaculture, and fisheries.

Mrs Christopher Mercy, who established an Organic Poultry Production Firm, Precious



One of the CDA short trainee in her farm, Double Laying Farm in Kaduna State

Farms and Agricultural Product Ventures in Kogi State was full of praises to the CDA for imparting knowledge and skills to her that have gone a long way in assisting her to become an entrepreneurial woman.

Her enterprise has six employees, comprising youth and women. In her testimonial, she mentioned that the hands-on training on organic poultry production she received from CDA made her to develop interest in organic poultry production. In addition to the poultry enterprise, she has established a training school in which men and women from across Kogi state go to learn organic poultry production. Mercy is also cultivating some herbs in her garden and is processing NAFDAC registration for her organic medications.

Samuel Ochimana from Kogi State established a V-Tech Integrated Farm and employs five people who are working on full-time basis. The enterprise generates over N1, 750,000 monthly from the sales of egg. Another successful CDA trainee, Mrs Maryam Bello, whose Jemtrade Worldwide Aquaculture enterprise has become very successful, said the business has become her source of livelihood and that she doesn't need any white collared job. Maryam mentioned that part of the training she received at the CDA under the aquaculture value chain was on recycling wastewater and promoting environmental sustainability. She now recycles the wastewater from her fishponds to grow crops in addition to the fish enterprise.



Mrs Mercy, a CDA graduate trainee with her students she trains on organic poultry farming

A group of two, Rafat Ahmed Onize and Abideh Ojima Emmanuel said they were inspired by the CDA training and have implemented the business strategy and techniques they learnt, the result of which is huge revenue generation for their aquaculture business.

Trainees in Kaduna State are also reporting success stories; a group of women trainees in Zaria town of Kaduna State have a successful aquaculture production enterprise called Fasasha Aquaculture Farm. The training they received from CDA helped them in running the business efficiently. The women have been producing and selling fresh fish with substantial revenue. Their plan now is to expand the business by adding value through processing and packaging to generate more revenue just as they were taught.

CDA Developed Protocols for Identifying the Sex of Date-Palm Seedlings, Signs Agreement with Jigawa State Government for Mass Production of Seedlings

The Centre for Dryland Agriculture (CDA) has developed a protocol that enables the identification of the

sex of date palm at the seedling stage.

Date Palm is dioecious, with separate male and female plants. During the establishment of plantations, it is difficult to identify the fruit bearing female plants at seedling stage. To address this problem, scientists from CDA comprising Drs Suleiman Babura, Lawan Sani and Kabir Umar have developed a procedure for molecular sex identification at early growth stage.

The sex-identified seedlings can then be micropropagated using tissue culture techniques. This will ensure sustainable supply of quality seedlings and enable farmers to cultivate sufficiently large number of productive female trees with minimal number of male trees.

Impressed with this landmark development, the Governor of Jigawa State, Alhaji Badaru Abubakar visited the CDA to explore possible collaborations to promote date palm production in Jigawa State.

In march 2022, Jigawa State government signed an agreement with Bayero



Yusuf Ibrahim of Yamco Agro Allied Ventures feeding his fishes



Musa Ibrahim processing rice in his firm, Koton Karfe Rice Firm

University, Kano (BUK) for the Centre for Dryland Agriculture (CDA) to produce 100,000 sex-identified Date Palm seedlings for distribution to farming communities across Jigawa State. The agreement, which was earlier endorsed by the Vice Chancellor, Professor Sagir Adamu Abbas, was signed in Dutse on Wednesday March 23, 2022 by the Honourable Commissioner of Agriculture during the opening ceremony of a Policy Workshop on indigenous tree restoration organized by CDA.

The Commissioner of

Agriculture, Muhammad Alhassan, who represented the Executive Governor, Alhaji Mohammed Badaru Abubakar (MON), was accompanied by the Commissioner of Land, the Managing Director of the Jigawa Agricultural and Rural Development Authority (JARDA), and several Permanent Secretaries and Directors from the State.

During the signing ceremony, the Jigawa State Commissioner of Agriculture stated that “we are signing this contract for the propagation of sex-identified date palm for the benefit of our

people, especially women”.

The Director of the CDA, Professor Jibrin Mohammed Jibrin, noted that the Centre has developed Date Palm sex identification technique as a direct response to a request by the Association of Professional Farmers of Kano and Jigawa State, who came to CDA and complained about their loses in resources, labour and time spending to date palm sometimes for more than five years before realizing the plants are male and will not bear fruits.

With this new technique and the tissue culture facility at CDA, the desired proportions of female and male seedlings can be propagated and distributed to farmers. According to him, Jigawa state falls within the region where date palm can be cultivated at commercial scale. The state has favourable soil and climatic conditions for date palm cultivation.

The existence of local varieties with good fruit qualities and strategic geographical location that enables double fruiting seasons show the potential of the state in commercial date palm production.

Some services offered by the Analytical Laboratory of the Centre for Dryland Agriculture The Centre for Dryland Agriculture has equipped its laboratories with modest equipment for research in molecular biology, plant tissue culture, GIS & Remote sensing, soil & plant analyses, and food analyses among others. Some of these equipment are used for:

1. Fertilizer Analysis

The CDA Lab has been doing fertilizer analysis using X-ray



Director, CDA, Prof Jibrin M. Jibrin (left) and Commissioner of Agriculture, Muhammad Alhassan (right)



fluorescence, CHNS/O analyzer and Micro Plasma Atomic Emission Spectroscopy for many fertilizer companies within and outside Nigeria, including OCP Africa, Emora Global Agro Limited, FAAM Integrated Services, Excel Fertilizer Company Limited among others. Additionally, the Laboratory assists government regulatory bodies such as Standard Organization of Nigeria (SON) and Farm Input Support Services (FISS) in quality controls for organic and mineral fertilizers.



Food Quality and Safety Analysis

The CDA laboratory offers services in food and feed analysis (proximate, mineral and aflatoxin) to many companies in Nigeria. The laboratory supports large companies, such as Dantata Foods and Allied Companies Limited, in product batch analysis of key nutrient ingredients. Likewise, it offers



services to several export companies , especially for sesame and hibiscus commodities. In 2021, the Centre served as a reference lab for chemical poisoning analysis in assorted commercial juices to support Nigerian Centre for Disease Control (NCDC) in addressing the outbreak of food poisoning in Kano State, Nigeria. Recently, the Centre's laboratory has been considered as a reference laboratory for aflatoxin and gossypols analyses across West Africa under PRISMA project.



Geological Analysis

The laboratory also provides rapid and accurate elemental analysis of rock minerals to several mining companies, especially in the analysis of rare earth metals using Energy Dispersive X-ray fluorescence spectroscopy and Micro Plasma Atomic Emission Spectroscopy.

