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THE BULLETIN

Report provides evidence of how climate change affects Arabica coffee growing areas

Do you know that high night temperatures affect our morning coffee?

Evidence that climate change is already having an impact on the *Arabica* coffee sector in the East African Highlands region is shown by a study called "*Coffea arabica* yields decline in Tanzania due to climate change: Global implications" published earlier this month by IITA, the International Center for Tropical Agriculture, and the University of Witwatersrand in www.sciencedirect.com. The study shows that over the last 49 years, there has been a +1.42 °C increase in night temperatures which has led to yield decreases in Arabica of 195 kg/ha. The consequences for smallholders in the region are dramatic as it represents losses of 46%.

"Coffee yields have declined to their lowest point in years, with many farmers in Tanzania giving up on coffee completely," says Alessandro Craparo, the main author of the study.

The sensitive *Coffea arabica* berries need low temperatures to grow well and produce high quality coffee for consumption, that is why they are best suited to the cool tropical highlands of East Africa, typically between 1300-2800 m above sea level. Using data from the northern Tanzanian highlands, the study demonstrates for the first time that the increasing night time (minimum) temperature is the most significant climatic variable responsible for diminishing *Arabica* coffee yields between 1961 and 2012 and proves that climate change is an ongoing reality. The researchers A. Craparo, P. van Asten, P. Läderach, L. Jassogne, and S. Grab use open access datasets, which confirm that out of many climate variables, night temperature has the greatest correlation to coffee production.

The results of the study projected forward means that without substantial adaptation strategies, the average coffee production in Tanzania will drop to 145 ± 41 kg/ha by 2060. This is approximately a 35% loss in yield for the farmer, which could mean a decrease of up to US$28 million in export earnings for Arabica for the country.

"The industry is aware of the impact of climate change on coffee production, but they need hard data to prove to regional decision makers, how urgently climate mitigation strategies need to be put in place," says Dr Piet van Asten, IITA Country Representative in Uganda and agronomist working on sustainable intensification of cropping systems. "The study is the first of its kind globally providing essential time-series evidence that climate change has already had a negative impact on *C. arabica* yields," he added.

Contrary to the typical constraints found in coffee research linked to rainfall and drought stress and the climate projections for future scenarios deriving from it, the observation of minimum temperatures needed for coffee growing leads to clear empiric data and biological relationships– the hotter the nights get, the higher the danger for *Arabica* coffee production.

At night temperatures of 23 °C and above, the plant's metabolism starts to change, leading to lower yields and reduced quality, which will have a significant impact on the coffee industries and processors.

The study, which was done under the CGIAR Research Program on Climate, Agriculture and Food Security also received funding from the German Federal Ministry of Economic Cooperation and Development, BMZ. It may give the coffee sector the hard figures required to encourage the public and the private sector to invest in climate change adaptation strategies that will better sustain the industry and the livelihoods of millions of smallholder farmers who depend on it.

Alessandro Craparo registering coffee berries with smallholder farmers in Northern Tanzania. Photo from P. van Asten.

Food security and livelihoods put at risk as destructive pest invades Tanzania

A new destructive pest is rapidly spreading through the coastal areas of Tanzania around Dar es Salaam and Zanzibar, attacking important food crops such as papaya and cassava, and ornamental plants such as hibiscus and frangipani. Scientists at IITA have identified it as the Papaya mealybug (*Paracoccus marginatus*).

In recent years, this highly invasive pest has also been spreading and causing damage in many Asian and West African countries. From its origin in Mexico, it was first observed on the African continent in Ghana in 2010 from where it spread to Bénin, Nigeria, Togo, and Gabon. This discovery in Tanzania means that the rest of East Africa is now likely to be affected as well.

Mealybug are tiny, white, flat insects which suck the life out of plants. The preferred host is papaya, but the insect also affects a wide range of crops including cassava, beans, coffee, pepper, melon, guava, tomato, eggplant, cotton, and jatropha. Therefore, if not controlled, the pest may result in widespread damage and loss of livelihoods for many farmers in the country.

The papaya mealybug appear as white fluffy spots on the undersides of leaves, branches, and fruit, often accompanied by an unsightly black, sticky substance coating these surfaces–this is a result of a sugary excretion which attracts mold. Farmers are unable to sell the often misshapen, discolored, and (in severe cases) completely shrivelled fruits.

According to Dr James Legg, IITA entomologist, and one of the scientists who is leading the efforts to contain the pest after first noticing the damage in his home garden, the papaya mealybug is currently one of the most destructive and rapidly spreading invasive insect species.

