Topic:

Data for Policy: How AI and Advanced Technologies Can Strengthen Food Security in Sub–Saharan Africa

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Data for Policy: How AI and Advanced Technologies Can Strengthen Food Security in Sub-Saharan Africa

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EPISODE SUMMARY:

This episode examines how data systems and AI can transform food-security planning in Sub-Saharan Africa. The discussion highlights major data gaps such as outdated soil information, limited environmental monitoring, weak yield records, and shows how tools like IoT sensors, satellite data, and predictive analytics can enable more proactive, evidence-based agricultural policies. It also stresses the need for inclusive frameworks that connect farmers, researchers, private sector actors, and policymakers, ensuring smallholder farmers benefit from accessible, affordable technologies. Ultimately, the episode envisions a future where localized data, digital innovation, and strong governance shape a resilient, sustainable, and equitable agricultural ecosystem for the region.

[Dr Oluwanbepelumi Olanubi]

Hello everyone. Welcome to another insightful episode of the Kingsgate Brief. As you all know, this is the podcast series of the Kingsgate Advisors Institute and I come in every month with guests who are practitioners, experts, professionals and even cutting-edge leaders in their field to dis‐ cuss some of the burning and major issues affecting Africa and the global south countries, and today is nothing short of that, it's another insightful episode to discuss something very important to Africa and even to the countries in the global south in general.

As you know, my name is Dr. Oluwanbepelumi Olanubi. I serve as the Executive Director of the Institute and if you haven't already, at this point, I want to invite you to subscribe to our YouTube channel, follow our LinkedIn page, and our Instagram page, so that you can be the first to know when we record and upload another insightful episode of this brief. Check our website online to have a deeper view into those things that we've been doing, there you can get to know what we do within the Institute and see how you can be a part of the community. I'm sure there's something we have for you and there's something you can learn from us. So, to take the conversation further today we are talking about something that is very important. We're talking about data for policy, and how Artificial Intelligence (AI) and advanced technologies can strengthen food security in Sub-Saharan Africa?

To set the conversation and the tone, SSA faced one of the most pressing development challenges of our time, which is food security, a growing population, climate change, and resource constraints. Despite the central role of agriculture in most of these African countries, we've seen that there have been data gaps, insufficient systems, and fragmented policies that have continued to under‐ mine the productivity and even the resilience of the region. Advances in AI have also come to play a significant role in helping to solve this problem.

AI data analytics and data technology offer an unprecedented opportunity to strengthen evi‐ dence-based policy making in agriculture, from predictive yield models to IoT enabled sensors, and even to remote sensing data. These tools have become very useful and has been transforma‐ tional in how government researchers and even farmers anticipate and mitigate risks. This conver‐ sation is going to explore this and much more to see how AI systems can advance policy design, improve coordination and drive agricultural transformation across the region and beyond.

Why does this really matter? It matters because food security is not just an agricultural issue, but it is an economic, social, and governance issue, at the heart of Africa's development. Data-driven policy making can bridge the long-standing disconnect between research insights and field re‐ alities and even national strategies. However, the challenges remain weak data infrastructure, low digital literacy, inadequate governance structures, and limited collaboration between the public and private sectors. All this has continued to hinder progress by understanding how technology can build that bridge and can help us address these long-standing barriers becomes so important

and pertinent.

It's very crucial to achieve this inclusive sustainable food system across the region. To discuss this and more, I have a very brilliant guest, and you will take it by my words, a researcher, an engineer and also it's a privilege that he is a member of our board of directors. Today we have Dr Temitope Odedeyi.

Dr Temitope Odedeyi is a senior research fellow at the University College London, and is the leading voice in the intersection of engineering, digital technology and sustainable development. He holds a BSc in electrical and electronic engineering from Olabisi Onabanjo University in Nigeria and he held both his MSc and PhD from University College London. He is a recipient of the prestigious Nigerian Presidential Special Scholarship for Innovation and Development.

His research interest focuses on analysis and design of high-speed telecommunication devices and electronic instrumentation with applied interest in food quality prediction and precision in our culture. In 2023 he was awarded the Royal Academy of Engineering Research Fellowship where he leads a groundbreaking 5-year engineering for development project. This initiative is developing IoT-enabled technologies that support data-driven farming and improve cassava yields in sub-Saharan Africa, advancing food security and climate-smart agriculture. Dr Odedeyi's work blends between continent innovation with real-world impact, particularly in Global South where he is hoping to reshape the future of agricultural productivity through digital transformation and smart systems.

Hello Dr. and thank you for joining us today.

[Dr Temitope Odedeyi]
Thank you very much for having me, it's a privilege to be here indeed.

[Dr Oluwanbepelumi Olanubi]
All right that's so good. So, by the end of this conversation we would have a clear understanding of how data and AI technologies can shape smarter agriculture and food security policies. Also, you'd have a deeper insight into institutional quality and ethical considerations in implementing these technologies. You would also be exposed to evidence-based perspectives on how sub-Saharan Africa can build sustainably in a tech-enabled food system. And lastly, I believe that a vision for regional collaboration in leveraging data for inclusive agricultural transformation is one of those things that you will be taking note of today. So, it doesn't matter if you're a policy maker, if you're a researcher, if you're a data scientist, a development practitioner, an agricultural expert, or you're just a student, this is one conversation you want to spend some time to dive right into it.