Soil and Plant Analysis

We offer a broad range of services in wet and dry soil analysis (physical, chemical, and biological) to the research institutes, Universities, and private farms within and outside Nigeria using advanced facilities like Micro Plasma Atomic Emission Spectroscopy (MP-AES), Intelligent Ion Chromatography, CHNS/O analyzer, and Near-Infrared spectroscopy (NIRS).



Name and Acronym of the Centre:

Agriculture for Food and Nutrition Security (AGRISAN)

Host University: Cheikh Anta Diop (UCAD)

Website: www.ceaagriscan.sn

Director of the center: Prof Samba Ndao SYLLA

Email : Samba.sylla@ucad.edu.sn

Deputy Director: Prof Diegane DIOUF

Email : Diegane.diouf@ucad.edu.sn

agriculture and food and nutrition security are defined.

The expected impacts at national and regional levels are:

(i) better employability of graduates and the creation of businesses and jobs in the agricultural sector,

(ii) nutrition-sensitive agriculture and more sustainable resource management,

(iii) (improved food and nutrition security for the most disadvantaged populations and improved resilience to all shocks, and

(iv) diversified processing and improved conservation of agricultural production.

Presentation of the CEA

The African Centre of Excellence in Agriculture for Food and Nutrition Security (ECA-AGRISAN) is a public consortium for scientific cooperation bringing together four (04) universities (UCAD, UGB, UT, USSEIN) and CRES, an independent research institution, the main national actors in research and training in the field of agrobiosciences with regional and international partners, whose comparative advantages it will capitalize. It is placed under the supervision of UCAD. The position of CEA AGRISAN on the issue of agriculture, food and nutrition security is relevant, with regard to international bodies (SDGs) but especially because it corresponds to the concrete concerns of several populations at the regional level. The creation of the Centre in the form of a Consortium is part of the general context of bringing together higher education, research and the private sector to respond, through a multidisciplinary and multisectoral approach, to the challenges of regional food and nutrition security. Indeed, in a context of climate change and its impacts on the resilience of anthropic systems, food and nutrition security issues are increasingly important.

CEA AGRISAN aims to contribute to agriculture playing a major role in economic growth, food security and poverty reduction in Senegal and the West African sub-region through training and research that concerns all segments of agricultural value chains. More specifically, it aims to:

(i) train human resources capable of

meeting the challenges of efficient agriculture while supporting sustainable development;

(ii) strengthen the performance of national and regional academic partners in terms of training, research and expertise;

(iii) promote sustainable cooperation and strengthen the institutional capacities of non-academic national and regional partners;

The expected results are multiple: competent human resources are trained, joint applied research programmes are implemented, research results are promoted, high-performance technical platforms are set up,

institutional capacities for intervention are strengthened,

Exchanges of teachers and students are carried out, multiple and lasting collaborations between the various partners are established, common training courses in the field of

Training and research themes

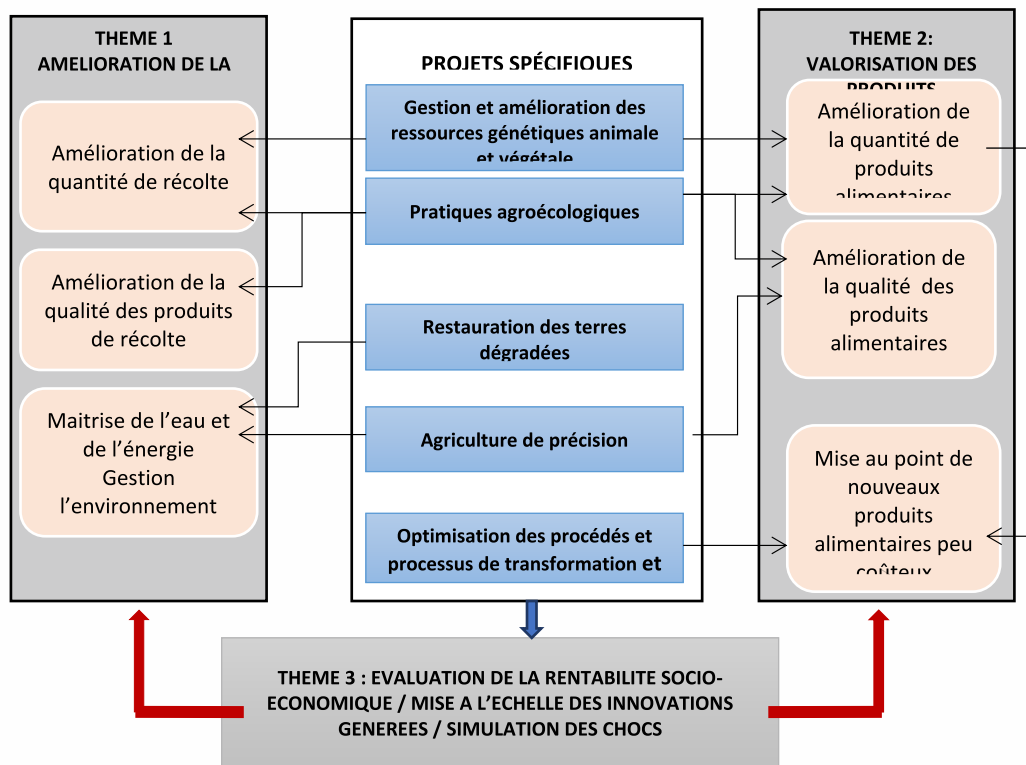
The activities of CEA AGRISAN are based on training and research themes that respond to the challenges of agriculture, food and nutrition security and transition of agricultural systems by associating complementary disciplinary fields. These themes are:

- improving productivity through the use of an efficient genetic resource and the adoption of sustainable agro-ecological practices,
- the valorization of agricultural products through the processing and improvement of their sanitary and nutritional quality,
- scaling up innovative products and practices and assessing their economic profitability as well as their level of efficiency and accessibility.

These themes are carried out within the framework of specific projects.

This is summarized in the figure below:





The strategy is based on:

- a pedagogical approach that is part of the digital culture and professionalization;
- strengthening existing training with new pathways including languages, entrepreneurship and gender;
- research programmes linked to the needs of the socio-economic world and involving development actors and national, regional and international partnerships.

