

Center for Strategic and International Studies

TRANSCRIPT

Event

AI for Food Security Forum
Technical Demonstrations - CGIAR

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FEATURING

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Zane Swanson: All right. A very quick thank you to Rob, Latha, Ruben, Francisco, Kyriacos online. Bear with us for just one moment. Thank you for serving as our information ecologist, since we're talking about data ecosystems.

(Pause.)

OK. So we're nearing lunch, but before that we have our second demo of the day. And for this demo it's my pleasure to welcome Jawoo Koo, deputy director of Digital Transformation Accelerator at CGIAR. We're moving from data ecosystems to agricultural ecosystems. Here Jawoo will present his work and his team's work on developing AI-enabled phenotyping tools capable of accelerating crop-breeding processes for global agriculture.

Join me in welcoming Jawoo. Thank you. (Applause.)

Jawoo Koo: OK. So this photo might look like AI-generated – (laughter) – but it isn't. Actually, it is a real photo taken about four years ago.

So back in 2022, CGIAR started testing robot in the field in our breeding program, just like this one. However, most of those efforts have not matured or really reached the point of scaling and adoption for many reasons. Some are just too expensive and some are just too difficult to adapt to local conditions. Still, we learned a lot. We continue the work. And these efforts have led to rapid progress in AI power data analytics. So today I'd like to share a few examples of how CGIAR is using these AI-powered tools to accelerate our breeding program.

So breeding is a powerful tool given to the humanity, and it's at the core of CGIAR's work. So we are the world's largest publicly funded agricultural research organization, with about 8,000 scientists working in – working across 90 countries in the world, mostly in the developing world. Many of our scientists are working on crop breeding or animal and tree breeding, and sometimes different species with improving varieties and species – that's our core business – and running thousands of field trials every season to improve those varieties. A recent study shows that more than 60 percent of modern varieties in the developing countries stem from CGIAR and has some CGIAR ancestry. So chances are the food you will – you will have during the lunch break might already have some CGIAR innovation embedded in, so you're welcome. (Laughter.)

But breeding is really hard work. It takes more than 10 years to release a new variety into the market. And much of the time is spent on something called phenotyping, and that's what we are going to talk about today.

So phenotyping means measurement for breeding. And the way we measure today, even today in 2026, is still very manual. The main method still relies

on pen and paper, and the method is slow, and it can lead to inconsistency in research. Even for basic measurements like how many stems do you see in a single plant can lead to different result depending on who measures, how many times measured, and when it's measured. So this inconsistency can really affect many things in the breeding decisions.

And this is why we've been testing many different and complementary digital approaches in our research. For example, the middle picture here is showing mobile phone mounted on pushcart in the field that take a lot of pictures very quickly and consistently. And we also are increasingly using drones to capture even larger-scale data collection in the field, and this has been generating lots of new data we didn't have before. And these approaches have shown four to five times faster the phenotyping in the field.

In the next few slide, I'm going to show you how we are using AI to analyze this data and turn that into breeding trait that actually we need to use in breeding science.

OK. The first example shows how AI can lower the barriers to working with breeding data. BrAPI, it's called – it's short for Breeding API – is the standard way that breeding databases are connecting with each other and talk to each other. So this is designed for machine. By connecting large language model to this BrAPI, or the Breeding API, now researcher can ask questions and find data in just plain English.

So, in this example, our researcher is trying to connect to the cassava database. And once it's connected, then this researcher is using an LLM to find what he want to see. So the researcher is – in this case is asking LLM to show all the germplasm, all the seed, a cassava seed that start with zero, just in the code name zero. And then, from that list, the researcher can select one specific report and ask for more information – more detailed information for specific writing. All of this is showing that what used to require very technical knowledge, or where to go and how to find it, how to use the data, or, like, sometimes like SQL data query, the processes without – now can be done very easily with simple, simple – the conversation in natural language.

And the next example is about digital phenotyping using computer vision. So digital phenotyping generate a large number of image files. And we need AI to analyze them and, again, turn them into trade data that breeders need to use. This example shows how we are using a tool called the Roboflow to analyze those images data – image data we collected in the field.

The researchers start by browsing CGIAR's image catalog and select a subset of images. And some of these images are then manually annotated, and then AI automatically annotate the rest of the dataset. And the researcher will then provide feedback to AI – this is good, this is bad, and how they can

improve error. And then, after that, Roboflow learns what researcher want to see in the result and develop a new model that can analyze images and extract breeding data pretty much automatically, so without further annotation or training. And this is a big shift. Now where we are heading is enabling breeders to collect data and extract trait automatically on the spot in the field at scale.

And the next example shows the compute code notebook that we are using for breeding informatics. Crop breeding is basically the sequence of decisions about which parent to cross, which offspring to advance, and which lines to release. Informatics supported all these decisions, and what you see here is part of the pipeline that we are building.

