African Orphan Crops Consortium

2019 Progress Report

2019

Financial and in-kind support for the African Orphan Crops Consortium (AOCC) tops **$80 million**

African Plant Breeding Academy (AfPBA) alumni launch **37 improved crop varieties**

By end 2019, the AfPBA graduated **112 scientists** from **27 African nations** including 87% PhDs and 38% women

The **fifth class** is set to begin in late 2020; and funding for a **sixth class** has also been secured

Alumni have published some **171 scientific papers** in peer-reviewed journals

Some **185 national breeding programs** focused on African orphan crops across the continent directed by alumni

Alumni land highly competitive plant breeding and research grants totaling **more than $13 million**

Three new genomes were published by AOCC in 2019

Alumni create and organize the **inaugural meeting** of the African Plant Breeders Association

FAO-AOCC partnership works to take the orphan crops movement global

Cover Photo: Mitchell Maher | International Food Policy Institute

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The COVID-19 pandemic has sharply illustrated the need for reliable supplies of nutritious food, especially for poor people in remote areas where transport is poor. The virus disrupted global food chains, including rice exports from parts of Asia, rice upon which large parts of Africa depend. And it reminded people of the importance of good nutrition in warding off and fighting disease.

In sub-Saharan Africa, more than one third of the population suffers chronic hunger in a 'normal' year. This translates to approximately 237 million people, including more than 58 million children under the age of five. Malnutrition means that many African children are stunted (low height for age), a condition which left uncorrected generally results in poor cognitive abilities and low lifetime earning power.

It was against this backdrop that in 2011, Dr. Howard-Yana Shapiro, Mars, Incorporated Fellow, and Dr. Ibrahim Assane Mayaki, CEO of the New Partnership for Africa's Development (NEPAD, now AUDA-NEPAD) conceived and co-founded the African Orphan Crops Consortium (AOCC). Through Dr. Tony Simons, Director General of CIFOR-ICRAF, the World Agroforestry Centre in Nairobi, Kenya, was established as a home base to the AOCC. Additional infrastructure and administrative capacity were later provided by the University of California, Davis.

Other early key collaborators included BGI, one of the world's leading sequencing organizations; Life Technologies, now part of Thermo Fisher Scientific, which donated crucial equipment; and World Wildlife Fund for Nature, which helped with initial vision and planning.

The AOCC's goal is to sequence, assemble and annotate the genomes of 101 traditional African food crops that rural Africans know and understand, to allow scientists to efficiently improve the crops' nutritional quality, productivity, climate resilience and disease and pest resistance, while training African scientists to best use the genetic information.

Ultimately, the objectives are to ensure that African plant breeders have access to and knowledge of ways to integrate the latest genomic technologies and tools to efficiently develop and release improved varieties of orphan crops to smallholder farmers for cultivation. By this means, both diets and farmers' incomes are improved, allowing the 600 million people who live in rural Africa to grow their own food and nutrition security and support a growing urban population in Africa.

It is an astonishing way of providing the benefits of high-tech science to small-scale farmers in some of the planet's poorest, remotest regions.

AUDA-NEPAD AFRICAN UNION DEVELOPMENT AGENCY

African Union Development Agency – New Partnership for Africa's Development

CIFOR World Agroforestry

Center for International Forestry Research and World Agroforestry

MARS

Mars, Incorporated

UCDAVIS Plant Breeding Academy

University of California, Davis

The Beginnings of the African Orphan Crops Consortium

The AOCC was launched in 2013 and approved by African heads of state at the African Union Assembly in 2014. The AOCC and its companion initiative, the African Plant Breeding Academy (AfPBA), which is coordinated by the University of California, Davis (UC Davis), comprise the most comprehensive and integrated crop improvement venture on the continent. Importantly, it is directed at national breeding programs. Its emphasis on cutting-edge science and training, coupled with its focus on value chain development (three of the AOCC's leaders worked in the private sector), make the complementary programs unique among similar initiatives.

Driving the growth of the AOCC and AfPBA is a global consortium of partner organizations which provides vital resources, equipment and in-kind support, currently valued at $80 million. In addition to AUDA-NEPAD and Mars, Incorporated, the consortium's key partners include UC Davis, the World Wildlife Fund (WWF), BGI and the Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF), which hosts the AfPBA and the AOCC Laboratory in Nairobi.

These key partners have galvanized an uncommon collaboration comprised of 29 government organizations, scientific and agricultural bodies, universities, private and public sector companies, regional organizations and NGOs, along with a network of more than 20 agricultural and horticultural organizations (see page 6). BGI of China spearheads the sequencing and annotation.