Supported training

LEVEL	FORMATION	Number of students enrolled
- Master	<ul style="list-style-type: none"> - Microbial plant biotechnology and plant breeding - Seed Science and Technology - Ethnobotanical biodiversity taxonomy and conservation - Quality in the food and beverage industries - Nutrition and human nutrition - Agronomy and Crop Protection 	More than 100
- Phd	<ul style="list-style-type: none"> - Microbial plant biotechnology and plant breeding - Conservation and biodiversity - Agronomy - Process Engineering - Food nutrition 	More than 30
- Cost courses duration	<ul style="list-style-type: none"> - Project writing - Personal development leadership; Speaking 	64
- Professional internship	<ul style="list-style-type: none"> - Stays of more than three months in a professional environment 	More than 92 people/month

Available capacities and means

- A multi-institutional environment provided with ICT and ODL equipment
- A soil microbiology laboratory
- A phytochemistry laboratory
- A nutrition laboratory
- A laboratory of chemistry and food technology
- An aquaculture and animal production unit
- Field and farm schools
- A critical mass of several dozen senior researchers
- Industrial partners, producer and processor organizations for professionalization and employability.

National, regional and international partnership
 The Centre brings together the agrobiosciences clusters of Senegalese universities and the sub-region (Benin, Burkina Faso, Niger,...). It capitalizes more than 500 researchers and teacher-researchers enjoying international recognition in the targeted fields and able to support the research projects and training programs of the Center. These higher education and research institutions (IES) collaborate with research institutions at national (ISRA/CERAAS/CNRA, ITA, CRES), regional (RUFORUM, AfricaRice, ICRISAT) and international (IRD, CIRAD, Agreenium, Virginia Tech) levels. The Centre's partners include agri-

food manufacturers (SODEFITEX, SODAGRI, SONACOS, AAFEX, FRUITALES, ESTEVAL), producer organizations (CNCR, ASPRODEB) and processing organizations (POPAS) and employers' organizations (CNES, CCIAK). Higher education and research institutions (IES-R) have long benefited from support from technical and financial partners (BM, DAAD, AUF, UEMOA, ECOWAS, AFD, ...) as part of their research activities. These IES-Rs have technical platforms (equipped laboratories and workshops, business incubators) in agrobiosciences and agri-food processing and process analysis units. They have experimental sites to carry out research.

CEA Team Members

SENIOR RESEARCHERS	SPECIALITIES
Prof Samba SYLLA	Soil microbiology
Prof Diegane DIOUF	Soil Microbiology/Physiology
Prof Madiallacke DIEDHIOU	Phytopathology
Prof Mame Samba MBAYE	Biodiversity/Systematics
Prof Adama DIOUF	Human nutrition
Prof Nicole DOSSOU	Human nutrition
Prof Nicolas Ayessou	Food technology
Prof Fatou NDOYE	Soil microbiology
Prof Abdala DIEDHIOU	Microbiology/Molecular Biology
Dr Birane DIENG	Biodiversity/Systematics
Dr Mariama NGOM	Microbiology/Plant Biotechnology
Prof Mame Oureye SY	Plant biotechnology
Prof Saliou NDIAYE	Agronomy/Ecology
Prof Abdala DIEDHIOU	Microbiology/Molecular Biology
Prof Aboubacry KANE	Soil Microbiology
Prof Mady CISSE	Food technology
Prof Modou DIENG	Food technology
Prof Farokh NIASS	Aquaculture
Prof Godar SENE	Microbiology / Molecular biology
Prof Ablaye DIAGNE	Socio-Economics and Management
Soukeyna DIALLO	Socio-Economics and Management



REGIONAL CENTER OF EXCELLENCE ON PASTORAL PRODUCTIONS: MEAT, MILK, HIDES AND SKINS (CERPP)



Directeur du CERPP

Monsieur MARICHATOU Hamani,

Professeur titulaire des Universités du CAMES, Spécialisé en Reproduction animale

The Regional Center of Excellence on Pastoral Productions: Meat, Milk, Hides and Skins (CERPP) is part of the Centers of Excellence for Impact (CEA-I) funded and supported since 2019 by the World Bank.

The CERPP is a project of the Abdou Moumouni University of Niamey (UAM) implemented by the Faculty of Agronomy of the UAM. It started its activities in 2020 after the signing of the financing agreement between the Government of Niger and the World Bank.

CERPP aims to strengthen the quality and relevance of higher education and research in the field of pastoral production and its valorization in the Sahel countries.

Specific objectives:

1. provide Sahelian states with human resources and techniques and technologies capable of improving livestock productivity and

2. revitalizing the meat, milk, leather and hides industrial sector;
2. Strengthen research and technology transfer for the development of livestock and the pastoral production industry;
3. Faire of the Faculty of Agronomy of the UAM a pole of regional and international attraction in terms of professional training in the production and valorization of pastoral products.

The CERPP plans to welcome a hundred Master students and forty PhD students, 1/3 of whom will come from the sub-region, as well as more than 200 technicians, apprentices and other professionals in the field. For short-term training, the center will offer annual training on artificial insemination, pregnancy diagnosis, animal feeding (treatment, conservation, rationing) and processing of pastoral products, in collaboration with vocational training schools, trades centers and industrial partners.

The setting up of training programs will be done in close collaboration with the various actors in the sector: vocational training centers, industries, livestock research and development centers, producer associations, higher education institutions, network of chambers of agriculture, etc. who will actively participate in training, research and supervision activities for students and trainees.

CERPP

RESEARCH AXES



Participants in the workshop to define research axes and themes

Identification of research challenges and needs

The CERPP programme is an important part of partnership with industry and academic institutions, which are key stakeholders in the implementation process.

To better involve them in the

management of the Centre and to support CERPP in carrying out training and research activities, decision-making bodies, composed of eminent personalities from both sectors, have been set up: (i) the International Scientific Advisory Committee (ISAC) for academic institutions and (ii) the

Industrial Advisory Committee (IAC) for the industrial sector.

For the assessment of research needs, sectoral and industrial partners first expressed their research needs on CERPP's areas of intervention during a national brainstorming workshop.



Participants in the workshop to define research axes and themes



Opening of the Workshop to define research axes and themes

The research axes and themes defined for the CERPP, and which are validated by the Doctoral School of Life and Earth Sciences of the University, are presented in the table below.