We are so ready for you, and I'll say let's get started. By way of starting Dr., before we go fully into the conversation, I want you to give us a bit of a background on what you've done, what you've been working on, especially in terms of the agricultural technology domain. I know you've done a lot of work in that area; can you just take us into your world of that so that we can understand the picture of what you've been working on.

[Dr Temitope Odedeyi]
Thank you very much, and I think that's a very good place to start. So, my foray into agricultural technology or agri-food electronics as we term it technically, started around about 10 years ago. By then I was still an early PhD student, well it started actually with a competition, and the competition was set up by my university, the University College London, and the oldest agricultural research institute in the world, Rothamsted, they're kind of very close to London here.

It was a hackathon event to develop solutions for agriculture for Africa, and at the start of that competition really I didn't have much in my mind of exactly what I wanted to do, but the driving force was me being an electrical engineer. They were trying to synthesize or to develop solutions for agricultural technology, and I didn't have an idea but it would be like a crime for me not to be involved.

That was my first step, and thankfully the idea we came up with then, myself and a team of three other PhD students, won that competition. The idea then was how can we develop a low-cost handheld device to do crop quality measurements that's tailored to the particularly important African crop, which is cassava. And from that step we got not a lot of money then, it was £10,000 in grants, and that was the initial step that really set me up in that direction.

And we just wanted to continue to build momentum in that area, and the next major step we had was a £100,000 grant from the university, also to take the idea that we started with and to make it a bit more robust, to get it into prototype stage, into a proper device. Then, step by step we got also, I was involved in another big grant that was funded by the Horizon Europe framework. This was in a collaboration with 13 other institutions across Europe and Africa called NESLA.

That was a big step, because then, we started to look beyond the limited scope of what we can do with cassava. It has been my mandate crop for a few years, what can we do with cassava, to going to what can we do with different contexts of agriculture under what is called the One Health framework. Essentially, how does quality and safety in how we produce food, both crops and live - stock, affect human health. That kind of broadened my horizon significantly, and after that, as you mentioned earlier, I was privileged to have the fellowship, the Royal Academy of Engineering Re - search Fellowship under the Engineering for Development Research Framework, which enabled me now to push much more across the application of, or adaptation of technologies and development of new technologies targeting Sub-Saharan Africa agriculture. So that's kind of like a very high-level

summary of my journey so far.

[Dr Oluwanbepelumi Olanubi]

Interesting, what started with just what we can call a small competition has become a major re-search product that is being used across Africa. That is really beautiful. Now, to build on that, I just want to also ask you, across SSA now, agriculture has remained the backbone of many economies, yet food insecurity persists.

How can advanced data systems and AI help governments and institutions design smarter, evi-dence-based agricultural policies? What can we do?

[Dr Temitope Odedeyi]

Okay, that's a very interesting question. First of all, I have to kind of present a caveat. I'm going to be speaking mostly with the heart of an electronics engineer, or like an agri-food electronics en-gineer. I have some experience, or at least some knowledge of policy, how policies are crafted, but I'm not an expert there. So, if I step on a few policymaker toes, please bear with me. But I look at this question on four fronts, right?

I think many of us, even whether we have a policy background, engineering background, or we're just keen observers, we'll be able to identify these four points. The first one is that we have mostly a reactive approach to problem solving across many sectors, where it's particularly dire in agri-culture, rather than a proactive approach. Hence, our responses tend to be more reactive than proactive.

For instance, we have cases where, there's a drought, and then the agricultural production fails significantly in a particular year. And then we quickly start to move to how do we rescue the situ-ation? But robust data systems can actually enable a more proactive response approach, where we can predict that there's a high likelihood that we're going to have this kind of problem by this period in this year. Then we start to look at how can we develop a system to help us minimize the shocks and the effect on livelihoods, both for the farmers and of course also for the consumers.

That's a key area where that data can actually make a huge difference, where we become more proactive in our responses. Another area is where we can actually do more long-term planning, and more long-term structuring to support the agricultural system. For instance, I was reading a report and it says even up till date, a lot of the responses that we have to agricultural shortfalls and challenges tend to be more around subsidies, and the ripple effect of that is we end up creating more problems than we solve. For instance, we have like, say maize fails or rice production fails in a particular year because the rains didn't come on time, right?

And then we find a way to subsidize importation and all of those things. But we know down the line,

we have created a problem for local rice production because now the cost drops if the expecta‐ tion of the consumer is that. Ultimately, we have that cycle that keeps coming on.

We invest a lot of money in these short‐term solutions, which eventually lead to those long‐term robust systems. Data systems can come in that area, kind of very connected to the first point of how we can be more proactive and reactive. We can be more long‐term in our approach to plan‐ ning than short‐term.

When we have in place a strong data system, that enables us again to say, okay, what do we expect to see 10 years down the line or five years down the line? When we start to invest in agriculture, how do we build up to ensure that we are ready for the things we expect to see in the next 10 to 20 years down the line? Also connected to that is, of course, policy generally.

Policy, we need evidence to be able to have strong policy, right? How do we generate this evidence data? To the question of how data systems can help, right?

We know that we want to have robust policies. To have robust policies, we need evidences, right? And the way we gather the evidence is having data systems that can make that data as rich, ro‐ bust, clean, and as useful as possible.

I remember that your question also includes both data systems and AI. When you include AI, what that does for us is, we're able to also extract intelligence much more quickly. Maybe later down the line, I'll be able to speak a little bit more, because I imagine as the discussion evolves, we get to a few more case studies where we can see how this actually works in practice.