In 2018, FAO joined the consortium to mobilize improved nutritional security through the orphan crops approach in all its member states. Given that the heads of state of the African Union Assembly voted to endorse the AOCC initiative, all African governments are represented in the consortium.

The 101 crops can support healthy African diets and expand farmers' incomes, and were drawn from an Africa-centric survey conducted by the WWF, AUDA-NEPAD and Mars, involving African women's groups, agricultural scientists, sociologists, anthropologists, nutritionists, policy makers, farmers, government representatives, universities, and many other stakeholders. The crops are typical of those already grown by households across the continent.

Three primary selection criteria were used for crop prioritization: rich in vitamins, minerals, micro- and macro-nutrients; relevant to pan-African agriculture; and suffering from a critical lack of genetic and breeding research. The list comprises 50 woody trees/shrubs and 51 non-woody crops, representing 28 phylogenetic orders and 45 families.

The AOCC aims to genetically sequence *de novo*, assemble and annotate the 101 food crops, and re-sequence at least 100 lines of each crop species by 2023. Initial sequencing has been carried out on 54 species, with genome assemblies of eight published and available in the public domain. Collaborators in the AOCC network are sequencing an additional 26 species. The AOCC is on track to meet and exceed its initial goals by 2023. AOCC is committed to publishing all sequence information open access to facilitate maximal use of the information by any scientist or organization. All genome data are hosted and maintained on the ORCAE database (*bioinformatics.psb.ugent.be/orcae/aocc*) at the University of Ghent Center for Plant Systems Biology, an AOCC partner.

Opened in December, 2013, the AOCC Genomics Lab is a state-of-the-art sequencing and genotyping lab to support breeding programs of the selected crops. Through partner support, the lab was initially equipped with four Ion Proton sequencers and reagents to begin the resequencing of 10,000 African lines, that is, 100 or so diverse lines of each of the 101 species.

The lab was upgraded in 2016 with a HiSeq 4000 sequencer and again in 2020 with a Nanopore Promethion. It was established with financial and in-kind support of partners such as Life Technologies (now Thermo Fisher Scientific), Illumina Inc., Oxford Nanopore, CIFOR-ICRAF, and Mars.

In 2013, the African Orphan Crop Consortium set out to support healthy African diets and expand farmers' incomes.

The African Plant Breeding Academy and its Students

While the consortium develops the genomic resources of these crops and makes these available freely to all, the vital pathway to impact is through the African Plant Breeding Academy (AfPBA). The AfPBA empowers mid-career African scientists to use the DNA-sequence information to accelerate the delivery of improved varieties tailored to meet consumers', processors' and producers' needs.

Since graduation, AfPBA alumni have launched 37 improved crop varieties and have established a continent-wide community of practice called the African Plant Breeders Association (APBA) to further the professional development of plant scientists on the continent, share research findings, and continue to educate about best practices in genomic applications and plant breeding.

The academy's intensive in-person training and mentoring program is a model for continuing education and professional development of Africa's scientists. By the close of 2019, 112 scientists from 27 African nations (87% PhDs, 38% women), had graduated. The fifth class is scheduled to begin in November-December 2020 (pandemic permitting), and funding for a sixth class has been secured.

Internationally recognized instructors share concepts and principles, while world-class specialists from the private and public sectors (more than 65 to date) including World Food Prize laureate Dr. Robert Mwanga, demonstrate concepts in action as well as practical aspects for success. In the academy's teaching, participants share their experiences to support translational learning so that new breeding approaches can be fully exploited in crops important to Africa's nutritional security.

This involves using genomics to leverage knowledge of 'orthologous' genes that contribute to the same function in related crops. The program culminates with each student devising a proposal to use one or more learnings or tools provided in the course to improve their own breeding program, mentored by one of the Academy instructors and critiqued by all classmates. These proposals have led to transformative outcomes, including external grant awards providing additional funding for research and training, promotions for academy graduates, and cultivar development pipelines to produce a continuous stream of improved crop varieties tailored to maximize productivity of local farmers and meet the needs for quality and nutrition for consumers and processors.

Collectively, the graduates work to develop improved cultivars in more than 105 crop species, 55 of which are on the AOCC list (see *africanorphancrops.org*). There are at least 185 national breeding programs across the continent directed by alumni of the AfPBA that are focused directly on improvement of African orphan crops.

One graduate's landmark paper provided a "roadmap" for genetic improvement of African orphan crops and similar species (Sogbohossou et al 2018. doi:10.1038/s41438-017-0001-2). Alumni have published some 171 scientific papers in peer-reviewed journals on African food crops, which have helped to put African orphan crops at the center of mainstream research and breeding efforts. (See page 10: Publications by AfPBA Graduates).

