Enhancing Africa's Nutrition Resilience through Artificial Intelligence

Thought Leadership Event

7 September 2017
Abidjan, Côte d'Ivoire

Overview

Malnutrition is a major challenge in Africa. The recent famine has focused attention on the need for prediction and prevention of nutrition crises in Africa. Scientists can use recent advances in artificial intelligence (AI) and a combination of traditional and new data sources to generate real-time insights into and dynamics of nutrition and food security to help predict and prevent future emergencies.

This was the objective of a high-level meeting co-convened by the International Center for Tropical Agriculture (CIAT) and the African Development Bank (AfDB), in collaboration with Big Win Philanthropy, Facebook, Dalberg Data Insights, and the Action Against Hunger's Modelling Early Risk Indicators to Anticipate Malnutrition (MERIAM) Project during the 2017 Africa Green Revolution Forum (AGRF) in Abidjan, Côte d'Ivoire.

The event was designed to spark conversations among the delegates – who represented diverse food and nutrition security actors as well as members of the artificial intelligence fraternity – on how to develop, validate, and deploy a Nutrition Early Warning System (NEWS) in Africa. The session, which was addressed by nutrition, food security, artificial intelligence, and data experts, was attended by more than 100 delegates who provided inputs on the development of NEWS in Africa.

Speakers at the event included Dr. Debisi Araba, CIAT's regional director for Africa; Dr. Jennifer Blanke, vice president for Agriculture, Human & Social Development, AfDB; Allison Greenberg, Action Against Hunger MERIAM Project; Prof. Ruth Oniang'o, executive director, Rural Outreach Africa, and African Food Prize 2017 Laureate; Dr. Moustapha Cisse, research scientist, Facebook Artificial Intelligence Research; and Rositsa Zaimova, associate partner at Dalberg Data Insights. Dr. Ed Rege, founder and CEO, PICO-Eastern Africa, facilitated the event.

The event was sponsored through donations and kind contributions from the African Development Bank and Big Win Philanthropy.

Setting the scene

Dr. Jennifer Blanke, in her keynote address, highlighted the bank's renewed focus on addressing nutrition to improve gray matter infrastructure and the bank's response to the current food crisis under the Say-no-to-Famine framework. She hailed the development of early warning systems to enhance nutrition resilience in Africa, citing the recent devastating effects of floods in Sierra Leone that have implications for health and nutrition, and the impact of drought on micronutrient-rich and animal-based foods. Dr. Blanke stressed that a new paradigm shift to strengthen NEWS for food and nutrition security is urgently required, and pledged close collaboration between AfDB and CIAT in this effort.

Highlighting the work of the MERIAM Project, Allison Greenberg articulated the complexity of nutrition and underscored the need to understand the root cause of malnutrition, which is not just the lack of food. Malnutrition has many multi-sectoral causes, which are difficult to generalize and often change in different contexts and settings. She noted that many existing early warning systems are not always effective for nutrition early warning as they report nutrition crises at their peak rather than before their onset, thereby making a case for NEWS. Clearly, many efforts focus only on food security early warning systems, which capture only half the picture. Greenberg emphasized the need to focus not only on strengthening and using information from existing systems but also on pulling in complementary data that can provide the big picture.

Panel conversation

A panel discussion was designed as an interactive session with the facilitator asking questions of the panelists, and engaging in follow-ups and probes. Some of the questions posed to panelists follow:

- What is the economic case for investing in nutrition early warning?

- What is AI and what is its role in nutrition early warning?

- What are the data needs required by NEWS versus the current data ecosystem in Africa?

- How will a more accurate, precise, and focused prediction change the way leaders respond to nutrition crises?

- What institutional structure is needed to address the current nutrition status in Africa?

The panelist responses are summarized below:

Prof. Ruth Oniang'o urged nutrition, data, and AI experts to simplify the information they communicate to make it more useful to decision makers and individuals at the household level. Policymakers often do not understand the data provided sufficiently to take timely action. She also called for more pragmatic

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approaches to solving food- and nutrition-related challenges. In her view, although the use of AI will provide data for more accurate predictions and forecasts of upcoming nutrition crises, much of the necessary action will need to be implemented by the continent's young educated population that is able to make full use of technology.