I'll add one more point to this. The final point I'd like to have in that sense is transparency. There's still a little bit of the opposite of transparency, which is opaque. Let's say opaqueness in how our policies are being made. And I think when we see that this the data that is guiding and why we are putting this kind of investment in this particular region of the country, rather than this other par‐ ticular region, many of us would relate to it coming from a multicultural setting, like most African countries are.

There's always that sense of why is it that all of this investment is going in this direction rather than in this direction? Why are they supporting this particular place? But when we have data that has been collected in a very transparent way, and the data speaks clearly that this is the area where we must invest if we are going to be able to safeguard our full security for the next 10 years. I imag‐ ine that people are a bit more amenable to supporting those frameworks rather than when these things are completely absent or not being adequately used. Thank you.

[Dr OluwanbePelumi Olanubi]

Very beautifully put together there, I like the four points that you mentioned. I know as we were talking, you touched a little on data, and I want us to probably zoom in a little more on when we talk about data systems, I want us to talk about data and gaps, data gaps that we've identified. In your own experience, you know, based on the research you've conducted, and generally when it comes to food security and the likes in Africa, what are the most significant data gaps that are undermin – ing full security planning process in the region? And how can AI be leveraged, or other emerging digital technologies, how can we leverage them to fill in these gaps when it comes to data? I know you've done some things in that regard.

[Dr Temitope Odedeyi]

Thank you for that question. I think I'm going to help you with this question. Let's start first with talking about the gaps, and then after I talk about the gaps, then you can ask again, because if I try to put them together, I might get lost.

Let's look at the problems first. What are the key challenges that we can easily, or at least we can identify?

It may not even be very obvious to many of our listeners or viewers. First one is the fact that be – cause of the generally free markets, at least significantly free market's structure and framework that the world tends to operate in right now, every form of agricultural production in a sense is a competition. Nigeria or Ghana wants to invest in or move much more strongly into the production of palm oil, for instance.

Then they're going to have the problems of how do we ensure that we are producing this compet – itively to justify the investment in that direction? That's where you start to see the kind of gaps that we have. First of all, let's take that example. Say a country, lets pick Ghana, I'm just using an hypothetical case to help us understand this problem. Ghana says, I want to start to invest much more in palm oil production. Now Ghana is going to be competing with existing superpowers or muscles in that area.

Now imagine that Ghana has to deal with the fact that the amount of data that they have regarding the environmental situation, like environmental data, for a particular region that we have impacted to be the hub or the hotspot for our palm oil intentions, we don't have enough data or environmen – tal data of what the climate patterns are in that region. The soil data that we have was the soil data that we had in 1980. Again, I'm speaking hypothetically, but if you do a bit of research, you see that the hypothesis is not very far from the reality.

But again, because these are very interesting discussions to be had. First of all, the amount of environmental data we have is not really very strong. We do know that we have hot, wet, and

season, but exactly how do this map for the last 10 to 15 years, which becomes the leverage or the starting point to predict what we expect to see for the next 15 years is not particularly strong.

Then we have the problem of our soil data, because soil data is something that is always continual – ly shifting, it's continually changing, because especially when we are looking at regions where we're already farming. We won't say we're already farming coffee or cocoa or cassava here, and now we want to have a map that this is our best place for where we want to further our intention for palm oil production. Then also we have the fact that how do we actually map these environmental con – ditions, both environmental and soil data, to yield for the different species of different genotypes.

By genotypes, we mean like say we want to plant this particular variety of palm oil, so which one should we be planting? Which one would actually do best in this particular region as opposed to this other particular region? Then what are the kind of pest and disease problems that we are go – ing to be facing if we wanted to do these things?

Then how do we ensure that we optimize the market condition around this place that we want to set up as the main region to farm? Now, I use that hypothetical case to kind of help us understand the scope of the problem. How much data can help, but how much we still have to do in being able to fill these gaps, because actually all of these things are itemized.

These five points, environmental data, soil data, the fact that how do we actually historical yield data and historical yield patterns, our understanding of pests and diseases and biological trends, our understanding of the market structure around the different crops we want to plant, and all of these areas are actually areas of weaknesses to different degrees across sub–Saharan Africa.

We probably have heard a lot about how much satellite data is already making a huge difference in agriculture.

Some of us might have heard how we have unmanned aerial vehicles, drones, as support systems for gathering all this kind of data. We've heard of, so we have those kinds of things. We also have IoT systems.

The IoT systems are reported on the internet of things. It means you have these sensors that are put in the field and that these sensors can pick, collect environmental data and then automatically transmit it to a cloud repository where it makes it easy for farmers to be able to remotely access the data and then use it for planning. But these things are not actually quite cost intensive.

But we do need to have these things. We do need to have them optimally provisioned for us to be able to get the level of data, or at least the quality of data that we need for strong decision–making and for policy–making. And then AI also helps us to be able to interpret and then extract value to

fill these gaps.

In a sense, where we needed to have like a huge amount of deployment, one of the projects I've been working on recently, is how do we make sure that we can synthesize very high quality envi – ronmental data so that we can minimize the amount of investment we need to make in deploying physical infrastructure. That's one of the works we have done and we're actually getting some quite good progress. A lot of other people working in this area.

So, what are the artificial intelligence frameworks or algorithms that we can deploy, or we can adapt that can help us to optimize these investments so that we get the kind of quality, and we get it as quickly as possible.

[Dr Oluwanbepelumi Olanubi]
A lot of work is actually going on there. From your responses, I can tell that a lot of frontiers has been shifted and we are looking forward to seeing this. But I'm just so curious again to think from the policymaker side of things that how does all this technology, information, data and the likes, influence policy-making?