Research axes	Shutters	Research topics
Improvement of production (Meat, milk, hides and skins)	Feeding	<ul style="list-style-type: none"> - Fodder production - Use of crop and forest by-products - Fattening techniques - Monitoring and restoration of pastoral resources
	Characterization, reproduction-genetics	<ul style="list-style-type: none"> - Breed characterization - Genetic improvement (selection, crossing) - Use of biotechnological tools (artificial insemination, embryo transfer,)
	Animal and public health	<ul style="list-style-type: none"> - Ethno-pharmacopoeia - dominant pathologies and zoonoses
Valorization of pastoral products (processing, industrialization)	Endogenous knowledge and modern technologies	Practices and technical itineraries: <ul style="list-style-type: none"> - Collection - Preservation, transformation - Packaging - Etc.
Socio-economic environment	Market structure for livestock, meat, milk and hides and skins in Niger, Sahelian and coastal countries	<ul style="list-style-type: none"> -Commercialization - Factors of non-competitiveness, - Endogenous investments, - the resilience of national actors to imports, climate change. - the supply chain for veterinary and zootechnical inputs, - tariff and non-tariff barriers

Conduct of the search

For the moment, CERPP has recruited two cohorts of Master 2 students giving a total of 45 students out of the 100 planned and two cohorts of doctoral students totaling 32 out of the 40 planned by the end of the project. These students come from different countries of the sub-

region such as Niger, Burkina Faso, Benin, Côte d'Ivoire, Mali, Guinea, Togo, Chad. Applications from Central Africa and Cameroon students had also been received. Students work under the supervision of a Research Director from a University or in co-supervision between an

Academic and a researcher from another institution. The first cohort of Master 2 students has started their defenses while the others continue their research in Niger or in their countries. The research work of all Master students begins with a three-month internship in enterprises.



CERPP students in entrepreneurship internship

Country	Theme
Niger	Characterization of milking, collection and microbiological quality of milk in the peri-urban area of Niamey.
	Antagonistic activities of lactic acid bacteria on milk pathogens during fermentation.
	Practices and qualities of Tabaski meat: the case of Niamey.
	Reasons for meat seizure and socio-economic impact.
	Cost of producing a litre of raw milk from cows on a family dairy farm: the case of the Kollo and Hamdallaye dairy basins.
	Evaluation of the cost of production of the liter of raw cows' milk produced in the family milkmaids of the Niamey dairy basin.
	Fodder value of defoliation residues of <i>Maerua crassifolia</i> Forskpar <i>Belenois aurota</i> (Lepidoptera / Pieridae)
	Sheep fattening and resilience of RBA groups in the rural commune of Chadakori.
	Characterization of small ruminant farming in the urban municipality of Dosso: diversity and feeding practices.
	Gastrointestinal parasitosis of small ruminants in peri-urban farms of Tahaoua at the end of the rainy season.
	Socio-economic study of the production, processing and marketing of Malkou in the city of Niamey in 2021
	Physico-chemical and microbiological characterization of the milk of the red goat of Maradi.
	Evaluation of the heat induction protocol "PRID7COSYNCH" in bovine artificial insemination in livestock farming in Niger.
	Implementation analysis of the performance of a HACCP system at the level of a Foura soga production line
Guinea	Manufacture and characterization of an artisanal cheese in Dalaba (Guinea)
	Evaluation of the zootechnical performance of cows resulting from artificial insemination in the peri-urban area of Bobo-Dioulasso in Burkina Faso.
	Socio-economic characterization of cattle farms and morphobiometrics of local cattle breeds in Burkina Faso.
Chad	Floristic diversity and characteristics of natural pastures in the provinces of Ennedi-Ouest and Wadi-fira in Chad.
	Physico-chemical and microbiological quality of cows' milk in markets and the peri-urban area of N'Djamena.
Chad	Dynamics of sheep farming systems in the Chari department (central Chad) in a context of climate change: testing a typology.



Faculty of Agronomy laboratories used for CERPP research



Students working on meat processing



Students milking milk

Infrastructure

The CERPP will unblock in September 2022 the construction of the Center building located on the campus of the Faculty of Agronomy and including two (02) laboratories. It is also planned to build a dozen offices, meeting rooms, dining halls, and breastfeeding room for students with young children.



Model of the CERPP building



ABOUT THE AFRICAN CENTRE OF EXCELLENCE ON CLIMATE CHANGE, BIODIVERSITY AND SUSTAINABLE AGRICULTURE (ECA-CCBAD)

The African Centre of Excellence on Climate Change, Biodiversity and Sustainable Agriculture (ECA-CCBAD) is a higher education centre whose main mission is to provide training and research in the thematic fields of biodiversity, food production (plant, animal and fisheries), water and sanitation, sustainable productive forestry, renewable energy in the context of climate change.

Set up in 2016 under the coordination of Professor KONE Daouda, the WASCAL/ECA-CCBAD center is hosted by the Félix Houphouët-Boigny University of Côte d'Ivoire. It aims at Excellence in student training (Master and Doctorate), research and innovation, governance through initial training, capacity building of administrative and technical staff in the public, parapublic and private sector.

With accreditation from the High Council for the Evaluation of

Research and Higher Education (HCÉRES) the training offer is diversified and concerns the Master and Doctorate programs in :

- CLIMATE CHANGE & BIODIVERSITY
- CLIMATE CHANGE & S U S T A I N A B L E AGRICULTURE
- CLIMATE CHANGE & CLIMATE INTERACTION
- CLIMATE CHANGE & RENEWABLE ENERGY
- CLIMATE CHANGE & GENDER

The center benefited from the support of the World Bank from 2016 to 2020 through the ACE 1 project.

Today, the WASCAL/ECA-CCBAD center benefits from the financial support of the French Development Agency for the implementation of the ACE-IMPACT project over a period of 4 years from 2020 to 2024.

The center remains open to the world by hosting the PASET program for the training of doctoral and Masters students through various programs and research projects including WASCAL, CCBAD, CABES, AFAS, H2, GSGS-UFHB.

Gender mainstreaming in the centre's initiatives is illustrated through its WafriCLP programme for entrepreneurship and women's leadership, which aims to build women's capacity in climate change research, innovation and policy in Francophone West Africa.

1- THE QUALITY OF YOUR CENTER FACILITIES

The Center offers an ideal framework for teaching and research thanks to its brand new and functional buildings bringing together five (05) laboratories with an operational and efficient technical platform; specialized language, GIS, course, documentation and reading rooms.





Panoramic view of the African Centre of Excellence on Climate Change, Biodiversity and Sustainable Agriculture (ECA-CCBAD), its laboratories and classrooms.

2- TWO REVOLUTIONARY SUCCESSES OF YOUR CENTER

The Center has distinguished itself by the valorization of its research assets through its Industrial Research Unit which provides the agricultural productive sector with approved biopesticides and interests to limit the impact and use of synthetic pesticides.

The Center also coordinates projects of national interest to increase the resilience of cocoa and cashew producers and for the provision of sanitized vitro-plants for the benefit of the sugar cane sector in Côte d'Ivoire.