Cheers from the 32 scientists representing 21 African countries comprising Class IV upon their graduation from the AfPBA in December, 2019.

One major outcome of the academy is the collaboration among cohorts as they interact and bond over the course of the six-week program. Many national scientists find themselves the sole breeder working on their particular crop in their country, so when these bright, motivated scientists come together to share challenges and ideas, tremendous impacts result.

For example, alumni have landed highly competitive plant breeding and research grants, totaling more than $13 million, which also support graduate education for more than 100 students. Class II cohorts Enoch Achigan-Dako (Benin), Julia Sibiya (South Africa), Happiness Oselebe (Nigeria) and Abush Tesfaye (Ethiopia) were awarded a MoBreed (Mobility for Breeders in Africa) grant by the Education, Audiovisual and Culture Executive Agency (EACAE) of the European Union to research key

The African Plant Breeding Academy and its Students
continued

indigenous crops, most of them among the 101 AOCC crops, while training 10 new plant breeding PhDs.

A Basic Research to Enable Agricultural Development (BREAD) grant was secured by Class I cohorts Agyemang Danquah and Michael Barnor (both of Ghana), along with AfPBA Instructor Iago Hale and World Agroforestry to advance shea (*Vitellaria paradoxa*), an economically important crop, especially across equatorial Africa.

Several alumni have secured Integrated Genotyping Service and Support (IGSS) grants through Biosciences eastern and central Africa – International Livestock Research Institute (BecA–ILRI) and the Bill and Melinda Gates Foundation to support genotyping for use in genomics-assisted selection approaches.

With active participation in the AfPBA, the cohorts have realized the importance of continuing education and a supportive community of practice. The alumni creation of the African Plant Breeders Association (APBA) furthers the impact of the AfPBA and offers a clear indication that academy alumni are the new leadership of plant breeding in Africa.

Conceived entirely by the graduates, the APBA is a platform for the continued professional development of African plant breeders, both in their work to create improved cultivars and in their work as educators; most AfPBA grads also teach at African universities in addition to their role as plant breeders. The inaugural biennial conference of the APBA was held at the University of Ghana in Accra in October 2019, attracting 421 participants from 38 countries, an impressive result for the emerging community of practice.

The APBA elected leadership for the next term (including several AfPBA graduates) and selected Makerere University in Uganda as the next conference host in 2021. The APBA garnered significant additional support for the 2019 conference. For example, the US Department of Agriculture National Institute of Food and Agriculture contributed funds to cover travel costs for US scientists to share innovation; AOCC partner Benson Hill Biosystems led a workshop to demonstrate the proprietary analysis software it makes available free-of-charge to AfPBA students, and the USAID Feed the Future Soybean Innovation Lab (SIL) sponsored a teaching workshop to build instructional skills of university faculty.

Dr. Rita Mumm, director of the AfPBA since its launch in 2013, designs the curriculum and coordinates world-class instruction and mentorship for African scientists. Dr. Mumm also serves as education and training lead for the Soybean Innovation Lab, partnering with African universities to enhance the quality of graduate education in plant breeding. She is founding director of the Illinois Plant Breeding Center, past president of the US National Association of Plant Breeders, a named inventor on several US patents, and serves on the Board of Trustees of the International Maize and Wheat Improvement Center (CIMMYT).

AOCC Scientific Director Dr. Allen Van Deynze is the director of the Seed Biotechnology Center and Associate Director of the Plant Breeding Center at UC Davis. In his role as Scientific Director of AOCC, Dr. Van Deynze serves as the pivotal point of connection for the sequencing and the many other contributions to the AOCC by partners and the wider AOCC network. He is an instructor for AfPBA and has received many awards, including the US National Council of Commercial Plant Breeders Public Breeder Award (2016), the International Pepper Conference Lifetime Achievement Award (2018) and the UC Davis Excellence in Research Award (2019).

"The impact of this uncommon collaboration, the AOCC, is grounded in its common goal to alleviate stunting due to malnutrition in Africa. The dedication of the AfPBA graduates and AOCC partners ensure its success," said Dr. Van Deynze.

Graduates of the AfPBA are the new leaders of crop improvement on the African continent.

"The AfPBA empowers the top plant breeders in Africa, resulting in a new community of leaders in crop improvement committed to delivering nutritional security to their nations," said Dr. Mumm.