I believe that most of, there's this sort of gap between this research and the results of the research and policy-makers when you're making policy that influences agriculture and other related sec – tors. So many politicians still rely on outdated or incomplete information, if I will put it that way. And how can we use real-time data and these predictive analytics to advance policy-making? And how can we get them across to the hands of those that actually do policies? When you talk about climate risk and talk about smart agriculture, there are some policies that will allow this to happen. How do we bring this information from the research angle to policy-makers to see the impact that we want to see, particularly in agriculture and similar sectors?

[Dr Temitope Odedeyi]
That's another very important question. I'm going to answer this one kind of contemplatively again, because it's not my core research area, but again, as a practitioner in the field, we've seen things that seem to work much better than some other things. One of the things I think seems to work much better is where we have a multidisciplinary approach or a multi-agent approach to solving the problem.

Multidisciplinary means that we are looking at, and not just listening to the voices of the agrono – mists or the people that understand crop scientists and things like soil or crop scientists. We're looking at how do we bring all of this expertise together? Because it is when we bring them togeth – er that we actually know what really matters.

But that's the multidisciplinary research approach, but we also need the multi-stakeholder

approach. I think on the multidisciplinary approach where we have interactions across different sectors of knowledge, I think we are kind of recognizing that that has to happen. The place where particularly I think my experience for sub-Saharan Africa, is where we now move much more strongly towards the multi-stakeholder approach, where we now have the farmers and policymak – ers at the table.

And then we have all the scientific strengths, because we have very strong scientific frameworks. But we need to get everyone together so that there's an understanding of exactly what are these people are doing, so that the policy maker can say, this is exactly what these people have found. And that can now influence their approach to policymaking.

I think that that's the key button, and I'm experienced in being a little bit involved at the borders and kind of making my early forays in that space, makes it very clear that it's a very difficult, and can be a really challenging thing to do. Because first of all, the fact is that we don't even speak the same language. Language of the electronics engineer and language of the agronomist are not exactly the same.

When we're not being a politician, then we have a different problem. What that means is, when we have that gap in that siloed thinking has meant that oftentimes we just revert to old systems that work. And I like how you framed the question, when you talk about the fact that we rely on outdat – ed or incomplete information.

Essentially, we're just basing a lot off, and I say a lot conservatively. It's often based on, what was the last thing we know that worked? Whereas we know that everything has shifted.

In fact, one of the things that we thought would not shift, which is like the weather patterns, has shifted significantly. And that's kind of created a problem where we have systems that don't work. And definitely real-time predictive analytics, as you framed the question, will make a huge impact, but it can't just make a huge impact on its own.

It is when we have this multidisciplinary and multi-stakeholder engagement that we can begin to shape our structures and our framework to address the risks that are impending.

[Dr Oluwanbepelumi Olanubi]
I kind of agree with what you said about multi-stakeholder, multidisciplinary engagement and multi-stakeholder, because like you said, everyone still lies from his or her own perspective and your own perception. As policy makers, we use a good policy based on the information we have.

And we do not, if we don't have the pertinent and accurate information, you might be obstructing the policy making and what solution we are trying to drive at or the problem we are trying to solve,

we might see ourselves creating more problems. So, I agree with that. And that also leads to the next question on how we can do that.

Because I would think, what would come to mind is maybe academic forum. But academic forum, the language they speak there is not the same as what you expect to be. Especially in the likes of Sub-Saharan Africa, where we have small holder farmers.

We're not talking about subsistence farming here. How can we leverage the private sector, maybe associations or groups? How can we leverage that to ensure this collaboration?

And how can we bring particularly, in SSA context, the small holder farmers and other associations that we have, how do we bring them to tell us maybe academically, or just tell us in a way that we can understand what the problem is. How do we enable such engagement in the way that they get access to the resources that they could use in terms of leveraging cheap AI? I know you've done some work regarding that. How do we get that to the farmers and how do we get it from us to the policy makers?

How do we enable that kind of policy making? Thank you.

[Dr Temitope Odedeyi]
Okay.
Thank you very much for that question. How?

I like how you're already free with that. This is a difficult question to answer. I think first of all, the key thing is the will.

I think across Africa, it's becoming glaring that this has to happen. And because it's becoming glaring that it has to happen, the will is becoming stronger and stronger. Once the will gets strong enough, we know we are going to overcome all the barriers that we have.

What are the actual steps that we'll have to take to overcome those barriers? I think one of the ways that we've always, we have often solved this kind of problems. Because I think if we look at the journey of humanity the last 10 years, especially if we look at what has happened since the second world war, a lot of frameworks just started to spring up that has enabled us to maintain a lot of things that would have been very difficult to even imagine before the first world war.

Partnerships, the United Nation projects and all of this, the thing like the World Health Organization all of this integrate, and it's very easy to take it for granted that all of this integrate. I'm kind of speaking first of all very broadly before I then go to more specifics. If you look at before the 1800s and then up to the 1890s, it's very difficult to imagine the kind of global alliances that have not

been forged that we now take for granted.

I think that's a testament to what can happen when there is a strong view to achieve some things. My short answer is frameworks. We need to have frameworks in place that enables us to convey the different expertise, interests and stakeholder groups.

The frameworks are like rules of engagement, so to speak. This is how we're going to work together. This is how we're going to make sure that every voice is heard.

This is how we're going to make sure that we don't leave out any key sector. Definitely the private sector is probably the biggest player in this. In terms of long-term planning, it's definitely the big – gest player.