Dr. Moustapha Cisse advocated for the role of AI in NEWS as it can build intelligent systems that make sense of data and draw otherwise hidden insights by analyzing the data in a way that human brains cannot. Generating good-quality data able to predict nutrition crises will need to go hand in hand with actionable insights – building not only intelligent systems that will tell what is going to happen but also options for proactive actions. However, Africa needs to build its capacity to manipulate and interpret data as AI has the potential to create a paradigm shift in this area.

According to **Rositsa Zaimova**, Dalberg Data Insights (DDI) uses both traditional and non-traditional data sources on various agricultural, food security, and nutrition indicators to pick up trends for food security. Currently, scientists rely heavily on survey data usually referred to as mainstream data. However, DDI has shown that non-traditional data such as satellite data and mobile phone communications can generate good-quality data to enable the prediction of a food crisis and plausibly a nutrition crisis. Determining data needs vis-à-vis current data available is also crucial. The use of these two types of data will be critical in developing NEWS.

Audience engagement

Sir Gordon Conway, a member of the *Malabo-Montpellier Panel* and professor of international development at Imperial College London, said:

"Why has [malnutrition in Rwanda] gone down? Because cross-ministerial and government groups meet on a regular basis and are responsible for the problem. … We need to get these modeling efforts to be feeding into cross-ministerial committees in a way that they can understand."

Through the Menti® platform (www.menti.com | code 62 55 40), an online audience participation/ feedback internet portal, delegates submitted questions and comments to the session. Below is a thematic synthesis of the comments from the delegates on the development, validation, and deployment of NEWS. More detailed comments are contained in Annex 1.

1. **Policymakers need to own the NEWS agenda**

   There is a need for the NEWS project to engage in policy advocacy and awareness creation to build support and overcome barriers at the policymaker level. Delegates emphasized the need for more accountability and proactive action on future crises, unlike what is evident on the current crises that remain largely ignored. There is a need to create more accountability among decision makers to deploy resources in advance of a crisis.

   The audience urged the creation of awareness on what AI is and its potential to prevent nutrition crises in Africa. Nutrition is an economic, socio-cultural, and political issue that needs to be examined as such by policymakers and those supporting them. To augment the uptake of AI, engagement with decision owners at the regional, national, and up to the household level was urged.

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2. NEWS will need reliable data of good quality

Concerns were raised on the availability of good-quality and reliable data. For NEWS to be effective, there is a need for real-time reliable data collection, efficiency in analysis, and dissemination that would allow for timely early warning. It was also pointed out that broad data variations are evident between international and national sources, and this should be addressed. It is necessary to think through how the use of AI can affect the work of smallholder farmers, directly benefit those affected by malnutrition, and how these data will be disseminated for action to be taken. There is a need to effectively package data and models on food security and nutrition based on end-user data consumption habits: from policymakers all the way to end beneficiaries. Existing data and models are too complex for effective action.

3. NEWS calls for collaboration

The silo approach to tackling food security, agriculture, and nutrition-related problems is to blame for the lack of sustainable solutions: each category of experts lacks visibility of what the others are working on. This fragmentation has led to limited actions and impacts. Other concerns related to overall nutrition and not necessarily to NEWS were raised, pointing to the need for the NEWS project to work in collaboration and to find synergy with other stakeholders working on nutrition-related projects. These concerns include whether the new approach of NEWS fits into approaches already in use in the project countries and the complementarity between NEWS and climate-smart agriculture initiatives to address food and nutrition security.

Conclusions

Building political will for decision makers to use early warning systems to prevent a crisis from happening and for at-risk communities to obtain the information they need to build resilience is crucial. In addition, involving the different stakeholders across nutrition-related sectors in the research on and development, validation, and deployment of NEWS is key. This will pool both financial and technical resources from a diverse partnership while assisting in the validation of the models and building a sense of ownership, making it easier for decision makers to incorporate NEWS into existing policies and programs.

In summary, the key takeaways from the session were the following:

- Africa needs a data revolution powered by its young people to drive a new green revolution for food and nutrition security for all.

- Smallholder farmers should not be left behind.

- There is a crucial need for more sensitive nutrition early warning.

- There is a need for a human-centered design that decision makers find user-friendly.

- Artificial intelligence can play a role in generating insights beyond what humans are able to.

- The importance of good, reliable data, traditional and non-traditional.

- The importance of a good partnership for implementation.