AfPBA graduates seek ways to "pay forward" their professional development experience and benefits, which multiplies impact exponentially. In 2017, Gemechu Keneni and Abush Tesfaye, both Class II cohorts from the Ethiopian Institute of Agricultural Research (EIAR),

initiated a capacity-building course modelled after the AfPBA. However, in contrast to AfPBA, which targets primarily PhD breeders, the EIAR course targets assistant breeders (i.e., MS-level) in Ethiopia. Participants in the two-week course were selected from national research centers, regional research organizations, and public university research programs. In another case, Enoch Achigan-Dako (Class II) translated his learnings to French for his graduate students at the University of Abomey-Calavi, Benin.

The APBA held its inaugural meeting in Accra, Ghana, in October, 2019, attended by 420+ participants including a large crowd of AfPBA alumni.

The AOCC/AfPBA is impacting the next generation of crop improvement scientists and supporting goals of African institutions to become engines of education and research in crop improvement. The academy has trained numerous junior faculty members that lead pan-African training programs and instruct at African Centers of Excellence, training the critical mass of graduate students that will become the continent's next generation of leaders. Junior faculty from the University of KwaZulu-Natal/ African Center for Crop Improvement, the University of Ghana/West Africa Centre for Crop Improvement, Makerere University/Makerere Regional Center for Crop Improvement, Haramaya University, and the University of Abomey-Calavi have enhanced their knowledge and skills in cultivar development and the use of genomics-based breeding approaches to increase capacity and preparedness in building the crop improvement workforce for Africa.

USAID SIL has joined in this effort with AOCC in supporting these instructors in plant breeding, mentoring curricula enhancement and supporting graduate student interfaces with the seed industry to promote innovation and problem-solving. With the higher-level capacity of scientists that are empowered to use genomic technologies, approaches, and tools in cultivar development, the DNA sequence data on AOCC crops can be exploited more widely and effectively.

In summary, the AOCC/AfPBA outcomes are improving the quality and effectiveness of the crop improvement workforce in Africa, now and for generations to come.

Africa is assuming a new status in agricultural research and commercial development of crop varieties while enhancing nutritional security. By 2030, the use of nutritious, climate-resilient African crops stimulated by the AOCC activities and furthered by the individual and collective efforts of AfPBA alumni are expected to be part of dietary improvements in 20% of Africa's rural populations and 10% of its urban populations.

On a global scale through its work with FAO, the AOCC approach has the potential to spur a global revolution in orphan crops in Africa—crops important to African diets—while at the same time contributing to the nutritional agendas of the United Nations 2030 Sustainable Development Agenda, with a special focus on the Decade of Action for Nutrition—the UN's commitment to eliminate malnutrition in all its forms in the 10 years from 2016-2025.

The AOCC approach also supports the AU 2063 Agenda. "Given the sequencing effort, professional development and diligence of the scientists, with the efficient breeding programs, disseminated with digital devices in African farmers' hands, we are on track to transform resource generation and wealth distribution equitably," said Dr. Yaya A.O. Olaniran, Nigeria's Permanent Representative to the FAO, IFAD, and WFP, and former Chairperson of the Committee on World Food Security.

"The AOCC and the AfPBA have already had immediate impact on the quantity, quality and availability of food in Africa," said Professor Tony Simons, Director General of the Center for International Forestry Research and World Agroforestry, which hosts the academy and its lab. "In times of global uncertainty and disruption with COVID-19, we need endeavors which can better connect our human health systems to our food systems and ecosystem functioning. AOCC is one such worthy endeavor. There will be other pandemics, and as much as we will need emergency responses as we do for COVID-19, we also need to work on ways to make our food systems and environments more resilient to such shocks. Diversity does make a difference, and AOCC is making crop plant diversity make a positive difference for Africa and for the world."

African Orphan Crops Consortium Partners

African Union Development Agency–New Partnership for Africa's Development *Midrand, South Africa:* Founding Collaborator, technical body of the African Union which has provided administrative, logistical and political support for the AOCC.

Agricultural Research Council *Pretoria, South Africa:* Supports the AOCC by sequencing genes (transcriptomes) for the AOCC.

Alliance for a Green Revolution in Africa *Nairobi, Kenya:* Supported by the Bill and Melinda Gates and the Rockefeller Foundations, it supports the AOCC in many ways and has contributed USD 1.1 million to the AfPBA.

Benson Hill Biosystems *St. Louis, USA:* Plant biology, analytics and cloud computing company focusing on global food systems. It is providing AOCC plant breeders with advanced computational technology to accelerate their breeding programs.