3- AN INTERESTING TEMOIGNAGE ON A FORMER STUDENT OF YOUR CENTER WHO SUCCEEDED

My name is Diallo Djenabou from Guinea-Conakry. I graduated from the first class of



Master in Climate Change and Sustainable Agriculture of CEA-CCBAD in 2018. The training at CEA-CCBAD gave me solid scientific and entrepreneurial skills that allow me today to exercise on a liberal basis cocoa production and valorization activities in Guinea.

My structure "ZEÏNA CACAO" is positioned on the value of cocoa to make it a product of national interest in Guinea. This entrepreneurial vocation was born the day after my graduation thesis at CEA-CCBAD on

"Agronomic characteristic and morphology of cocoa, case of the plantation of Sao touton in ganoa »

For more information, please refer to my Facebook page: ZEÏNACACAO

WASCAL/ECA-CCBAD
Centre of Excellence
Scientific and Innovation Pole of
the University Félix
HOUPHOUËT-BOIGNY
www.wascal-ci.org /
infos@wascal-ci.org



ABOUT

CEFTER



Dr. Barnabas Ikoye
DIRECTOR CEFTER &
CENTRE LEADER ACE-IMPACT
PROJECT

Post-Harvest losses constitute the major factor contributing to food insecurity in Sub-Saharan Africa but are often overlooked. It is estimated that Africa loses food valued at US \$4.0 billion yearly due to post-harvest losses. This serious shortfall leads to stunted development, malnutrition, diseases and death of millions of children. Post-harvest technologies currently in use are either too expensive or unsuitable for local environments. Chemicals which are widely used have often proved hazardous.

The WHO estimates that 3 million farmers in developing countries experience food poisoning from pesticides and about 18,000 deaths are recorded yearly. Contaminated food contributes to 1.5 billion cases of diarrhea resulting in 3 million deaths of children yearly.

Benue State located in the middle belt of Nigeria and usually regarded as the food basket of the nation produces a wide range of crops ranging from grains, tubers, to fruits and vegetables. Huge quantities of these crops are lost due to lack of adequate post-harvest technologies.

Nigerian and indeed African teachers and researchers need to be equipped with adequate facilities to be able to utilize multidisciplinary approaches to embark on high capacity building through teaching, conduct of cutting edge research and promotion of active outreach programmes to address post-harvest food losses. Through the support of the World Bank, the Benue State University has established the Africa Centre of Excellence for Food Technology and Research (CEFTER) to address these challenges. The success of CEFTER will depend on the strong and long standing partnerships between academic, research and extension institutions in Nigeria and the sub region.

The mandate of CEFTER is to promote teaching, research and extension in post-harvest sciences, enhance agricultural productivity and industrial output for the socio-economic advancement of Nigeria and Africa.

The educational research and outreach goals of CEFTER include:

1. To develop a critical mass of well-trained African students in control of post-harvest losses.
2. To empower African Researchers to identify technologies that will reduce post-harvest losses.
3. Development of Technologies through applied research for reducing post-harvest losses.
4. Engage communities, farmers

and industries in dissemination of technologies in post-harvest food losses.

The Centre for Food Technology and Research (CEFTER) Benue State University is a Centre of Excellence for control of Post-harvest food Losses. With a focus on training both high and lower level manpower to address the menace of food wastes in West and Central Africa Regions. Three years ago 24 Centers were selected through a rigorous competitive exercise among over 150 Universities in the region with the major objective to improve on quality of higher education in the Region. The Centre adopted a multi-disciplinary approach of training which involves a mix of core university professors and industry based experts. The excellence starts from involving all stakeholders in curriculum development and extends to quality teaching and students spending quality time at various industries during their study period at CEFTER.

The Centre aims at training future train young African scientists, agricultural technologists and other experts with a mind set to solving Postharvest problems in Africa. The learning environment is student centred with modern classrooms and smart boards. All students receive special training on essential academic ICT skills, intercultural Communication, endnote usage, scientific writing and research presentation skills and other pedagogic tools to enhance their learning. Attention is paid to student learning outcomes by continually monitoring their performance at student seminars, examination and hands-on training at compulsory internships at industries and sectoral institutions.

The priority educational themes for CEFTER Postgraduate programs are in the areas of Biotechnology, Food technology and Packaging, , Chemical preservation, Transport and Storage, rural sociology as well as food economics. The thrust is to make the project sensitive to the needs and characteristics of rural households and to the economic



Farmers struggling with post-harvest losses



and institutional environment in which they are implemented. These themes will contribute to project success by applying socio-economic expertise in Agriculture and control of postharvest which is the development challenge.

The National Universities Commission has accredited the under listed programmes:

MSc./PhD. Food Science & Technology

MSc. Bio Statistics MSc/PhD. Post-Harvest Physiology of Crops and Management

MSc./PhD. Food Chemistry

MSc./PhD. Food Processing Technology

MSc./PhD. Analytical/Environmental Chemistry

MSc/PhD Organic/Natural Products Chemistry

MSc. Post-Harvest Engineering & Technology

MSc./PhD. Rural Sociology & Agricultural Extension

The Centre has also introduced short term diploma courses in Food Preservation, pest control and Produce Management mainly to train lower manpower and farmers/food handlers. Since commencement of academic program, the Centre has trained over 200 Africans on its Masters' program while a total of 124 are undergoing intensive research leading to award of PhD. At the

moment CEFTER students come from Gambia, Liberia, Ghana, Cameroon and Nigeria. The training is manned by an experienced team of over 30 Professors and 43 senior level academics that have received modern training on effective teaching and post graduate supervision coordinated by the University of Copenhagen, Denmark.

The Centre boasts of exceptionally conducive learning environment with fully air conditioned lecture rooms and student hostels. Apart from the fact that CEFTER complex is equipped with smart class room facilities, all academics are trained to use and get rewarded financially if they sign up to using modern teaching techniques. Our students are exposed to hands on training through a specially designed internship program that takes them to at least three industries and one research institute within three months after course work. This puts our students in a position to easily blend with industrial jobs and to establish small scale industries.

The Centre has also put in place support schemes for students and staff; some of which include funding both academics and students to conferences, covering the full cost of publication, tuition

and accommodation support to indigent students and scholarship to non-nationals on PhD and MSc programmes. Over 302 students have benefited from CEFTER student support scheme. In the last three years CEFTER staff and students have recorded over 65 peer reviewed journal publications and over 10 novel equipment and research outputs that are been reviewed for patents.

The Management of the Centre has been adjudged by the World Bank supervision teams to be great, as our Vice chancellor Prof. Tor Jor Iorapuu gives maximum attention and support to the Management team and the Centre generally. All these make studying at the University exciting and most students happy to be studying at Benue State University. For those willing to join the CEFTER project as students or visiting academics, please visit www.cefterbsu.edu.ng for details on our programs and admission/partnership. CEFTER partners with industries and research institutes within and outside Nigeria; from where it draws manpower and makes use of laboratory resources.