"In Tanzania," he said, "we have observed the pest along the coastal belt around Dar es Salaam and its environs, mostly on papaya, cassava, and ornamental plants such as hibiscus and frangipani. We need to carry out a survey throughout the country to determine the full extent of spread and the range of plants affected."

"Samples sent to IITA's Biological Control Center for Africa, Cotonou, Bénin, have been positively identified by Entomologist Dr Georg Goergen. Now that we know with what we are dealing we need to act fast. The pest can easily spread throughout the East African region causing major damage and threatening the food security and incomes of tens of thousands of Tanzanian farmers."

Papaya fruits heavily infested by the papaya mealybug (left). A stump is all that is left of a young papaya plant in Bagamoyo after it was invaded by the mealybug (right).

The mealybug are easily blown by the wind or carried by ants from one plant to another. They are transported longer distances by people who unknowingly carry infested plants or fruit from one part of the country to another, or from country to country.

Efforts are under way from IITA, the Ministry of Agriculture, Food Security and Cooperatives (MAFSC), and the United Nations Food and Agriculture Organization (FAO) to mobilize funds to use biocontrol agents to contain the pest before it gets out of hand. This involves introducing its natural enemies, such as parasitoids--extremely tiny insects that lay their eggs inside the papaya mealybug. As the eggs hatch, tiny worm-like "larvae" emerge which then eat the mealybug from the inside out!

Mr Elibariki Nsami from the National Biological Control Programme of MSFSC said that biocontrol is an effective way to manage the menace as most pesticides were not effective since mealybug are coated with a protective wax. "The biocontrol mechanisms are safe as they are very specific and attack only the papaya mealybug. They are also cheap, cost effective, and safe for the environment."

It will also be important to set up a surveillance system to track the spread of the pest in the country and the wider region and to create awareness among the farmers and general public on how to control it.

Private sector in Japan to partner with IITA's Business Incubation Platform

Dr Nteranya Sanginga was in Japan, 6-10 April, where he met national and international partners and private sector representatives (see story on IITA Bulletin 2271). The photo shows Dr Sanginga in the meeting with private sector representatives. The Japanese National Television (NHK) was there to cover the event and also interview Dr Sanginga.

Stakeholders come together in Burkina Faso to look at biocontrol solution for aflatoxin

IITA with partners United States Department of Agriculture (USDA) and Institute for Agricultural and Environmental Research (INERA) in Burkina Faso is convening a stakeholders' conference aimed at increasing awareness of the hazards of aflatoxins, understanding the peculiarities of aflatoxin contamination in local farming areas, and promoting biocontrol mechanisms for stemming its spread in susceptible crops throughout Africa.

The stakeholders' meeting is taking place 23–24 April at the Splendid Hotel, Ouagadougou, Burkina Faso. Participants include producers, scientists, and private-public sector partners working directly with the aflasafe project in reaching farmers in the region and seed companies, CNRST, USDA-FAS, Nestle, and partner universities.

Key stakeholders representing various partner institutions during the opening program.

Aflatoxins are naturally occurring poisons produced by fungi known as *Aspergillus flavus* and others which contaminate the soil and crops (especially maize and groundnut). This contamination has debilitating effects on human health, lowers production of livestock and agriculture, and severely restricts trade opportunities for most farmers in sub-Saharan Africa. Specific interventions in the form of biocontrol mechanisms can, however, be employed in controlling and preventing aflatoxin contamination. This approach significantly improves the security and quality of agricultural produce and increases trade opportunities for stakeholders all along the value chain.

Dr Ranajit Bandyopadhyay, IITA Pathologist (middle row, with laptop), gives an update on the aflasafe project, the factory in IITA Ibadan that produces the biocontrol product, and the market models being used in Nigeria, Kenya, and Senegal to promote access to aflasafe.

IITA has adapted a biocontrol approach for Africa that changes the composition of fungal communities by letting local strains of nontoxic *A. flavus* (atoxigenic strains) become established in the crop environment in place of strains that produce large amounts of aflatoxin. A biocontrol product, called aflasafe BF01, for Burkina Faso was developed by IITA and partners to reduce the rate of contamination in crops and subsequent risks.

aflasafe BF01 is a natural, simple, safe, and cost-effective product that uses native nontoxic strains to replace aflatoxin-producing fungi. Similar products are being developed or used in more than 10 other African countries. Trials of BF01 have shown a remarkable reduction in aflatoxin contamination in maize (85%) and groundnut (94%). These results have encouraged IITA and its partners to explore the opportunities for escalating the adoption of aflasafe as an effective tool in preventing the spread of aflatoxins in Burkina Faso in particular and sub-Saharan Africa in general. This can be achieved by educating stakeholders about the dangers of aflatoxins and the efficacy of aflasafe.

