

Researchers identify adaptive traits with immense potential for yam improvement



Loading yam tubers into a truck for transport to markets.

A collaboration between scientists at [IITA](#) and 16 other institutions has contributed to tools and insights that will enable yam breeders to unlock the potential of *Dioscorea alata L.*, also known as greater yam. These will help breeders take full advantage of the crop's adaptability to varied environments. [to page 3](#)

Director General assesses ATA-DRC progress during DRC tour



DG Nteranya Sanginga discussing with the Minister of Agriculture Excellency Désiré M'Zinga Birihanze.

During his recent visit to the Democratic Republic of Congo (DRC), [IITA](#) Director General [Dr Nteranya Sanginga](#) met technical and financial partners of the Institute to discuss synergizing ongoing agricultural development and transformation programs for sustainable results.

His tour included visits to the Minister of Agriculture Excellency Désiré M'Zinga Birihanze, Minister of Finance Excellency Nicolas Kazadi, World Bank Country Director Christophe Carret, and other government and private sector partners.

DG Sanginga's visit came a month after IITA commenced activities as a technical partner in the Agenda for the Transformation of Agriculture in the Democratic Republic of Congo (ATA-DRC) Program. He highlighted the sustainability advantages to the

Congolese government and its partners for agricultural transformation regarding investing in different initiatives with converging interests.

The DG visited Ceragru, an Agri multiplier in rural Kinshasa and an ATA-DRC Program recipient during his tour. IITA is supporting Ceragru in upgrading their laboratory equipment, training laboratory workers and technicians, and consulting on the renovation of the agricultural greenhouse for rapid multiplication of cassava cuttings.

Cassava cuttings from Ceragru will be transplanted to the seed field of the Government's Mongata agricultural site. IITA is also providing technical backstopping to Mongata, particularly with optimizing the mechanization of the farm and the processing plant.

With the optimized mechanization, field clearing has been reduced to 8 hours for 50 ha from the previous estimate of 45 days with manual labor. This has also reduced costs to US\$10 ha/day from US\$35 ha/day.

While visiting the Mongata field activities, DG Sanginga discussed the collaboration between IITA and Bio Agronomic Business (BAB)—a company managing agricultural sites in the DRC. Though IITA will manage Mongata because it provides technical support in production, processing, and facilitation for the market, BAB will handle sales.

The ATA-DRC Program, initiated by DRC President H.E President Félix Tshisekedi, aims to transform the nation's agriculture into a profitable sector, creating wealth and jobs and sustaining food security within and beyond the region. *Contributed by Michèle Kimpwene*



Top: DG Sanginga visiting IITA's private sector partner CERAGRU. Bottom: IITA's Mongata Site Manager Marcos Dalevedove showcasing a modified potato harvester now used for cassava harvesting.

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Always clean your hands; practice physical and social distancing; wear face masks properly; avoid crowds and public places; keep a 2-meter distance from the next person; and practice general sanitation and hygiene.

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Yam—genus *Dioscorea*—is an essential food and income source in tropical and subtropical regions of Africa, Asia, Latin America, and the Pacific, contributing more than 200 dietary calories per capita daily for around 300 million people. Yam tubers are also rich in carbohydrates and protein and contain vitamin C. Yam is available year-round because of their high postharvest shelf-life, making the crop a critical crop cultivated by African farmers.

Despite its significance for millions of people globally, the greater yam remains an orphan crop, receiving marginal commercial and research attention. The greater yam has a high potential for increased yield and broader cultivation, with advantages over other root tuber-banana crops due to its superior nutritious content and low glycemic index. Moreover, its ability to grow in tropical and sub-temperate regions suggests that it is highly adaptable to its environment.

A study conducted by 30 researchers from 17 institutions indicates that there may be adaptive traits that could be exploited in different global contexts. The greater yam establishes itself vigorously, produces higher yields than other domesticated yam species, and better tolerates marginal, poor soil

and drought conditions. These traits suggest a high nutrient-use efficiency.

