

# Next Einstein Forum awards high impact innovations

On the last day of the Next Einstein Forum (NEF) Global Gathering 2018 in Kigali the focus shifted to "Breakthroughs from across the world," looking first at how indigenous crops on the continent could be harnessed to meet the challenge of climate change and food scarcity.



NEF closing ceremony. Image supplied.

Dr Sayed Azam-Ali, the chief executive and founder of Crops for the Future, explained the necessity for science and technology to be used to access and retain the knowledge of "super foods" naturally found in Africa by using climate solutions to translate that knowledge into contemporary practices.

Crops for the Future has designed biotechnology applications for the genetic improvement of underutilised crops, as well as a database capturing crops and agricultural methods of remote rural farmers that often only exists orally.

The company then applies this knowledge to grow the crops industrially and modify them into consumer products.

## First database of underutilised crops

"When an African farmer dies it said that an entire library dies with her," Ali said as he introduced his company's research into the genetic mapping and archiving of crops such as the Bambara groundnut – a drought-resistant plant with antioxidant properties originating in West Africa, with a nutritional value higher than that of fresh cow's milk and soybeans.

"There are four crops that Africa needs to survive in the future and unfortunately those plants are not found on the continent. What we have done is developed the first database of underutilised crops. We can turn this pyramid around and put these indigenous crops back on top of the pyramid."

In the discussion "Feeding the World" director at the World Bank for Food and Agriculture, Dr Simeon Ehui warned that "yield decline of cereal crops in Africa could reach about 27 percent to as much as 50 percent due to climate change".

"We need to do much more. Climate change does not have any borders," Ehui warned. The response from NEF fellow and biotech specialist Dr Sanushka Naidoo was a call for more coordinated research into genetic modification to improve crops and yields.

## **The skill to master gene modification**

"We can select drought-resistant varieties using genetic markers. We can look at the genome specifics. We are also looking at how to use gene editing to look at the susceptibility of certain plants," said Dr Naidoo, whose research at the University of Pretoria focuses on mechanisms to produce long-lasting resistance to pests and pathogens in certain crops.

"Do we have the skill to master gene modification? If we don't we are doomed," concluded Dr Ousmane Badiane, Africa director at the International Food Policy Research Institute.

On diseases, the NEF audience heard of Professor Chamindie Punyadeera's use of saliva samples, rather than blood or other invasive procedures, to detect oropharyngeal cancers, the sixth most common cancer in the world.

"Give it another five years and you'll see doctors and dentists using these techniques. This should increase the chances of opportunistic testing," Punyadeera said, adding that detection of HPV virus, a prevalent and easily contracted sexually transmitted virus that can lead to cancer, could be decreased by using saliva detection.

The cost of saliva testing kits was currently at around \$40 per kit, but that was coming down as its application became widespread, Punyadeera said.

## **Changing the way we learn**

The agenda of the forum then switched to the intersection of science and culture and how scientific endeavour could be enriched by paying attention to the processes and systems by which knowledge is acquired and communicated.

Ghanaian health policy expert and NEF fellow Dr Aku Kwamie captured the thrust of the "Changing the way we learn" topic, arguing for a fluid approach to science curriculums that focussed on multiple interventions in the teaching sector, and included the family, government and the individual motivation of teachers and their students.

"We need to re-respect the teaching profession," Kwamie said.

"We need to develop reflexive thinking in our teachers and students. This takes a collaborative effort of government, teachers and every stakeholder in this sector. We must respect our teachers and remember they have dreams, aspirations and families."

Professor at Carnegie Mellon University and president-elect of the Institute of Electrical and Electronic Engineering Jose Moura said that teachers needed to instil a "fearless feeling that failing is not an issue".

"We need to instil in them the audacity of failure, of trial and error," Moura said, adding that in the era of big data and the growing ability to capture large amounts of information, the focus needed to be on building structures to nurture scientists that can interpret and apply the data.

Senegal's Minister of Higher Education and Research Mary Teuw Niane titillated the audience when he suggested that witchdoctors used binary mathematics to make their predictions, before turning to the serious issue of developing indigenous knowledge systems and languages to teach the science and Stem subjects at an early age.

## **Manifesto for smart cities**

"We must see cities as living systems," declared Professor Eliane Ubalijoro of McGill University at the panel discussion on how urban planning, technology and scientific research could be combined to create smart and sustainable cities.

According to World Bank data no country has ever attained middle-income status without urban population growth. Africa's urban population is currently estimated at over half a billion, matching growth rates seen in Asia. Urban growth, however, is not always painless for policymakers and the general public.

Jean-Philbert Nsengimana, special advisor to the executive director at Smart Africa, said the goal was to build cities where "citizens, leaders and policymakers use data to make cities safe, efficient, livable and sustainable".

Professor Hamidou Tembine, a NEF fellow, is using game theory – the study of mathematical models of conflict and cooperation between intelligent rational decision-makers - to further the pursuit of smarter cities.

## **New model for a healthy Africa**

The final session of the Forum, titled "The Future of Health", explored the barriers to wide deployment of personalised health in Africa, zooming in on practical and policy solutions that will deliver flexible and affordable health solutions.

The Babyl Rwanda smartphone application, an artificial intelligence-enabled platform that combines mobile technology and the clinical expertise of real-life doctors to widen access to healthcare, stole the show as an example of the dial-a-doctor ethos at the core of precision medicine.

The precision medicine model proposes customised healthcare, with medical decisions, treatments, practices, or products being tailored to individual patients, and has been championed by NEF as a means to tackle health deficiencies on the continent.

Chief executive of Babyl Tracey McNeil described the application as "community based health workers with a doctors brain," explaining how 850,000 Rwandan were already using the app which allows them to book appointments, receive prescriptions as well have real-time access to their medical history.

"Having a doctor in your pocket is helping us to get to the bottom of the pyramid," McNeil said.

"You cannot create a proper health system without the three P's: personalised, predictive and preventative medicine," Dr. Agnes Binagwaho, vice chancellor at the University of Global Health Equity.

## **High impact innovations win big**

The NEF Global Gathering 2018 closed with the final pitches for the NEF Challenge Innovation to Implementation (Ci2i) in Deeptech, climate-smart and personalised health innovations, each finalist vying for the \$25,000 prize.

Malawi's Rachel Sibande's "Light from Maize" won in the climate category for her idea of using maize cobs to generate electricity. Dr. Conrad Tankou won in the personalised health field for the invention of a digital microscope that connects a smartphone to scan for cervical and breast cancer remotely, uploading the data on to the cloud for doctors kilometres away for analysis. Professor Abdoulaye Banire Diallo's precision genome analysis project won in the deeptech category.

## **2020 in Nairobi**

"We raised the bar a little bit higher with this edition. Nairobi is going to be a higher standard of excellence" said NEF founder and chairman Thierry Zomahoun while announcing plans to start a \$1m fund to award scientific breakthroughs on the continent under the auspices of the Forum and its partners.

"This was an opportunity for our leaders to show high-level commitment to science," said Rwandan minister of education Eugene Mutimura at the closing ceremony.

The 2020 Next Einstein Forum will be held in Nairobi, Kenya.

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