The first part is quality assurance. The tool on the screen just show the – how we identify our layers and spot inconsistency that needs to be addressed.

The second example you are seeing here is how we predict trait – predict trait values using machine learning models. And then you can visualize them. You can interact with the tool so that you can – you can zoom into the exact trait that you want to target.

And the third part of the example is showing crop growth model. It simulate how a crop develop under different conditions without having to wait for another season, another train, another – the trial and data collection. You can actually start simulating how it might grow in the field.

And all of these runs on a cloud platform called Databricks, which enables researchers to share data and analyze together across all the – across all our breeding trials and locations around the world.

OK. So I started with this real photo, but this time, actually, it's moving, powered by AI. (Laughter.) So, again, four years ago, it was only an exciting pilot that we tried in the field. But over the past few years, however, we made real progress on how we collect the data and analyze at scale with the help of AI. The fully automated AI-powered phenotyping seems much closer to reality than ever before. That makes this time – this really a very exciting time to be working in this field and at CGIAR. Yeah. Thank you. (Applause.)

Mr. Swanson: Thank you, Jawoo. That was great.

We do have time for a couple questions. So, if you could raise your hand, we'll take one or two questions. It was great that we actually saw some code there. Not every AI forum or presentation actually shows you code, so excited to see that. Any questions? We have one over here. Emma will – oh, we have one in the back, Emma, and then we'll take David's question up front, back to

back. Thank you. And when you ask, please stand and introduce yourself. Thank you.

Audience Member: Hello. My name is Katrina. I work for the USDA, for the Foreign Agricultural Service. That was really neat. I enjoyed it. It was nice.

So a very simple question – not simple, but you get it. AI is only as strong as the ecosystem of data behind it. In an era of climate shocks and black swan agricultural events – we all know black swan means here, right? It means that an anomaly came out of nowhere once in a lifetime. It shouldn't have happened. It deviates quite a bit. How do we prevent models from becoming overconfident when the environment itself is changing faster than the data can keep up with?

Mr. Swanson: Great question. Thank you.

Over to David. And then over to you, Jawoo.

Audience Member: OK. So the CG systems haven't invented breeding, of course. So the universities were critically important from that, as was government, as was USDA with Katrina's. So we got Norin 10 from the Japanese in 1946, we brought it to Washington state, and then we expanded it through Ohio State and other land-grant universities. And then the CG have sort of taken over and monopolized that space. Now, with some of the advantages from AI my question would be, how is the CG using some of that resources to improve capacity in national breeding programs, which we can all admit have been absolutely decimated over the last 30 or 40 years?

Mr. Koo: OK. The first question about the black swan, the AI overconfident, actually one thing – one keyword I should have highlighted even more was the complementary nature of these new technologies. We are not trying to replace – I mean, there is a good reason the pen and paper survived decades of breeding research. It is repeatable. It keeps the track. And, yeah, it just has a manual advantage over other technology we have.

So we are not totally moving away and going only all in on new technologies, so it's really complementary. So we are finding the pain point of breeding process that can be accelerated by AI. So we wouldn't let – this is just too important data and decision to be made in our, you know, entire work. So, yeah, we wouldn't really let AI to make overconfident decision and go away with it. So, yeah, that's a really important question, and that's really in back of my mind.

David, so the capacity breeding – capacity building part, so when I said there are thousands of breeding trials going on, actually, these are mostly working in collaboration with local NARS partners and local institutions. It is not

entirely, solely led by CGIAR. So the capacity building is one of three main pillars of our research innovation strategy, and that's always there.

And the data we are developing, the platform I showed, is all geared toward open access and open data ecosystem. We do recognize there are sometimes sensitivity of sharing data across institution, across sectors. And we are trying to get away or find a way to turn – go around that by developing something of a federated data ecosystem so each institution, or be it public organization or private institutions, they can have their own instance of data platform and they can share only what's really necessary to share, and not even to the human. The AI can actually do the job for you, so that it can pull all the available data for improving data but nothing – improving the model, but not really sharing raw data.

So there are many innovations to work better, tying this partnership between – across sectors and countries, and not CGIAR. So, I mean, we are receiving these grateful resources not just for our own sake; this is for entire kind of crop breeding improvement for the global food security. So, yeah, we pretty much believe in this partnership.

Mr. Swanson: Thank you, Jawoo. With that, let's thank Jawoo one more time, and then you can find lunch outside. (Applause.)

Oh, Caitlin first.

Caitlin Welsh: Thanks to Rob for a fantastic panel, and thank you to your panelists. Thanks to Jawoo for a fantastic demonstration.

We're going to break for lunch right now, which we're serving in our reception area, and we will reconvene here at 1:45 p.m. sharp. So look forward to seeing you then.

(END.)