The study, which addressed resource gaps by presenting a highly contiguous chromosome-scale genome assembly of greater yam combined with a dense genetic map derived from African breeding populations, shows that these traits will be valuable in combating climate change. The researchers also studied genes for resistance to anthracnose, a damaging fungal pathogen of yam, and other tuber quality traits, such as extensive inbreeding.

A significant hurdle for breeders is the difficulty of making successful crosses in *D. alata* due to lack of flowering, limited seed set, and differences in flowering time. The genome sequence and associated resources will facilitate future marker-assisted breeding efforts for greater yam, and the genome-enabled methods will allow breeders to make the most out of each cross and use fewer resources to maintain genotypes that are less likely to be useful.

Over 90% of global yam production comes from West Africa's "yam belt"—Benin, Côte d'Ivoire, Ghana, Nigeria, and Togo—where yam's importance is demonstrated by its vital role in

traditional culture and religion. To meet the demands of an ever-growing population and tackle the threats that constrain yam production, the rapid development of improved yam varieties is urgently needed. But conventional breeding for desired traits in greater yam is arduous.

The study used genomic and genetic resources to identify nine quantitative trait locus (QTL) for anthracnose resistance and tuber quality traits. Greater yam is highly tolerant of the most significant yam virus, yam mosaic virus. By leveraging QTL and genome-wide association for disease resistance and tuber quality, as well as marker-aided breeding strategies and genome editing, yam breeders aim to rapidly generate disease-resistant, high-performing, climate-resilient varieties of greater yam, preferred by either or both farmer and consumer.

The study, [Chromosome evolution and the genetic basis of agronomically important traits in greater yam](#), was published in the Nature Communications open access journal. The tools and resources highlighted will empower breeders to use modern genetic tools and methods for breeding the yam more efficiently, thereby accelerating the release of improved varieties to farmers.

IITA researchers collaborated with others from the University of Copenhagen, Denmark; International Trade Center, Ghana; University of California, USA; Innovative Genomics Institute, USA; National Root Crops Research Institute (NRCRI), Nigeria; Institute of Experimental Botany of the Czech Academy of Sciences, Centre of the Region Haná for Biotechnological and Agricultural Research, Czech Republic; School of Life Sciences, University of Dundee, United Kingdom; DOE Joint Genome Institute, USA; World Agroforestry (CIFOR-ICRAF), Kenya; African Orphan Crops Consortium, Kenya; Cornell University, USA; Agricultural Research Council, Biotechnology Platform, South Africa; James Hutton Institute, UK; University of California, USA; Okinawa Institute of Science and Technology, Japan; and the Chan-Zuckerberg BioHub, USA.

Contributed by Timilehin Osunde



Selling yam tubers at Bodija Market in Ibadan, Nigeria.

Cuso and IITA to address climate change in Nigeria

Danny Pelletier, Key Program Officer for [Cuso International](#), visited [IITA](#) headquarters, with James Odey, Business Development Manager, on 4 May. They visited the Institute to discuss further areas of collaboration to address climate change issues.



Key Program Officer Danny Pelletier sharing the purpose of the visit.

Cuso is a Canadian Non-Governmental Organization (NGO) working with other partners to tackle poverty and inequality. With an existing relationship with some of IITA's hubs in Africa, the NGO seeks to extend the partnership to Nigeria, hence the courtesy visit to the IITA headquarters.

IITA Deputy Director General, Partnerships for Delivery (DDG-P4D), [Kenton Dashiell](#), welcomed the delegation and highlighted IITA's activities and technologies. While commending the agricultural technologies available at IITA, Pelletier briefly introduced Cuso's activities,

revealing the similarities between the two organizations, ranging from mandate crops to youth and gender-focused activities. "I see a lot of alignment with the works at IITA and Cuso. We have also seen emerging opportunities for partnership with IITA."

Highlighting the areas of interest for partnership, Pelletier mentioned youth, women empowerment, capacity development, and sustainable livelihoods for marginalized groups. "We will bring in our different expertise that will complement resolving climate change," Pelletier said.