The government intervention, as important as it is, cannot be the main. In fact, that is the reason why most of our approaches have been short-term. It's been more reactionary.

Okay, let's just slap subsidy on this problem. Let's just send all the farmers for money. Let's just subsidize the cost of fertilizers and all of those things like that.

It's because that's like a typical government response. But when we start to bring in the role of the private sector, we begin to look a bit more forward-thinking in our approach. I was privileged to be part of the launch of an initiative by the Commonwealth. So, we have 21 countries out of about 50 sub-Saharan African countries as part of the Commonwealth, but it's not every sub-Saharan African country that's there. There's a major sub-Saharan African interest in the Commonwealth.

There was a launch of the National Agricultural Data Infrastructure. And the idea of that system was to create a system for collecting agricultural data and considering it as a national asset. In a sense, it creates a framework for every different sector and different people. The private and gov – ernment level have been collecting agricultural data and holding agricultural data for many years.

How do we have a system that is reliable, that's interoperable, and that can support better policy and investment decision? Essentially, we have this hub where we can feed all these different data. We have hubs that have frameworks in place that can then become channels to feed all different data from different sources into a system that everyone that needs data for different reasons can go to that hub and access data that they need to do whatever it is they need to do.

Again, it could be government, from government policy, it could be for, for example, I want to invest in this particular sector or I want to start this particular initiative. Where is the data that I need to build my case? Do we have this map data support?

I was at the launch of the National Agricultural Data Infrastructure and it kind of opened my mind to how important frameworks would be in determining how fast we can move and how successful – ly we can move. This is because, for many of the things that we need to do, we don't actually have the frameworks in place to be able to do them successfully or reliably.

Hence, we have to think of more frameworks rather than just say, let's convene. We need to have frameworks even for our convention. We don't want to convene, we just have like frameworks.

How do we ensure that all the voices are heard? How do we ensure that all the infrastructure we already have in place can be used harmoniously? How do we ensure that we are able to also val – idate things?

We are sure that the data that we have is actually good data rather than data that has been col – lected in a way that makes it compromised or we can't really make strong inferences. In short, as I started my answer to that question of how public and private stakeholders can collaborate to ensure that we maximize agricultural data is actually, first, how do we set up the frameworks that makes this possible? And I think, again, we have different examples we can learn from.

I kind of just shared NABG as an example of what I have seen, but we also look across different sec – tors, like what are the frameworks that we have that enables us to be able to have a kind of impact. I'm very careful to mention sectors now because we know different sectors have got their different attacks, but, we are a world–led organization and I just mentioned that as an example. What is the framework that we have in place? It enables doctors to be able to get information there, govern – ments to be able to take and receive directives there.

What are the frameworks we have in place? At least we have those as examples of what we can then adapt to enable this kind of partnerships but at the local, national level, and also across the continent and across regions.

[Dr Oluwanbepelumi Olanubi]
That's really brilliant and I agree with you. Frameworks actually help to build systems that is repli – cable across sector, within sectors, across the country, within countries.

And such framework not only allow public–private partnership in that regard, it also helps to build structures and systems. And the fact that farmers can now see that there's sort of a structure that they can always go to, to get informed is impressive. It's not just about trial and error or luck or ex – perience but there's a structure where I can learn from. And also, the government has also a struc – ture where they can get the real information that they need in policymaking. That's really good.

I want to take that forward and talk a bit more on farmers, particularly in rural African country

context. Now, many farmers in rural Africa lack access to digital tools and connectivity. How can we ensure inclusivity? Because I believe that it is important. I'm talking about data-driven agriculture. How can this benefit small-holder farmers, and not just the large-scale producers? How do we bring those high-end technology, internet of things and the like, to a farmer, say in Nigeria, in Kaduna or in a local environment in Ghana or any other African country? How do we bring those technologies to them?

And how do they access it in a way that is sustainable?

[Dr Temitope Odedeyi]

Thank you very much for that one. My first approach to that question would be to say that my experience is that farmers are very interested. They are very curious and they are very open.

And that's because farmers are facing problems now that they have not faced, at least the people that trained them, they didn't face quite the same problems that they are facing now. The evolving climate has been particularly strong in the last 20 to 30 years, more than we've ever had it, at least in a more recent history. So, when you notice that your livelihood is at stake, you become very interested.

But the question now is, how do we ensure that that interest translates to actual action on their part? Because that's where we are, where we found inclusivity.

The investment that is going to make these data systems that we're talking about, enable stronger policy and more forward-looking policy is actually quite extensive. Itt's often beyond the cost that a smallholder farmer can bear. And as we know, the agricultural system across most of South Africa is heavily smallholder farming.

They strongly support the smallholder farmer model. And I think it's actually not a disadvantage in a sense. Of course, there's a lot of disadvantages with that, but in terms of how that enables people to be at least reasonably employed, it's an advantage because the population is quite big and we need to employ labor.

If we have the smallholder farming model as a way for people to have some gainful employment, I think then the approach would be good, and rather than trying to discourage that, we should find a way to strengthen that model to ensure that we keep people employed. As a transitionary phase to where we need to be, where we become a lot more mechanized and at least more mechanical driven than people drilling. That said, it becomes that the problem is how do we ensure that the technologies that we are looking at then are accessible to the farmers?