Biosciences Eastern and Central Africa International Livestock Research Institute (BecA-ILRI) *Nairobi, Kenya:* A shared agricultural research and biosciences platform providing laboratory services to African and international scientists conducting research on African agricultural challenges. It provides AOCC with lab and project support, training of breeders, and the curation of germplasm used.

BGI *Shenzhen, China:* Key Collaborator, one of the world's leading sequencing organizations. It is involved in sequencing, annotating, assembling and curating many of the 101 African orphan crop genomes.

Center for International Forestry Research and **World Agroforestry** (CIFOR-ICRAF) *Nairobi, Kenya:* Key Collaborator, hosts the AOCC laboratory and the AfPBA. CIFOR-ICRAF helps manage the data and website.

Corteva Agriscience *Johnston, USA:* A private agricultural company focusing on development of crops. Corteva is helping train plant breeders and development of genomic resources for the AOCC.

CyVerse *Tucson, USA:* is a collaborative that has developed a cyber-infrastructure for data-intensive biology driven by high-throughput sequencing, phenotypic and environmental data sets. It has helped the AOCC with analysis and curation of sequence and genotype data.

Dovetail Genomics *Santa Cruz, USA:* A genomics company that contributes to assembling AOCC genomes.

Food and Agriculture Organization of the United Nations *Rome, Italy:* Supports the development of the AOCC through a letter of intent with specific areas of support.

Google *Mountain View, USA:* Provides rapid transfer of AOCC data worldwide using cloud space.

Helmholtz University *Munich, Germany:* annotates and assembles pan-genome and defines structural variants in complex genomes.

Illumina Inc. *San Diego, USA:* Develops technology and kits for use in genetic research, and has provided the AOCC with reagents to sequence the gene complement of 50 species and has donated their HiSeq 4000 Sequencer to the AOCC lab to sequence 10,000 accessions of African crops.

Mars, Incorporated *Maclean, USA:* Founding Collaborator, one of the world's largest privately-owned food companies; it has provided over $4 million for the African Plant Breeding Academy, scholarships for breeding programs and support for AOCC lab personnel.

Thermo Fisher Scientific *Waltham, USA:* Key Collaborator, acquired Life Technologies, which donated four Ion Proton machines to the AOCC. Thermo Fisher helps companies and organizations solve their research challenges and donated reagents to AOCC for Proton Sequencers.

Integrated Breeding Platform *El Batán, Mexico:* Provides data management systems for plant breeders. The IPB provides training to AOCC breeders through the UC Davis Plant Breeding Academy.

Oxford Nanopore *Oxford, UK:* Genomics company providing DNA and RNA sequencing technologies. It will provide its platform and reagents to AOCC breeders.

UNICEF *New York City, USA:* Supports the development of the AOCC.

Keygene Inc. *Rockville, USA:* International company supplying genomic tools for plant breeding. It is providing its tools to AOCC breeders and is sequencing AOCC species.

Scotland's Rural College *Edinburgh, UK:* Promotes AOCC and writes peer reviewed articles in collaboration with AOCC and AfPBA.

VIB – University of Ghent Center for Plant Systems Biology *Ghent, Belgium:* Non-profit research institute in the life-sciences sector with 1,200 scientists conducting basic research on molecular mechanisms. It has helped AOCC with bioinformatics and annotation of plant genomes. VIB hosts the completed genomes for AOCC.

LGC *Hoddesdon, UK:* International life sciences measurement and testing company, providing reference materials, genomics solutions and analytical testing products and services. It has also provided genotyping services and training for AOCC plant breeders.

Syngenta Inc. *Minneapolis, USA:* Supports travel for workshops and leads the Demand-Led Breeding initiative.

University of California, Davis *Davis, USA:* Key Collaborator, one of the world's leading agricultural universities, it manages the AfPBA and co-leads the AOCC laboratory and scientific program.

African Orphan Crops Consortium Partners
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University of Dundee *Dundee, Scotland:* Non-profit research institute specializing in plant breeding. It provides gene sequencing tools and analyses to AOCC breeders.

Wageningen University *Wageningen, Netherlands:* World-leading agricultural university working closely with AOCC to define the nutritional value of African crops and breeding lines.

World Food Programme *Rome, Italy:* The food-assistance branch of the United Nations and the world's largest humanitarian organization addressing hunger and promoting food security. It supports the AOCC in development.

World Wildlife Fund for Nature *Washington DC, USA:* Key Collaborator, helped with initiation and vision of the AOCC.