IITA Management cites SARD-SC for impressive implementation

The IITA Management has commended the SARD-SC project, funded by the African Development Bank (AfDB), for its highly satisfactory implementation and the meaningful impact the commodity value chains are making in the lives of the beneficiaries. Director General Nteranya Sanginga led the team comprising Mr Kwame Akuffo-Akoto, Deputy Director General, Corporate Services; Dr Ylva Hillbur, DDG, Research for Development; and Mr Omoshalewa Sholola, Director of Finance, during the recent internal evaluation conducted 21 April.

DG Nteranya Sanginga (middle) driving home a point during the internal project evaluation. Others in photo are (from left) Omoshalewa Sholola, Finance Director, and Ylva Hillbur, DDG, Research for Development.

Dr Sanginga said he was delighted that the project was on track, and praised the achievements recorded so far since its inception in 2012. "I am quite impressed by what you have achieved so far in terms of new varieties, technology dissemination, and value addition to commodities and how they are changing lives, generating income and employment for the people."

The DG said the evaluation was conducted to give an update of the project's progress in the areas of technology dissemination in preparation for the Mid-Term Review (MTR), and its financial standing, and also to discuss possible solutions to any implementation challenges. "The SARD-SC project is very important, not because it has a huge budget but in terms of the impact it is designed to have on the productivity of and income from the value chains of the commodities you work with and the lives of the people. This is a project which allows us to assess the impact of some of our mandate crops – cassava, rice, maize, and wheat. It is one project that helps to maintain strong IITA relationships with the AfDB."

The evaluation started with Dr Chrys Akem, Project Coordinator, presenting an overview of the project activities and achievements on the value chains for the four mandate crops. He went on to highlight their impact on the livelihoods of many in the project target countries. His presentation also highlighted new varietal development of the target commodities and their dissemination to farmers and farmers' groups. He also spoke of the project's distribution of better quality cassava stems to farmers, improvements in the mechanization of production systems for all the commodities, and infrastructural development with the building of cassava processing centers in DR Congo, Tanzania, Zambia, and Sierra Leone. The establishment of these processing centers had led to new product development (confectionery with cassava flour) hitherto unknown in some of these countries. Consequently, it had fostered a strong sense of community engagement, especially the women. Included in his presentation was an update on the procurement and financial status of the project.

Dr Akem explained that the project activities had been aligned with IITA's refreshed strategy in the areas of increased food security and availability, increased profitability of food products, and sustainability of natural resource management.

It was not all rosy for the project, as he revealed some of the challenges in the areas of procurement and financial disbursement. He also pointed out some of the opportunities going forward as the project takes on the mid-term review.

The DG urged the project team to ensure that they used the forthcoming MTR as an opportunity to record their recommendations in the Bank's final documents. Other members of the Management team also provided comments and asked for clarification from the Project Coordinator. Mr Sholola commended the team for effective financial management and control. Mr Akuffo-Akoto advised the team to ensure the sustainability of the structures built in the project areas, and Dr Hillbur encouraged them to continue to have strong linkages with other institutional projects.

IITA to host AWARD Women's Leadership Program in June 2015

IITA is collaborating with African Women in Agricultural Research and Development (AWARD) in hosting the AWARD Women's Leadership and Management course to be held in IITA, Ibadan, Nigeria in June.

IITA warmly invites participants from partner organizations, colleagues, and other interested parties. Reservation deadline is 5 June 2015. Click http://bit.ly/1Cd7lz8 to view details on how to apply.

AWARD
African Women in Agricultural Research and Development

Events

Aflatoxin Awareness and Aflasafe Stakeholder Consultative Workshop, Splendid Hotel, Ouagadougou, Burkina Faso, 23 –24 April

Aflatoxin Awareness and Aflasafe Stakeholder Consultative Workshop, Radisson Blu Hotel, Lusaka, Zambia, 28 April

African Cassava Agronomy Initiative (ACAI) Stakeholder Convening and Proposal Writing Meeting, Ibadan, Nigeria, 28 April – 1 May

2015 Annual Review and Work Planning Meeting, IITA, Ibadan, 29 –30 April

IITA Board Meeting, Livingstone, Zambia, 4–8 May

Welcome, new staff!

Brita Dahl Jensen has joined IITA in Arusha, Tanzania as Project Leader and Senior Scientist on the project 'Improvement of banana for smallholder farmers in the Great Lakes Region of Africa'.