By accessibility, we are looking at, is this something that the farmers can reliably obtain them-

selves, as in can you reasonably obtain it within the cost, can it be provisioned for them within the cost brackets that they can actually pay for? Accessibility also can be thought about in terms of the ease of use, how sophisticated are these systems? To make it more practical, for instance, now we say we have this problem of limited agricultural data from this particular sector of the country, right?

Now we could have the approach of, okay, so let's get the government to invest in deploying sen – sors in the field and then just putting all of these things there. But that kind of just half solves the problem because then who is going to bear the cost of installing, maintaining, and ensuring that tampering is minimized? What we want to be thinking about is how do we ensure that these tech – nologies can actually flow through the farmers into the field and be managed by them so that the farmers can take ownership for those things?

It has to be then that we create a system that makes the farmer appreciate how important these things are for their own long–term sustainability, as in survival or their food or economic security, and also enable them to be involved in bearing some of the costs because they are going to be bearing the advantage. And also make it easy for them to be able to deploy these. So, the partic – ular story that got me into Agri–Food Electronics was cassava.

Cassava, as we know, across most of sub–Saharan Africa is a key staple crop. I imagine that you also, like me, grew up eating some kind of cassava product. If it's not Eba, then it is Fufu.

And there's the gari that we drink in the afternoons. You just come from school and you take your gari, put it inside water, and if you're buoyant, you add groundnuts, peanuts, and then you have it. We grew up with this, but then over time, the industrial use of cassava started to also evolve.

We're looking at cassava for industrial starch production, sweeteners, and in fact, cassava for bio – fuel production.

And that meant that we now have a parallel market for cassava that actually could generate more income for the farmer, and they know they can sell to the local market where it's food. We can also have a parallel production where we target the kind of varieties that the industrial processors need for their industrial processes.

The bottleneck we found is that for you to sell cassava into the industrial markets, you need to un – derstand the starch content, because the farmer, the industrial buyers, they don't buy, they don't pay based on bulk weight.

They pay based on the starch content, and that means that farmer Daddy, can go to the industrial processors and then they sell, they buy his own produce, 10 tons for $500, right?

And then farmer Bukayo comes and he got $250. And then farmer Ajit Shafae had the worst of it all because when farmer Ajit Shafae got to the processing plant, they said, oh, you have brought a particularly weak produce. The starch content is so low that we cannot even justify buying it because you're going to get a very low starch yield. So, farmer Ajit Shafae gets turned back at the gates. So now farmer Ajit Shafae, and farmer Bukayo are now discussing, what happened?

You understand? So now we came in with the idea, let's create a system, a local device that en – ables every farmer to be able to test their starch content in the field. And because the farmers understand the problem, it became clear when we started to engage with them that if we can do this for us, then we will try our best to be able to come up with whatever costs is going to be.

But eventually the experience we found was that because the cost of any new technology can always be often prohibitive, we still had that problem of how can we make this low cost enough for the farmers to be able to adopt? And if we can't make it low cost enough, what are the market models that we can design? And to ensure that it still becomes accessible to the farmers.

With those kinds of thinking of how do we ensure that this technology is not out of reach of the small older farmers? We create another way, where we solve, and have a short–term intervention that creates long term problems. Because if we keep technologies that are useful for the farmers or the small older, and medium older farmers out of their reach and make it more only accessible to much industrial scale farmers, essentially, we will continue to increase the pressure on those people and then they would get discouraged.

And then we create the ripple effect of breaking down employment, which of course progressively is increasing. So, we have to think of accessibility in terms of, to round up, cost, and how we ensure that we're able to make the cost of this technology as low as possible, and affordable, or we create a market entry or business models that enables an aggregation of these farmers to be able to do this, and access this technology.

And also to make sure that we are creating technologies that are accessible in terms of ease of use. And that's another thing that drove my own intervention. Looking at how we ensure that this device, whether at any level of literacy, it can be used to interpret what is happening.

You know what to do with it, and you don't have to go and sit under a lot of lessons before you understand how to operate the device. So those kinds of thinking must underpin our approach.

There's an intervention that I'm also familiar with, and this is from the Sustainable Trade Initiative, IDH. The IDH is sponsored by the government of the Netherlands, and they've been a partner with us at UCL, my university in agricultural research.

One of the things they do is, they look at different possible technology interventions, and it doesn't have to be core technology. It could just be framework or structures, systems or market models that can be successful, that can work with farmers. And then they support the introduction of these interventions.

They give support, and get farmers to be able to relate or at least get an idea of how this works, support their training, and intervention, so that there is an easier access. It's completely a not-for-profit organization, and their interest there is not how much money, but to ensure that if this is a model that can work, and to ensure that it gets to where it needs to get to? What are the things that the makers of technology need to factor in? And how can they support them to do it so that the farmers are included in the process of innovation? And then they have maximized the poten-tial for success.

Another thing they did, that I learnt about is the block farming model. Block farming is where, if you want to do any kind of mechanization that is very difficult to do, for a farmer that has maybe two hectares or five hectares of land, what they did is, they aggregate all the farmers in this particular situation and they call it a block farming model.

So, let's aggregate all of these farmers so that we have a contiguous arable land that is enough to justify the introduction of mechanization. For instance, I have like a huge swath of land that will be up to maybe 50 or maybe even more farmers. And then all of them come together, and when it's time to do any mechanization effort, it is coordinated across all the whole, and then the benefit goes to all the individual farmers.

Whereas it would have been one big player buying off all the land and then mechanizing, and we still retain the structure of the small, old, and middle holder farms, but the benefits gets to them also. And I think those kinds of interventions will be very important in the whole framework of how we get data, policy, and how we get all those interventions to support more robust and sustainable food system across Sub-Saharan Africa.