Annex 1: Detailed Delegates' Inputs into the News Conversation as Captured by Menti®

The session captured detailed inputs from the delegates via Menti® and these are reproduced verbatim below by theme. These themes will be useful in developing the outline of the second NEWS white paper on the design considerations of NEWS. The highlighted questions and comments stand out in this regard, and will form part of the white paper outline.

Need for policy advocacy and awareness creation to spur action

- If no action is being taken on current nutrition crises, what makes you think there will be action on future crises?

- We need to address the issue of political will from African governments to ensure they are enrolled and are part of the solutions.

- How will you convince politicians to deploy resources in advance of nutrition crises? Early warning does not translate into early action.

- In addressing nutrition, we need to understand that nutrition is not just an economic issue; it is also a social, cultural, and political issue.

- Most prevalent malnutrition is caused by a lack in productive/dietary diversity. What role do policies have in promoting diversification?

- Early warning systems are at the level of policymakers yet the people most affected by malnutrition are often too distant from the action.

- What does artificial intelligence mean and what evidence is there on the ground? Why is it artificial?

- I am skeptical of the technology fix. When all you have is a hammer, every problem looks like a nail.

- Also, we really cannot predict the future. We can only explore possible future scenarios, anticipate, and proactively prevent malnutrition.

- We live with hunger to really understand what NEWS is all about.

- The professor [Conway] has hit the nail on the head. We need less grammar if we are to make headway

Food and nutrition security linkages

- Is food insecurity an early warning for nutrition insecurity? If so, how are you using existing tools on food security?

- To address food and nutrition security, we must ensure that climate-smart agriculture is taken into account to the fullest.

- Quality and quantity of food are the two sides of food security. How does the model proposed by MERIAM work?

- How will NEWS integrate climate changes in terms of impact on yields?

- Almost no discussion has been held on irrigation to enable year-round food production and income and food security as a major part of the solution for Africa.

NEWS will need reliable data of good quality

- At the core of resilience decisions, you need real-time reliable weather data connected to proper analysis and dissemination mechanisms.

- What type of data will be needed to train effective AI systems for effective nutrition surveillance?

- Speed in collecting, analyzing, and disseminating the data is key for early warning. What are the innovations for allowing timely warning?

- Data collection and quality of data in Africa; what is the availability of reliable baseline information?

- Finding reliable data (often conflicting sources, international vs national). There is often a broad variation.

- Availability of reliable data.

- The concern is that the way is too complex and long winded to provide evidence that we are already aware of. We need action.

- Data quality issues: Who is the target audience of NEWS? Can it make heads and tails of this complex work? Intra-household malnutrition?

Simplifying and adapting AI and big data into existing contexts

- Although AI can have myriad applications in agriculture, what can be the consequences for smallholder farmers?

- Having data is one thing. But how will these data get to the people on the ground for implementation?

- The biggest challenge, which is actually an opportunity, is to support and expand multi-purpose data systems and ensure open access.

- Even though models are great avenues for expressing complex matters in a palatable way, they are full of all manner of assumptions.

- I think Dr. Cisse captured one of the weaknesses of models. They hardly capture weak signals and emerging trends that aren't very visible yet.

- The majority of the people affected by malnutrition are poor and not very sophisticated. How can we make data and AI accessible to them?

- Can you resume your new approach for early systems and does it go along with those already deployed in the countries you're working in?

- What is the potential of the MERIAM in providing data and information that help predict malnutrition and help mitigate against it?

Other considerations: synergy and collaboration across systems

- Do you see the "school farm" model as a cost-effective and sustainable solution to school meals?

- Has anyone done an analysis of any correlations between season of birth (e.g., at or between rainfed harvests) and stunting?

- How do you account for household inequities in nutrition?

- The production of nutrient-enhanced crops is key to reducing malnutrition and promoting good health.

- Cornell University carried out a study in Zambia that found that families irrigating their land were 50% less likely to have stunted children.