Head of IITA Capacity Development Office, [Zainatou Soré](#), stated that IITA has ongoing programs in these areas, and the Institute is looking to have a program for marginalized groups. Hence, there is room for partnership.

Dashiell also emphasized IITA's interest in partnering with Cuso in these areas.

While the partnership process has not been finalized, a date will be scheduled for Cuso's Head of Programmes to visit IITA. "We will invite you back anytime you are ready," Dashiell said.

IITA youth representatives took the visiting team on a tour of IITA facilities, particularly the youth centers and activities. *Contributed by Favour Eleta*



The Cuso team with the IITA team.

Bees: An active source of food and livelihood for man

Bees are one of the most hard-working creatures on earth. Bees do so much for our planet, including pollinating flowers, fruit and food crops, and even some trees. They produce the nutritious sweet syrup called honey and contribute to the earth's biodiversity and ecosystem stability. Bees could constitute a source of livelihood for anyone who learns to keep bees for honey production.



Bees gathered on a honey harvester's head.

Beekeepers will do well to love nature, exercise patience, and possess tender care and a sense of duty. With training from experts, investment capital, and a conducive environment for the bees, anyone can start.

The [IITA Forest Center](#) keeps bees in several hives in the wild for honey extraction. It also offers training to intending beekeepers. We recently harvested about 35 liters of honey from four hives, worth NGN210,000 (approximately US\$500).

A healthy, well-protected, and thriving hive can produce between 20 and 100 liters of honey annually. However, a poorly maintained hive will be exposed to infestations and attacks from bee predators, such as bears, birds, mice, beetles, moths, and fungi. This is bad for business.

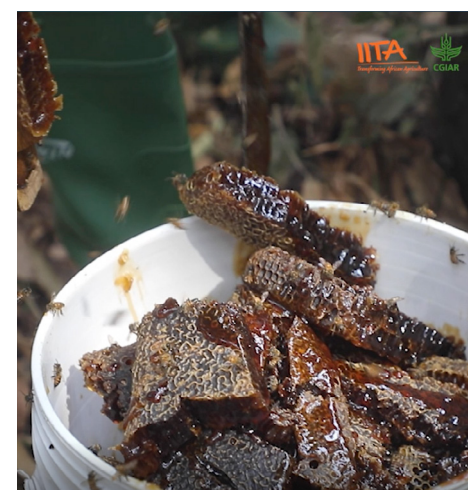
Bees need enough space in their hives to function maximally. They keep producing honey, which is also their food, even after storing enough to last them a long time. If bees run out of space in their hives, they swarm out to search for larger living spaces. This is also bad for business. Bees need enough space to be functional. One way is to check in the hives to collect stored honey regularly. Another way is to add shallows to the hives when the bees run out of space. Shallows are frames set on top of the main hive, with space only big enough for worker bees to pass through. The added space only serves as a vault to store extra honey.

When collecting honey, make sure not to take the whole lot at once. Since the honey is food for the bees, they would read complete extraction as a threat

to their safety and desert the hive for a more protective space. A healthy colony will give a beekeeper a huge honey harvest, and it will serve to pollinate surrounding vegetable gardens.

Bees can travel an average of three miles from their hives looking for food. They forage for nectar from flowering plants, pollen from pollen-producing plants, and resin from trees used to make propolis—the brownish substance bees use to seal open spaces in their hives. These three are essential for a healthy and thriving beehive. The nectar gets converted to honey, while the pollen feeds young bees.

If looking to set up a beehive for honey production, look out for these things: a teeming population of nectar and pollen-producing plants and trees. Other equipment needed includes a constructed hive, a smoker to ward-off bee attacks, protective jackets, long gloves, and a hive tool, which looks like a crowbar to lift the hive lid during inspection or harvesting. *Contributed by Folake Oduntan*



Left: Harvesting honey from a bee hive at the IITA Forest Center. Right: Honey from harvested honeycombs.