HEAD OF EXPLORATION AT UNDP NIGERIA'S ACCELERATOR LAB VISITS CEFTER ... UNVEILS LATENT PARTNERSHIP OPTIONS.

The head of exploration at UNDP Nigeria Accelerator Lab, Lantana Elhassan earlier today, led a high powered delegation on a working Visit to CEFTER with specific partnership options in thematic areas that anchor the ultimate mandate of the Centre. The Accelerator Lab team leader identified several pathways and entry points for partnership with CEFTER and other stakeholders in the Benue value chain via the creation and support of knowledge exchange platforms and sharing of resources as key components to explore. The meeting which also had in attendance CEFTER ACE-Impact Project Team Members

outlined and agreed on some entry points which would be discussed in greater details going forward.

Among the thematic areas of partnership proposed were, Capacity building, small skills experiments, data driven interventions, some people commercialize products of agricultural research and provide extension worker support.

UNDP Nigeria's accelerator lab pledged to develop Data gathering models in order to maintain and drive a comprehensive data hub for key agricultural activities and farm

segments in the Benue value chain. The data gap in Benue is huge. Benue State the Team observes produces so much food crops but majority of such farming interests and communities but there is no data on any of such on the digital space thus, not visible on the digital map. Open source and freely available data is therefore, critical to UNDP

The Accelerator hub also intends to take advantage of the goodwill Benue State Government has shown in the allocation of 44 hectares of land to facilitate the setting up of experiment farms to demonstrate some sampled

CEFTER postharvest loss control research findings to verify the feasibility and projected impact of same.

On the development of simple tools to facilitate some crop farming activities, a developer market hub is to be established by UNDP to give opportunity to local artisans and empower them via proper trainings with a view to enhancing their skills set for the commercial production of those tools/machines to help control postharvest losses (eg. Market hubs: Hardware garage, mega power)

In his Response, CEFTER Director and ACE-Impact Centre Leader Dr. Barnabas Ikyo appreciated UNDP Accelerator lab for Visit and called for a specific work plan with definite timelines and expected commitments from CEFTER on all the articulated partnership options. Dr. Ikyo explained that the Work plan would guide implementation and provide a template for self-assessment towards activating the functionality of the partnership.

Dr. Ikyo explained that CEFTER is working on some important projects which would help drive the partnership profile UNDP has unveiled. He articulated some of such programmes to include: Working on an Agro incomer's platform, launching of the Benue Agricultural network/part digital, part physical with a view to looping it into the ecommerce.

Dr. Ikyo assured that CEFTER wants to create a platform beyond mere data wells. Consequently, Benue Television

has been engaged in the production and distribution of jingles.

Major highlights of the occasion were the exchange of souvenirs, memorabilia, group pictures and lunch.

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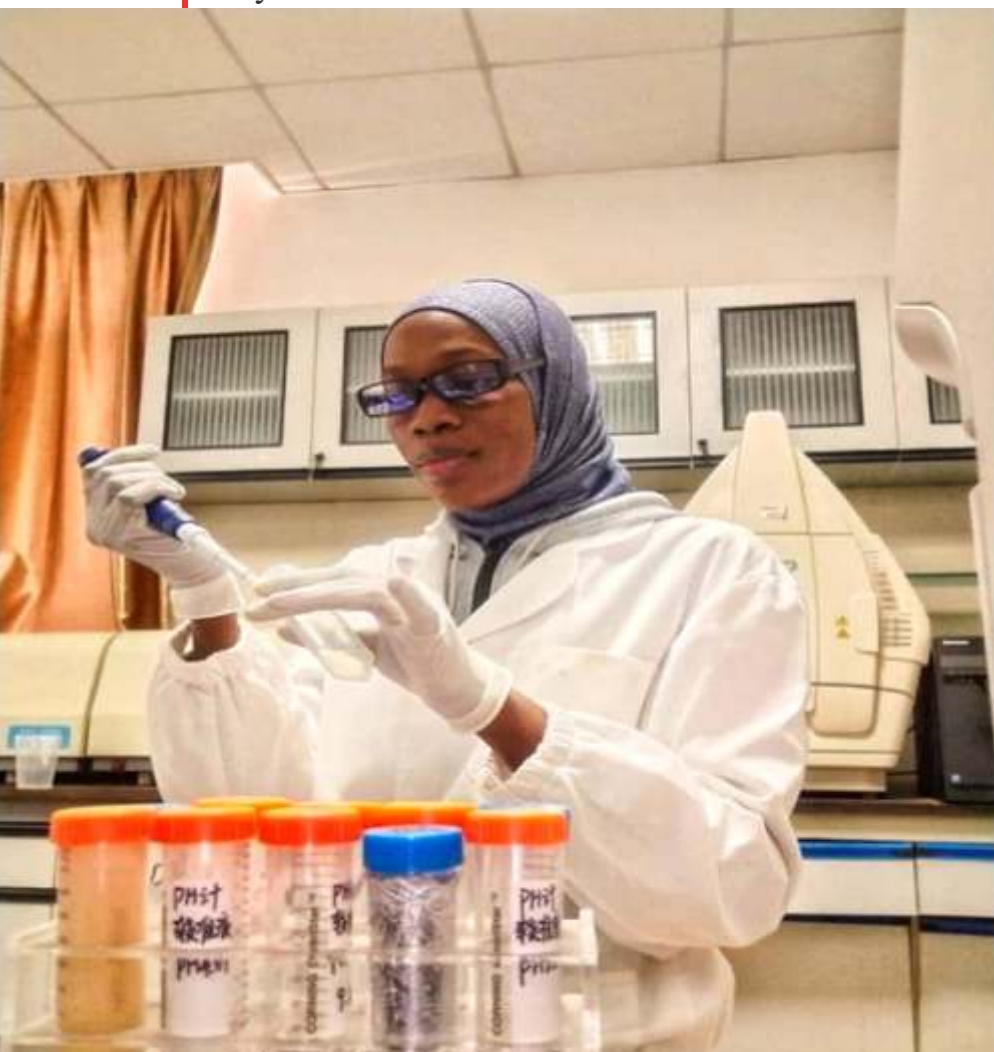
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CEFTER

INTERNATIONAL ALUMNUS PENS AN EMOTION LADEN COMMENDATION

By: Mrs. Mariama Kebbeh



Mariama, a Post Graduate Student in the Lab conducting experiment

The joy of CEFTER is to see her graduates gainfully employed and doing really well across various sectors of the west and Central Africa. The Centre prides in the quality of facilities she provides to make teaching and learning pleasurable for students and faculty. Our class rooms are e-compliant with the best safety compliant structures in place. The Centre also insists on a friendly learning environment that inspires scholarship devoid of intimidations, harassments and all forms of exploitations. Therefore faculty members are fully and properly motivated to delivery on their statutory

obligations.