Brita is an agronomist with a PhD in plant pathology, obtained at The Royal Veterinary and Agricultural University in Copenhagen, Denmark (now part of University of Copenhagen (1997). She has more than 20 years of international work experience within the field of plant genetic resources, breeding, plant pathology and crop protection of vegetables, roots and tubers and cereals, and several years of experience from developing countries in Africa, Asia, and South America, embracing activities from research to product development with a strong managerial and partnership building component. She started her work career as a product manager and later researcher in the Danish private vegetable seed company L. Dæhnfeldt A/S, in Odense, Denmark (1989-1998). Later, she joined The Royal Veterinary and Agricultural University in Copenhagen/ University of Copenhagen as an assistant/ associate professor (1998-2011). More recently, she has been working as a researcher (pathologist) at Aarhus University, Denmark, and as a consultant (2011-2014).

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Regina Kapinga has assumed duty as the Head of Advocacy and Resource Mobilization based in IITA-Tanzania, Dar es Salaam, Tanzania. Regina, a Tanzanian, holds a PhD in Agronomy (major – adaptive breeding and crop management, 1994) and an MSc in Crop Science (1988) from the University of Ibadan, Nigeria. She obtained her BSc (major in Botany and Chemistry, 1984) at the University of Dar es Salaam, Tanzania.

Previously, she was the Senior Program Officer (2012–2015) and Program Officer (2009–2012) with the Bill & Melinda Gates Foundation, Seattle, Washington, United States. She held the post of Sweet Potato Breeder for sub-Saharan Africa and VITAA Partnership Program Coordinator (2001–2009) at the International Potato Center (CIP) – sub-Saharan Africa region in Kampala, Uganda. She had served as the Director of Research Coordination and Promotion at the Tanzania Commission for Science and Technology (COSTECH, 2000-2001), and Root Crops Research Scientist and National Coordinator for Root and Tuber Crops Improvement Program (1984-2000) at the Ministry of Agriculture, Food Security and Cooperatives, Mwanza, Tanzania.

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Jonathan Mutie Matheka has assumed duty at IITA-Nairobi, Nairobi, Kenya, as Postdoctoral Fellow – Enset Transformation. Jonathan is from Kenya. He obtained his BSc in Biochemistry (2003) and MSc in Biochemistry (2007) from Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya. He holds a PhD in Plant Biotechnology from Kenyatta University (KU), Kenya (2014).

Prior to this appointment, he worked as a lecturer at the University of Eldoret (2014–2015) and a Consultant at KU on tomato genetic engineering, and had trained students (2013–2015). He was also a Research Assistant with JKUAT (2012–2013); and Research Assistant at KU (2007–2009).

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Chinyere Obilo, a Nigerian, has joined the IITA-Ibadan team as Project Administration Specialist. Chichi holds a BSc degree in Computer Science with Economics from the Obafemi Awolowo University, Ile Ife, Osun State (2000) and an MSc degree in Enterprise System Implementation from Cranfield University, United Kingdom (2007).

Before this appointment, she was the Head of Enterprise Project and Change Management Office (EPMO) at Diamond Bank Plc (2013–2015). She worked with the team lead process and projects improvement – IT Business Improvement Department at First Bank of Nigeria Plc (2009–2013); as Project Manager with West Midlands Nigeria Limited; Business Analyst for Project Team at Volkswagen Group UK Limited; Business Analyst for Value Engineering UK Team, and System Analyst for Simulation Support Team.

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Ana Luísa Oliveira, a Portuguese, has joined IITA-Nairobi, Kenya, as Postdoctoral Fellow – Crop Genetics and Molecular Breeding. She holds a PhD in Technologic, Molecular and Comparative Genetics (2013) from CGB/IBB, Universidade de Trás-os-Montes e Alto Douro, Portugal. She obtained her MSc in Crop Genetics and Breeding (2008) from China Agricultural University, Beijing, China; Licentiate in Agronomic Engineering (2004) from Universidade de Lisboa, Lisbon, Portugal and a BSc (Hons) in Bioscience Technical Engineering from Escola Superior Agrária de Beja, Instituto Politécnico de Beja, Beha, Portugal (1999).

Prior to this appointment, she was a Postdoctoral Fellow at the Department of Genetics and Biotechnology, Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal.

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Got a story to share? Please email it with photos and captions every Wednesday to Andrea Gros (a.gros@cgiar.org), Katherine Lopez (k.lopez@cgiar.org), Jeffrey T. Oliver (j.oliver@cgiar.org), Catherine Njuguna (c.njuguna@cgiar.org), or Adaobi Umeokoro (a.umeokoro@cgiar.org).