Annex 2: Confirmed Delegates' List and Attendees

	Name	Surname	Position	Organization
1	Tariq	Yusef	Associate	ABG
2	Allison	Greenberg	Manager	Action Against Hunger
3	Sindha	Gramoney	Trade Manager	Africa Business Group
4	Ernest	Fausther	Senior Monitoring and Evaluation Manager	Africa Business Group
5	Christine Ndiaye	Sene	Program Manager	Africa Lead
6	Alex	Ariho	CEO	African Agribusiness Incubators Network
7	Jennifer	Blanke	Vice President	African Development Bank
8	Charly	Facheux Tchoufong	Vice President	African Wildlife Foundation
9	Andrew	Burns	Regional Sales Manager	AGCO
10	Michel	Coral		AGCO
11	Shlobi	Malueke	Manager, Marketing and Communications, Africa	AGCO
12	Nuradin	Osman	Vice President and General Manager, Africa	AGCO South Africa (PTY) Ltd.
13	Espoir	Olodo	Agriculture Expert	Agence Ecofin
14	Rebbie	Harawa	Interim Head, Farmer Solutions Program	AGRA
15	Mulemia	Maina	Deputy Director	Agri Experience Limited
16	Millicent	Omukaga	Head of Operations	Agricultural Finance Corporation
17	John	Ng'ang'a Mungai	Planning and Resource Mobilization Officer	Agricultural Finance Corporation-Kenya
18	Leah	Ndungu	Regional Manager	Australian Centre for International Agricultural Research
19	Edgar	Jone	Agribusiness Coordinator	Beira Agriculture Growth Corridor
20	Belinda	Richardson	Fellow	Bill & Melinda Gates Foundation
21	Victor	Ajieroh	Senior Program Officer, Nutrition	Bill & Melinda Gates Foundation (BMGF)
22	Dennis	Rangi	Director General, Development	CAB International (CABI)
23	Jean-Marie	Delon	West Africa Sustainability Program Manager	Cargill West Africa
24	Oliver K.	Kirui	Senior Researcher	Center for Development Research (ZEF), University of Bonn
25	Justice A.	Tambo	Senior Researcher	Center for Development Research (ZEF), University of Bonn
26	Ayoola	Kassim	Reporter	Channels TV
27	Moses	Orim	Cameraman	Channels TV
28	Erik	Pederson	Director, Government Relations	Chicago Council
29	Ntiokam	Divine	Founder	Climate Smart Agriculture Youth Network
30	Folosho	Olaniyan		Contact Consulting Nigeria Ltd.
31	Edward	Mabaya	Senior Research Associate	Cornell University
32	Aliou	Boly	Program Director, Senegal	DAI, Inc./Africa Lead
33	Muguro	David	Group Secretary	Dajopen Waste Management (CBO)

	Name	Surname	Position	Organization
34	Rositsa	Zaimova	Associate	Dalberg Data Insights
35	Brian	Frimpong	Managing Partner	Databank
36	Ousseynou	Ngom	Consultant	Development Gateway
37	Mamadou	Makadji	Director General	Doun Kafa
38	Kyle	Newell	Director of Agriculture, Enterprise Growth Services	EY
39	Moustapha	Cisse	Researcher	Facebook
40	Nadia	Nsabimbona	Resource Mobilisation Officer	FAO
41	Nnaemeka	Ebechidi	CEO	FarmHarbor
42	Coulibaly	Maimouna	Director	FASO KABA
43	Femi	Oyeniyi	Chief Executive Officer	Femvest Ventures
44	Oluwabunmi	Ajilore	Foresight Advisor	GFAR (Global Forum on Agricultural Research and Innovation)
45	Caroline	Mutepfa	Technical Advisor	GIZ
46	Julius Singoma	Kagmba	Project Manager	Global Alliance for Livestock Veterinary Medicines (GALVmed)
47	Dioscore	Shikama	Founder and CEO	GO Ltd.
48	Alfred	Yeboah	Programs Manager	Grameen Foundation
49	Joost	van Odijk	Strategic Partnerships and Business Development	Grow Africa
50	Bruce	Scott	Senior Advisor	ICRAF
51	Bernadette	Mukonyora	Program Analyst East and Southern Africa	IFAD
52	J. Scott	Angle	President and CEO	IFDC
53	Gordon	Conway	Professor of International Development	Imperial College London
54	Some	Koussao	Plant Breeder	INERA
55	Dadie	Tayoraud	COO	Injaro Investments Ltd.
56	Rob	Nooter	Senior Development Officer	International Fertilizer Development Center
57	Katrin	Glatzel	Program Leader	International Food Policy Research Institute (IFPRI)
58	Andrew	Mude	Principal Scientist, Economist	International Livestock Research Institute
59	Barbara	Bamanya	Senior Monitoring and Evaluation Specialist	International Livestock Research Institute
60	Vivian	Atakos	Regional Communication Specialist	International Potato Center (CIP)
61	Adiel	Mbabu	Regional Director	International Potato Center
62	Hilda	Munyua	Project Manager	International Potato Center
63	Prashant	Dhote	Vice President Exports	Jain Irrigation Systems Ltd.
64	Naomi	Ndele	Head, SME and Agribusiness	KCB Bank Kenya
65	Martin	Fisher	CEO	KickStart-International
66	John	Kinaga	Director, Programs and Partnership	KickStart-International
67	Hugh	Scott		KPMG
68	Julio	Garrido-Mirapeix	Partner	KPMG
69	Amos	Rutherford	Chief Executive Officer	Legacy Crop Improvement Centre (LCIC)