Every year the Centre updates her Alumni hub data base which tracks and follows up on all categories of graduates from the Centre with mentorship and counseling roles as often as the need arises. Recently, Leadership and Project Management Team Members of World Bank Africa Centre of Excellence: Benue State University Centre for Food Technology & Research went agog celebrating the receipt of an emotional commendation letter from an international Alumnus, Mrs Mariama Kebbeh.

MRS. MARIAMA KEBBEH

In the letter, the Graduate of CEFTER's Food Science and Technology said the two years programme formed the basis of her determination towards achieving in-depth knowledge in Food Science.

As part of the degree, Miss Kebbeh explained that she studied various courses relating to diverse aspects of Food Science and Research which wetted her appetite for more in graduate studies.

Consequently, miss Kebbeh is now on a PhD programme in Food Science & Engineering at Zhejiang Gongshang University, College of Food Science & Biotechnology.

The commendation letter also revealed that Mariama's MSc Programme at CEFTER exposed her to some major development challenges in Postharvest confronting third world nations of the world especially Africa in the field of

Food Science.

Such development challenges in postharvest and several other research engagements on the subject of postharvest loss control at CEFTER spurred Miss Kebbeh to further her studies in Food Science so that she would be able to ultimately attract help to the Continent via her research endeavours and simple technological solutions hence her PhD studies.

Life for Mariama Kebbeh has been a process of conscious evolution with the value system inculcated in her at CEFTER been an integral component of that experience.

Like many other graduates of CEFTER, Mariama reveal that she feels obliged to pen down the commendation haven benefitted tremendously from the guidance of the distinguished scholars and faculty at CEFTER.

explained that she studied various courses relating to diverse aspects of Food Science and Research which wetted her appetite for more in graduate studies.

Consequently, miss Kebbeh is now on a PhD programme in Food Science & Engineering at Zhejiang Gongshang University, College of Food Science & Biotechnology.

The commendation letter also revealed that Mariama's MSc Programme at CEFTER exposed her to some major development challenges in Postharvest confronting third world nations of the world especially Africa in the field of Food Science.



Alumni



Such development challenges in postharvest and several other research engagements on the subject of postharvest loss control at CEFTER spurred Miss Kebbeh to further her studies in Food Science so that she would be able to ultimately attract help to the Continent via her research endeavours and simple technological solutions hence her PhD studies.

Life for Mariama Kebbeh has been a process of conscious

evolution with the value system inculcated in her at CEFTER been an integral component of that experience.

Like many other graduates of CEFTER, Mariama reveal that she feels obliged to pen down the commendation haven benefitted tremendously from the guidance of the distinguished scholars and faculty at CEFTER.



BENUE STATE UNIVERSITY'S CENTRE FOR FOOD TECHNOLOGY AND RESEARCH (CEFTER) PARTNERS CRANFIELD UNIVERSITY, UK

BY: Jacob Shagbaor Suemo, PhD
Communication Officer CEFTER

Vice Chancellor (VC) Benue State University (BSU), Prof Tor Joe Iorapuu recently led a high powered delegation comprising CEFTER Management, BSU Council representatives and CEFTER Board of Governors members to the United Kingdom for strategic international

collaborations & partnerships towards the effective implementation of CEFTER'S ACE DEVELOPMENT IMPACT PROJECT.

The delegation was at Cranfield University, United Kingdom to woo the University management to a partnership with Benue State

University's Centre for Food Technology and Research in the areas of Post harvest Technologies, Faculty and students exchange among other matters of mutual interest to both institutions.

Visibly Present on the BSU delegation is the Centre Leader

and Director CEFTER, Associate Prof Barnabas Ikyo to provide expert opinion and ACE DEVELOPMENT IMPACT insights and expectations to help guide the proposed partnership. BSU Vice Chancellor, Prof Tor Joe Iorapuu listens to Expert Opinion on some core areas of interest from their Host at Cranfield University while CEFTER Centre Leader Dr. Ikyo looks on with keen interest.

Prof Iorapuu and his Team met with Prof Terry Leon the Pro-Vice Chancellor for Research and Innovation & Professor of Plant Science at Cranfield to

discuss partnership entry points for both Universities. Both teams had very useful discussions that hold a lot of promise for postgraduate students of CEFTER who would soon begin to enjoy placement in Cranfield (Exchange sessions) once the partnership becomes operational amongst many other potential collaborations.

Speaking further on the rationale for the strategic visit, the ACE Impact Centre Leader and Director Cefter, Dr. Barnabas Ikyo explained to CEFTER News crew that it is mandatory for the CENTRE to secure

international collaborations to enhance the corporate image of the Centre as well as fulfill core disbursement linked milestones. It is hoped that, Cranfield University would at the completion of the partnership deal, take up active faculty roles in some of CEFTER's Post Graduate programmes to help add value to the CENTRE's Faculty profile and strengthen delivery of core academic content across the relevant disciplines within the scope of the Cefter's Ultimate academic and research mandates.



Post harvest handling of fruits and vegetables

CEFTER

SECURES NAFDAC REGISTRATION NUMBERS

FOR FOUR PRODUCTS

BY: **Jacob Shagbaor Suemo, PhD**
Communication Officer CEFTER



CEFTER Centre Leader, Dr. Barnabas Ikwo surrounded by CEFTER staff while displaying the neatly framed commendation letter from BSU Management to CEFTER upon securing NAFDAC Approval for CEFTER Food Products

National Agency for Food and Drug Administration and Control (NAFDAC) has approved and issued registration numbers for four (4) food products of CEFTER viz: CEFTER cookies, CEFTER bottle water, CEFTER sachet water and CEFTER Yoghurt respectively.

CEFTER's Deputy Director Training, Dr. Adejo made the disclosure in an exclusive chat with CEFTER Communications crew at the main campus of the Centre recently. The Deputy Director Training and Research explained that the approvals

came after few months of painstaking and scrupulous test protocols on the products by NAFDAC.

Dr. Adejo explained that the approval has enhanced the ultimate outlook of the products for optimal market efficiency.

He assured that the Centre would now conveniently initiate the commercial production of the products for bulk supplies to wholesalers and retail outlets.

On her part, the Deputy Centre Leader and Director Operations, Professor Gillian Ogbene Igbum



described the approval as timely and expressed hope that the development would be managed well hence the promise to enhance the financial profile of the Centre.