2019 AOCC Collaborators

African Bean Consortium

Bionnovate Project

Bioversity International

CIAT– International Center for Tropical Agriculture

Cleome Consortium

Crop Breeding Institute, Zimbabwe

Crops for the Future Research Centre

Fababean Consortium

Hohenheim University

ICARDA– International Center for Agricultural Research in the Dry Areas

ICRISAT– International Crops Research Institute for the Semi-Arid Tropics

IITA– International Institute of Tropical Agriculture

Lentil Sequencing Consortium

National Research Council Canada

NWO Food & Business Applied Research Fund

Pan African Bean Alliance

Sweet Potato Consortium

USDA-ARS Subtropical Horticultural Research Station

USDA-ARS, Wisconsin

World Vegetable Centre

2019 AUDA-NEPAD Members

Algeria

Angola

Benin

Botswana

Burkina Faso

Burundi

Cameroon

Cabo Verde

Central African Republic

Chad

Comoros

Congo

Democratic Republic of Congo

Côte d'Ivoire

Djibouti

Equatorial Guinea

Egypt

Eritrea

Kingdom of eSwatini

Ethiopia

Gabon

Gambia

Ghana

Guinea

Guinea-Bissau

Kenya

Kingdom of Lesotho

Liberia

Libya

Madagascar

Malawi

Mali

Mauritania

Mauritius

Morocco

Mozambique

Namibia

Niger

Nigeria

Rwanda

Saharawi Arab Democratic Republic

São Tomé and Príncipe

Senegal

Seychelles

Sierra Leone

Somalia

South Africa

South Sudan

Sudan

Tanzania

Togo

Tunisia

Uganda

Zambia

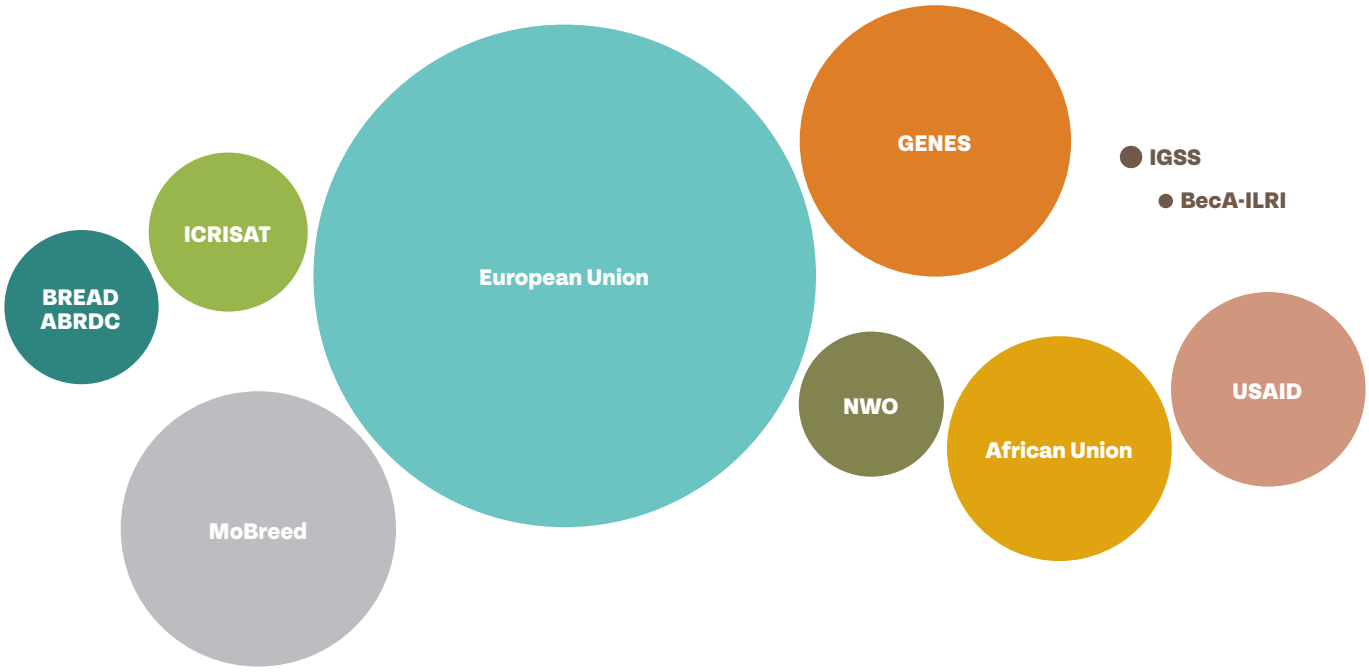
Zimbabwe

Given that African heads of state at the African Union assembly voted to endorse the AOCC initiative, all African governments are partners in the Consortium as well.