[Dr Oluwanbepelumi Olanubi]
I love it, a lot of innovative solutions here and there. Like I used to tell my people, innovative solution is not just a buzz word. We are actually seeing these solutions here and there to solve the problem. And that's something that I look forward to seeing in SSA, where more countries like Nigeria, Ghana, Kenya, and others, farming using new agricultural regions that way. We've had interesting conver-sations so far, we've talked about data, spoken about stakeholder engagement, and I was talking about how to bring in unique frameworks and the use of AI.

I want us to turn to the side of the government now, and talk a little about how governments can increasingly adopt AI for decision making, which are ethical, and has governance measures, to

safeguard data privacy, because that's very important in this stage and time.

Data privacy, accountability, and public trust. How can government or initiatives by governments in that way adopt AI in decision making and also safeguard data privacy and accountability and ultimately build public trust when it comes to sustainable agriculture?

[Dr Temitope Odedeyi]
Yes, and I think it's one of, in my perspectives, the simpler questions you've asked me today. And why I say it's not a particularly difficult question is because in the agricultural sector, of course there's financial interests involved that is actually quite strong.

But the level of complexity or the need for issues like privacy and issues of fairness and this kind of things is not nearly as strong. I think when we come to data collection, a key issue is always privacy.

How do you ensure the ethics of the data collection? Compared to systems where we are collect – ing health information, like human health information or financial data, we both can agree that the level of, the problems that we created if agricultural, like the soil data gets leaked is nothing com – pared to what happens if someone's health data or someone's financial data gets leaked.

It's not nearly as comparable, and if we already have systems in place that have been able to help minimize the risk, but of course, it's still an ongoing problem. But this is not to just minimize the scale of the problem.

But if we can do it with a reasonable amount of success in the financial services sector, in the health sector, then it means that we already have good starting points to achieve similar ends when we come to agricultural data. Hence, I think it's typically the same rules we apply, but at smaller, and lower level of complexity and then the severity of impact when there's a breach, and we still need to ensure that the data is collected in a way that we don't have minimized biases.

We want to make sure that we have clear privacy rules in place when we are collecting data as we have to do every data structure. The people that we are collecting data from need to know what we are going to be using the data for, so we don't just take people's data like that.

All of these governments have very robust GDPR rules that governs data use across Europe. So, we have this kind of frameworks that we can actually leverage on, so we do not just start from scratch.

Essentially, we should ensure that we are learning from the best practices. Because in a sense, the amount of risk that we face in this particular sector with data breaches, is a little less than what was compared to much more difficult scenarios. I think then you have like a good place to start up, to build up from.

I'll keep that answer short because I think in a sense, just from my perspective, I think it's not the biggest concerns, or the biggest hindrances that we have to deal with.

[Dr Oluwanbepelumi Olanubi]

I agree with you. When it comes to data related to agriculture, it's not as delicate as health-related information or financial related information, but regardless, we still have to be careful and we still have to be cautious when we undo such data.

We are heading towards the end of the entire conversation and it has been so insightful, and rich. Thank you for sharing and not holding back.

I have two more questions; I'll take it one after the other.

The first is for you to share examples of African countries or regional initiatives where data-driven systems have successfully influenced agricultural or food security policy. We want to see what are the success stories that we've had so far.

[Dr Temitope Odedeyi]

Thank you. I think we'll find that at different levels, we have different degrees of interventions with different levels of success. One of the countries in South Africa that keeps coming up in terms of, oh, these people are doing quite well, is Rwanda as one of those countries.

And one of the interventions that they have is something I believe is called the Rwanda's Soil Infor – mation Services. Essentially the idea is to have a system back on where they can continually get reliable data on soil information. It's not individually managed, but it's managed centrally.

And then you have access to the soil data that can influence your agronomy. How do you produce your crops, your timing of your planting, and harvesting, and the interventions you need to do in terms of fertilizer usage? Like a centralized resource that enables people and different stakehold – ers to understand the state of their soils at the local level.

I think that's a very key one because one of the areas we talked about was, so we have all of these different soils, since the state of the soil is continually changing, depending on what you're using the soil for. How do you ensure that you have a good enough understanding of the state of your soil before it will determine what you should be planting, when you should be planting it, and what intervention you need to ensure that you maximize your yield? I think that is a very good example.

The fact that it is centrally managed means that the cost is also centrally borne because the cost of doing soil analysis, even for me, since I do fund my research and I'm part of my research, I do the International Institute of Tropical Agriculture in Ibadan, Nigeria. One of the days we need to, we

were doing a particular pile that had to do with some yield modeling. I wanted to take this, and do the soil analysis.

And when I got the yield for the soil analysis, it was like, as the typical Yoruba person would say, simple. So, a system like that makes it easier. I'm looking at the fact that we do have a certain amount of research funding to do agriculture in the research that we're doing.

But even at that, we looked at the cost of the soil analysis for not a particularly huge tract of land, and said, okay, how's the farmer going to afford this? So that kind of intervention for farmers is a great one.

Then we have all of these long running trials, like trials that have been running in the IHCA as an example for decades on crop breeding. We've been doing crop breeding trials to develop new varieties or genotypes of crops that would have different traits, such as maybe a very high yield, drought tolerance traits, disease resistance traits, and things like that. We have this kind of project that has been going on.