In his remarks, the Centre Leader, Dr. Barnabas Ikya appreciated the entire management of the Centre for

the feat describing the approval as a product of team work, persistence and pedantic commitment to excellence.

CEFTER Communications desk also gathered that the vision is to collaborate with relevant agencies to experiment specific research findings from the pull at the disposal of the Centre in

order to add value and strengthen capacity for full scale commercial productions.

The products are faring well in the market with huge acceptance indicators and significant patronage within and outside Makurdi index



CEFTER & NRI UNIVERSITY GREENWICH INTRODUCES CASSAVA BAGS

REDUCE THE HIGH – LEVEL OF DETERIORATION
OF CASSAVA TUBERS AFTER HARVEST



Cassava plays an important role in agricultural development, especially in sub-Saharan Africa, because it serves either as subsistence or a cash crop. It is one of the most common food crops grown and consumed in almost every part of Africa. As a result, cassava requires considerable postharvest timely operations

and intensive labour to be processed into a storable form soon after harvest, thereby putting undue pressure on both the farmers and processors.

A sample CEFTER Cassava Product

Consequently, Benue State University Centre for Food Technology and Research in Collaboration with Greenwich University carried out a painstaking Post Harvest loss control research initiative on cassava tubers preservation which now heralds the introduction of cassava bags for garri, (CB4G), a project that would help reduce the high – level of deterioration of cassava tubers immediately after harvest as a timely intervention to both producers and processors.

The project is so significant because in Nigeria for instance,



Cassava Bags

apart from direct consumption, cassava serves as a major raw material in the production of consumables, pharmaceutical and industrial products such as confectionery, sweeteners, glues, plywood, textiles, paper, biodegradable products, monosodium glutamate, drugs, etc. Furthermore, cassava chips and pellets are used in animal feeds and alcohol production. Despite the various potentials that cassava has in transforming the economic and social wellbeing of Nigeria as the largest producer of the crop, its production is characterized with high - level of losses due to the presence of cyanogenic compounds in it.

However, the success of the cassava bags innovation would depend pointedly on the careful handling of the cassava roots right from the time of harvesting. This is so because, it was observed during the experiment

that birthed the said bags that, cassava roots with injury or severe cuts were more susceptible to early deterioration than those without cuts.

There is therefore every need for capacity building of cassava farmers and processors on the package of practice (PoP) or best harvesting skills that will minimize postharvest losses.

Except for other special purposes, carefully harvested cassava roots should not be allowed to last longer than five days in the bags before processing.

Furthermore, bagging the harvested cassava roots on the field is likely to produce the best result. It may also make transportation of the cassava easier and safer.





A group picture of participants and special dignitaries at WCAPHCE 2022

CEFTER PARTNERS AGRICULTURAL RESEARCH COUNCIL FOR UPSCALING AND PROMOTION OF AFRICAN INDIGENOUS FOODS

The Centre for food technology and Research Benue State University Makurdi in collaboration with Agricultural Research Council of Nigeria invited researchers from west and central for the upscaling and promotion of African indigenous foods to global standards through effective research in production, processing, storage and utilizations.

Speaking at the event which had over four hundred participant and exhibitors, the Executive Governor of Benue State, His

Excellency Dr. Samuel Ortom assured of the commitment of the Benue State Government to collaborating with CEFTER-BSU to strengthen food security in the state and upscale and promote indigenous food commodities in the State. The Governor expressed the commitment of the Benue State Government to partnering with CEFTER to ensure that the communiqué arising from the Congress is given the attention it deserves.

In his remarks the Vice Chancellor, Benue state

University Professor Tor Joe Iorapuu described the theme of the event as apt, timely and consistent with current realities surrounding food and nutrition security in west and central Africa.

The VC appreciated CEFTER for consistently enhancing the visibility of Benue State University in the Areas of research, international collaborations and faculty development. He wished participants at the Congress and exhibitions fruitful deliberations assuring of the Commitment of

the University to pushing for the implementation of the recommendations articulated in the communiqué.

The Centre Leader and Director CEFTER Associate Professor Barnabas Ikyo while welcoming participants at the event said CEFTER's focus is on reducing post-harvest losses in West and Central Africa hence the theme of this year's congress. Dr Ikyo explained that this year's congress provides an opportunity for African researchers to present results of research on African indigenous foods and the use of cutting edge

research approaches to improve production, value chain addition and utilization.

The congress was the second since the first one was organized in the year 2018. Dr. Ikyo said the motivation for this year's congress was idea of the congress was born out of the ultimate mandate of the Centre

Earlier, the Central Planning Committee Chairman of the congress, and Executive Secretary Agricultural Research Council of Nigeria, Professor Garba Hamidu Sharabutu appreciated CEFTER for the

hand of fellowship to the Agricultural Research Council to collaborate and put together the event. He appreciated all those who ensured the effective implementation of the congress noting that CEFTER's partnership is strategic, purposeful and very significant. Highlights of the occasion were presentation of papers, split sessions, plenary discussions, exhibitions, red carpet and entertaining performances, dinner meetings and side meetings as well as interesting poster presentations.



From Left to Right: Dr S. Banka-CEFTER Secretary, Dr. K. Ikyenge - Commissioner for Agriculture BSG, Prof. T. Iorapuu - BSU, VC, Dr B. Ikyo, -CEFTER Director/Centre Leader & the HOD Food Science Technology, Kano State University



CEFTER'S STUDENT WINS ACE-IMPACT STUDENT INNOVATION RESEARCH AWARD 2022

A Master's student of Food Chemistry in the Centre for Food Technology and Research Benue State University Makurdi, Ms. YONGOIKYO KUMAWUESE ABIGAIL has been named the winner of the 2022 ACE Impact student innovation research award.

The award is in recognition of exceptional research with both scientific and societal value undertaken by 300 students from 53 African Centers of Excellence. It takes into account practical and long term impact of the research conducted and its impact in the region's most critical priority areas. The research work was supervised by Dr. Sylvester Adejo on the topic, FORMULATION OF INFANT FOOD WITH FORTIFIED MANGO FRUIT FLOUR.

Responding to the news, CEFTER Director and Centre Leader

congratulated Ms. Abigail and the supervisor of the research work Dr. Adejo and the entire CEFTER Team for their commitment to excellence, describing the feat as a consequence of diligence and hard work. The Centre Leader Promised that CEFTER Management on her part shall continue to provide the enabling environment for teaching, training and research to help give students the necessary

requirements to excel without fail. Consequently, Miss Abigail is to attend the 8th ACE IMPACT Regional Workshop to be held in Gambia from 14-18th November 2022. The student will receive the award alongside the Centre Leader and other Center representatives on the sponsorship of The Association of African Universities AAU