Grants Received by African Plant Breeding Academy Graduates

Awarded as of 2020	Funds in USD
European Union Recruitment and training of plant breeders in Benin	$ 6,000,000
MoBreed EU sponsored grant to research African Orphan Crops	1,800,000
GENES Grant sponsored by EU agency, EACEA, to develop climate-smart crop varieties	1,750,000
African Union Enhance biofortified sweet potatoes value chains for improved nutrition in women and children in Benin, Niger and Nigeria	1,200,000
USAID Soybean Innovation Lab (SIL) Support to faculty and plant breeding programs at African universities to upgrade curricula	900,000
ICRISAT Molecular breeding for drought tolerance and resistance to blast in finger millet	610,000
BREAD ABRDC Integrated resource development for the genome-enabled improvement of shea tree for sub-Saharan Africa	564,471
NWO Food & Business Applied Research Fund *Cleome gynandra* for the development of improved cultivars for the West and East African markets	500,000
Integrated Genotyping Support and Service (IGSS) Bambara, potato, Kersting groundnut, cowpea	12,000
ABC from BecA-ILRI Cassava-Bunmi Olasanmi	5,000
Total	**$ 13,341,471**

Grant Funding Sources



Publications by African Plant Breeding Academy Graduates

Enoch G. Achigan-Dako

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Muhyideen Oyekunle

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Robooni Tumuhimbise

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Varieties Released by African Plant Breeding Academy Graduates

Mathews Dida
Maseno University, Kenya

Maize variety (Maseno EH14) that is high yielding, Striga weed tolerant and adapted to western Kenya mid altitudes (1200-1700m) above sea level. Released in 2016.

Finger millet variety (Maseno 60D) drought tolerant and matures in 80 days from planting—much earlier than all Kenyan finger millet varieties. Released in June 2016.

Jean-Louis Konan
CNRA, Cote d'Ivoire

Coconut cultivar PB121 improved (Malayan Yellow Dwarf x West African Tall improved) for Ghana, Nigeria, Sierra Leone.

Coconut cultivar B113 improved (Cameroon Red Dwarf x Rennell Island Tall improved) for Ghana, Nigeria, Sierra Leone.

Coconut cultivar Panama Tall Monagre for Nicaragua

Henriko Kulembeka
Ukiriguru Agricultural Research Institute, Tanzania

Five cassava varieties for Tanzania: TARICASS1, TARICASS2, TARICASS3, TARICASS4, and TARICASS5.

Cassava variety for coastal lowland and Mid Sub humid agro-ecologies of Tanzania, Kiroba.

Cassava variety for coastal lowland and Mid Sub humid agro-ecologies of Tanzania, Kizimbani.

Cassava variety for coastal lowland and Mid Sub humid agro-ecologies of Tanzania, Mkumba.

Cassava variety for coastal lowland and Mid Sub humid agro-ecologies of Tanzania, Mkuranga 1.

Amade Muita
Agricultural Research Institute, Nampula, Mozambique

Groundnut variety Amena-018 (ICGV-SM 08520). Spanish erecta type, dark cream high yield and drought tolerance.

Groundnut variety Mapupulo-018 (ICGV-SM 08520). Spanish erecta type, dark cream, high yield and drought tolerance.

Groundnut variety AMM-018 (ICGV-SM 08520). Spanish erecta type, dark cream, very high yield and drought tolerance.

Muhyideen Oyekunle
Ahmadu Bello University, Zaria, Nigeria

Oyekunle, M., A. Menkir, S.G. Ado, I.S. Usman, H. Mani, U.S. Abdullahi, M.B. Hassan, R. Abdulmalik, L.B. Hassan, H.O. Ahmed, and M. Usman. Nomination of three-way cross white maize hybrid (SAMMAZ 58) for registration and release in Nigeria.

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Viviane Raharinivo
National Center of Applied Research for Rural Development, Madagascar

Four rice varieties for southwest part of Madagascar especially the irrigated zone at the Great Plain of Bas Mangoky: FOFIFA 187, FOFIFA 188, FOFIFA 189, and FOFIFA 190.

Robooni Tumuhimbise
National Agricultural Research Organisation, Uganda

Five cooking banana varieties resistant to disease and pests for Uganda: NAROBan1, NAROBan2, NAROBan3, NAROBan4, and NAROBan5.

All varieties released during 2019 unless otherwise noted.