	Name	Surname	Position	Organization
70	Christabell	Makokha	Country Director Zambia	Mercy Corps AgriFin Accelerate Program
71	Rotimi	Olawale	Global Convener	Nigeria Investment Cloud
72	Younes	Berrada		OCP Group
73	Thierry	Hot	Special Advisor to President	Office of the President, Burkina Faso
74	Olawumi Mayowa Ishola	Ogundele	CTO, Agroplexi	Onesimus Technologies
75	John	Magnay	Head of Agriculture	Opportunity International
76	Sanjay	Sethi	Director, Sustainability Projects	Phoenix Global DMCC
77	Michel	Lavollay	Founder	PPP Europe
78	Oluyemisi	Iranloye	CEO	Psaltry International Company
79	Ruth	Oniang'o	Executive Director	Rural Outreach Africa
80	Andre	de Jager		SNV
81	Katarina	Kahlmann	Regional Director	TechnoServe
82	Rafael	Flor	Director	The Rockefeller Foundation
83	Betty	Kibaara	Associate Director	The Rockefeller Foundation
84	Mark	Cackler	Manager, Agriculture and Food Security	The World Bank
85	Sarah	Simons	Senior Agriculture Specialist	The World Bank
86	Holger	Kray	Head, Africa Agriculture Policy Unit	The World Bank
87	Anu	Paasiaro	Partner	UCAN Partner
88	Dr. Rapheal	Adu-Gyamfi	Project Agronomist	UDS/AGRA Youth in Agriculture Project
89	David	Mueller	Programme Analyst	UNDP
90	Heike	Baumuller	Senior Researcher	University of Bonn
91	Sheryl	Hendriks	Director, Institute for Food and Well-being	University of Pretoria
92	Kwasi	Ampofo	Researcher	University of Queensland
93	Youssef	Essaoudi	Business Manager North and West Africa	UPL Limited
94	Edward Reuben	Githaiga Muito	Chief Executive Officer	Vision2030 Youth Entrepreneurs Associates
95	Beatrice	Ifie	Plant Breeder	WACCI
96	Eric	Danquah	Director	WACCI, University of Ghana
97	Jennie	Van der Mheen	Manager International Cooperation Africa	Wageningen University and Research
98	Scott	Wallace		Wallace Associates
99	Mawuli	Coffie	Team Leader	West Africa Food Markets Programme
100	Victor	Afari-Sefa	Regional Director, West and Central Africa (WCA) – Coastal and Humid Regions	World Vegetable Center
101	Caroline	de La Maisonneuve		
102	Julie	LeBlance		

The International Center for Tropical Agriculture (CIAT) – a CGIAR Research Center – develops technologies, innovative methods, and new knowledge that better enable farmers, especially smallholders, to make agriculture eco-efficient – that is, competitive and profitable as well as sustainable and resilient. Headquartered near Cali, Colombia, CIAT conducts research for development in tropical regions of Latin America, Africa, and Asia.

CIAT is proud to celebrate *50 years* of agricultural research and development impact

In 1967, the majority of poor and hungry people in the tropics were smallholder farmers. Increasing the productivity of their crops was, therefore, the critical entry point for CIAT's research. Since that time, we have been concerned with nearly every aspect of tropical agriculture: the crop varieties that farmers grow, the production systems they manage, the agricultural landscapes they inhabit, the markets in which they participate, and the policies that influence their options and decisions. Today, we also look forward at emerging challenges, with a renewed commitment to feed the planet and offer a better deal for both farmers and consumers.

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