And what they do, is that they do all of the trials, validation of this new varieties, and then they re-lease it into the field for the farmers to use. That's a key aspect of how we have examples of where we have data-driven systems. Because these crop or yield trials are very heavily data-driven.

I've been privileged to look at how they collect the data and how the level of detail that's involved in the data, how it's reported, and how it is curated, and archived. It's brilliant. We have this kind of systems regionally and nationally.

I have done some work with the Crop Research Institute or the Council for Scientific and Industrial Research in Ghana, it's based in Kumasi. They are affiliated with the CGIIR framework that IIT is a part of. And we see this kind of systems that actually behind the scenes, we don't see them often.

We just know that they're there, but a lot of the fact that we still have food in the region is down to this effort. And now these efforts also are being supercharged by data-driven systems to ensure that their own work also becomes much more streamlined, much more robust, and is able to de-liver much more impact. I also want to mention one more.

I was going through the National Agricultural Technology Innovation Policy from Nigeria, and it was kind of written as a forecast of what the Nigerian government wants to be doing policy-wise for agriculture from 2022 to 2027. How closely have they've been able to match the forecast?

I can't say specifically, but it's great to have at least a guiding framework that says, okay, so these are the things we want, we have to be doing, these are the kind of responses or interventions we

want to be involved in, and these are the outcomes we're expecting.

That's also a good example of initiatives that can help, and that can strengthen cultural and food security policy. I mentioned earlier the narrative, which is like National Agricultural Data Initiative that's being spearheaded by the Commonwealth. The idea is creating structures that enables regionality and nationality to be able to maximize the potential that data holds for food security across the region.

[Dr Oluwanbepelumi Olanubi]
Thank you. This brings us the last question for today. It's been a robust conversation, and person – ally, I have some research to do after this conversation. I need to check up a lot of things that are happening. It also helps you in your own research as we continue to work within the institute.

I want to ask you, looking forward to 2030 and 2040, can you paint a picture for us?

What could a truly data-informed and cultural policy ecosystem look like for SSE? One that bal – ances innovation, sustainability, equitability, climate-resistant and climate-friendly and cultural systems. Can you just paint the picture of what it will look like in the next 20 years, and what the culture will look like in Africa and beyond?

What would we want to see? What do you want to see?

[Dr Temitope Odedeyi]
That's a big question because I like to dream. And I think the dream is actually not so far-fetched. Let me lean in as I start to dream now.

What are we looking at? What do we want to see? What would a truly data-informed and cultural policy ecosystem look like?

I think it's not very complicated and not very complex. The key thing is we need to have policy ecosystems that, first of all, caters to the contextual need. What I envision that to mean is that we have policies that have been trained to use machine learning language on local context and local data so that we have systems across the region that is actually built around our extant needs, the things that we actually need.

And that in itself will now become like a structure or a system that enables the inclusive part – nerships, so private sector, public sector, research organizations, the financial sector, and all of these things, to be able to contribute maximally. Oftentimes we have the lopsided kind of con – tribution where there's a heavy reliance on foreign investments or contributions and things like

that. I believe that a strong data-informed and cultural policy ecosystem starts to help that bal – ance to be achieved.

The third point I want to add to that is where we have every player understanding they are ac – tually are contributing to the success of the whole system, particularly the farmers. Small and medium-old farmers particularly, can get the impression that they are actually part of a thriving ecosystem and their voices are informing the responses that they are getting.

The system will be truly remarkable if we're able to achieve that, and I think it will make a huge impact across our food system in sub-Saharan Africa because we know most of the productions are actually quite not particularly optimistic, we're going to be facing the worst climate-induced variations that we've ever faced in recent history.

We have the explosion of goods and then more stress on our existing infrastructure, but I think it's also an opportunity, and the opportunity there for us is when we create a system that enables the kind of interventions that enables us to optimize all our possibilities. In terms of resources, man – power, skills, ideas, and innovations.

I think also that for the agricultural system to particularly thrive, the role of the youth is a key, and a major factor that must be strengthened. When we create a system that we get much more, we make agriculture sexy again, where there are actual farmers proud to be a farmer again.

And their parents don't feel like they're wasting their life. We are dreaming, but I think it's actually achievable. And the things that will make it achievable are part of the structures from what I'll talk about, where we create a system that's open, transparent, and inclusive, that caters to the extra needs that are actually context-driven, and enables everyone to be able to play a role.

I hope I've dreamt well.

[Dr Oluwanbepelumi Olanubi]
Yes you have. Dr. Odedeyi, thank you so much for sharing with us. Thank you for bringing those examples. Thank you for sort of educating us, because it's more like an education.
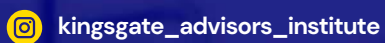
We look forward to another episode in the coming year, to talk about the success stories and what we've achieved from our last conversation. To our viewers, there you have it, another insight – ful episode and you would agree with me that Dr. Odedeyi has done justice to all the questions we've asked, as touching the use of AI technology to drive sustainable food systems in Africa and beyond.

I'd also want to encourage you, if you haven't already at this point, please follow us on social media,

like our pages, follow us on YouTube, and subscribe. In fact, turn on the notification bell so that you can know when we upload new episodes. We promise to always give you insightful, rich, educating and informative discussions generally on our podcast.

Like we also mentioned for the Young Scholars Academy, for those of you that have been following us already, very soon we'll open the second cohort for applications to be open soon. So, please stay tuned. For that, you might want to follow us closely on our website where we make the an – nouncements and across our social media pages. Thank you once again for staying tuned. I will see you again next time and have a good day. Bye everyone.