African Orphan Crops List

Abelmoschus caillei
Okra

Adansonia digitata
Baobab Tree

Allanblackia floribunda
Vegetable Tallow Tree

Allanblackia stulhmanii
Mkani or Msambo

Allium cepa
Onion

Amaranthus cruentus
Grain Amaranth

Amaranthus tricolor
Vegetable Amaranth

Anacardium occidentale
Cashew

Annona reticulata
Custard Apple

Annona senegalensis
Wild Custard Apple

Artocarpus altilis
Breadfruit

Artocarpus heterophyllus
Jack Tree

Balanites aegyptiaca
Egyptian Balsam

Basella alba
Vine Spinach

Boscia senegalensis
Aizen or Nabedega

Brassica carinata
Ethiopian Mustard

Canarium madagascariense
Ramy Nut

Carica papaya
Papaya

Carissa spinarum
Conkerberry or Bush Plum

Casimiroa edulis
White Sapote Tree

Cassia obtusifolia
Sicklepod Senna

Celosia argentea
Cockscomb

Chrysophyllum cainito
Star Apple

Citrullus lanatus
Watermelon

Cocos nucifera
Coconut

Colocasia esculenta
Taro

Corchorus olitorius
Jute Mallow

Crassocephalum rubens
Yoruban Bologi Herb

Crotalaria juncea
Sunn Hemp

Crotalaria ochroleuca
Rattlebox

Cucumis metuliferus
Horned Melon or Kiwano

Cucurbita maxima
Pumpkin

Cyphomandra betacea
Cape Tomato

Dacryodes edulis
Safou African Plum

Detarium senegalense
Sweet Detar

Digitaria exilis
Fonio Millet

Dioscorea alata
Water Yam

Dioscorea dumetorum
Bitter Yam

Dioscorea rotundata
Yam

Diospyros mespiliformis
African Persimmon

Dovyalis caffra
Kei Apple

Elaeis guineensis
Oil Palm

Eleusine coracana
Finger Millet

Ensete ventricosum
Ethiopian or Abyssinian Enset

Eragrostis tef
Tef Cereal Grass

Faidherbia albida
Apple-ring Acacia

Garcinia livingstonii
African Mangosteen

Garcinia mangostana
Mangosteen

Gnetum africanum
African Jointfir

Gynandropsis gynandra
Spiderplant

Hibiscus sabdariffa
Roselle

Icacina oliviformis
False Yam

Ipomoea batatas
Sweet Potato

Irvingia gabonensis
African Bush Mango

Lablab purpureus
Lablab Bean

Lannea microcarpa
Tree Grape

Lens culinaris
Lentil

Macadamia ternifolia
Macadamia

Macrotyloma geocarpum
Kersting's Groundnut

Mangifera indica
Mango

Momordica charantia
Bitter Gourd

Moringa oleifera
Drumstick Tree

Morus alba
Mulberry

Musa acuminata
Banana or Matoke

Musa balbisiana
Banana

Musa x paradisica AAB Group
Plantain

Opuntia monacantha
Prickly Pear

Parinari curatellifolia
Mobola Plum

Parkia biglobosa
Locust Bean

Passiflora edulis
Passion Fruit

Persea americana
Avocado

Phaseolus vulgaris
Green Bean

Plectranthus esculentus
Kaffir or African Potato

Plectranthus rotundifolius
Frafra Potato

Psidium guajava
Guava

Ricinodendron heudelotii
Njansang Ground Nut Tree

Saba comorensis
Rubber Vine or Gumvine

Saba senegalensis
Weda, Nsaban, Kabaa Tree

Sclerocarya birrea
Marula Tree

Solanum aethiopicum
African Eggplant

Solanum nigrum/ scabrum
African Nightshade

Sphenostylis stenocarpa
African Yam Bean

Strychnos cocculoides
Monkey Orange

Strychnos spinosa
African Orange

Syzygium guineense
Water Berry Tree

Talinum fruticosum
Ceylon Spinach

Tamarindus indica
Tamarind

Telfairia occidentalis
Fluted Gourd

Tylosema esculentum
Marama or Gemsbok Bean

Uapaca kirkiana
Wild Loquat

Vangueria infausta
African Medlar Tree

Vangueria madagascariensis
Spanish Tamarind

Vicia faba
Broad or Fava Bean

Vigna radiata
Mung Bean

Vigna subterranea
Bambara Groundnut

Vitellaria paradoxa
Shea Tree

Vitex doniana
Chocolate Berry Tree

Xanthosoma sagittifolium
Walusa or Elephant Ears

Xanthosoma spp
Cocoyam and Arrowroot

Ximenia caffra
Sour Plum

Ziziphus mauritiana
Jujube Tree

African Orphan Crops Consortium

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