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THE PROMISE AND PITFALLS OF INDEX INSURANCE: BUILDING RESILIENCE THROUGH RESPONSIBLE IMPLEMENTATION

QUESTION & ANSWER TRANSCRIPT

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Julie MacCartee: Great. Thank you so much, Jen, Tara, and Michael. And thank you to all of our participants on the webinar who have been sharing resources, asking some really great questions, and providing some interesting comments and responses to other people's questions. We really appreciate that.

We've been collecting your questions in a little box that the presenters can see, and so we have about half an hour to run through as many of them as we can. So I'll begin posing the questions to our presenters and we'll see how many we can get through.

So there were several questions that came in about failure rates and basis risk. And so I'll read through a few of them, and we can see if we can answer them a bit as a group.

So Doris Owusu observed that some products, and she noted Ghana as an example, continue to be challenged by basis risk. So can you provide a little bit more on what basis risk and what is being done to address it? And then there were also some questions just about what researchers and the insurance industry can do to reduce basis risk. So Michael, would you like to jump in to begin that answer?

Michael Carter: Sure. I'd be happy to do so. And I started to try to answer some of the questions in the box, but it was not an easy thing to do, because it kept jumping around. So let me just verbalize here.

Thank you, Doris, for that question. Basis risk is a term that is used somewhat loosely, and people fight about exactly what it means, so I avoided it, and just went to this idea of a contract failure. But basis risk basically means risk that's uncovered by an insurance contract. When I talked about a failure rate for insurance, that's just a – to me was a simpler way to talk about what many people describe as basis risk.

I know in Ghana there have been efforts to use rainfall-based insurance, and so that creates a lot of uncovered basis risk or creates what I was calling a relatively high failure of contract – relatively high failure rate for an index insurance that's based just solely on a – based on a rainfall index.

I think if we all – any of us who are farmers or even who have been gardeners, we know that there are lots of things that go into plant growth besides rainfall. So most rainfall-based contracts are simply using – typically using an estimate of the rainfall that hit the ground, the total rainfall that hit the ground over a ten day period. And as we know, it depends on the intensity of that rainfall, it depends on the soil condition when the rainfall hits, it depends on the temperatures, and then

there's all sorts of other inputs that come into determining whether or not you get good plant growth. So you might start – you might get good rainfall at the right density, but then the temperatures are too high, or you might get an insect invasion, etcetera.

I think the way to fix basis risk, and we're talking about doing this in Ghana – we've been working with the Ghana Agricultural – I think it's Ghana Agricultural Insurance Program – about investigating whether or not we can actually reduce basis risk or reduce contract failure rates by moving to remote sensing based measures of plant growth. That is, that's the output that we're interested in insuring, or it's closer to the output we're interested in insuring, rather than trying to write a contract just on one of the many, many inputs that determines whether or not farmers have good years or bad years.

So again, the question, what do we do to reduce basis risk? What I was suggesting is that first of all, we need better designed contracts that are much better at predicting average yields. So when we've actually – when we've actually implemented the minimum quality standards with real farmer data, what we've done is we've collected information from farmers on the ground, historical data from them about what their yields are, and then we're able to look at different indices and design indices that actually correlate as good as they can with average losses within an insurance zone.

We call that ground truthing an index. It's not just sort of saying, well, in the abstract, rainfall should matter, so therefore, rainfall indices should be a good insurance index. We actually put it to the test with farmers' information, and farmers' information is reflecting not only rainfall patterns, but intensity of rainfall to intensity – reflecting insect invasions, it's reflecting a lot of the complex biological interactions that go into determining it.

And then the other – so as I say, I think there's technological solutions out there that, number one, allow us to – allow us to measure plant growth directly, and number two, are very high resolution in the sense – I gave the example of three meter by three meter resolution. We can downscale the contracts and effectively make the insurance zones as small as we want to. Again, rainfall, most of the rainfall contracts, they're based on satellite estimates of rainfall, are based on, I believe, most of it right now is five kilometer by five kilometer estimates, which means every single farmer in a 25 square kilometer area gets payouts based on a single index. And we know if you're in the Sahelian region or the – or just below the Sahelian region, and if you're in Mali or Burkina, for example, within a 25 square kilometer area there's a number of farmers that will have had very, very different experiences.

So being able to downscale the contract to the level say of a village and get an

estimate of average yields in the village in a much smaller area, is going to eliminate a lot of the basis risk or the contract failure rates.

And then finally, what I was talking about with an audit rule, a failsafe audit rule, is meant then as just something that jumps in, even if a high quality contract doesn't – you know, gets it wrong for – at the level of say the village, we can still come in and protect those farmers. So hopefully, that gives some clarity on some of those ideas.

Julie MacCartee: Thank you, Michael. I think that you at least partially addressed this question in your response just then, but I wanted to call it out, a question from Aaron Collins. What methodology is used to choose the appropriate index in different contexts? And can you maybe compartmentalize that piece of your previous answer?

Michael Carter: Sure. So I think right now, I think as – I think it was Jen who said there's a lot of excitement about index insurance, and I personally got interested in it after writing a lot of dismal papers for years saying that risk makes people poor, keeps people poor, as Tara said. And at some point said, well, okay, enough of that. Is there something to be done about it?

So that's the excitement. But it's a new technology. It's a novel technology. And a lot of people have put a lot of time into trying to find solutions. So when – what – so recognizing that, I think at this stage of development, until we get just a little more experience, and we know what exactly tends to make for a reliable index insurance contract, I think we need to take a little bit of time and do some experimentation.

So one project that we did was with World Vision in Tanzania in a rice growing area. We collected – at fairly low cost, we collected retrospective yield data from farmers in this rice growing area. We hired a remote sensing specialist to work with us, and we used the – a huge number of different satellite-based measures to see which one of them actually provided the best insurance value for the farmers. And we ended up finding the answer to that, and there's – I don't want to get too wonky on this, but there's sort of the question of what the index might be, so NDVI is a commonly used one that we've used in livestock insurance contracts. NDVI is just a measure of basically the green reflectance of the earth. That sounds fairly abstract, but if you think about a farmer's field, it goes from brown to green over the course of the growing season. And if you can measure that very precisely, you have something that tells you a lot about what's going on with plant growth.

There's other higher generation, later generation measures that are – that also tell us about plant growth, so you can estimate evapo-transportation, you can measure something called FPAR, fraction of photosynthetically active radiation, etcetera, etcetera. So there's that aspect to it. You can detect planting dates, which will help you predict yields. You can do what's called crop masking, so if you have a lot of high resolution pictures, you can do machine learning and tell your computer to learn to ignore those pixels that are not the crop you're interested in insuring.

So there's a number of technology things you can do to improve the accuracy, but again, at this stage of development, I think it's worthwhile to make sure we ground truth them. So in the case I mentioned of Tanzania, we got some data, and we went through literally thousands – with a lot of computer programming, we went through thousands of options in terms of crop masking, in terms of planting detection, and in terms of using NDVI versus FPAR versus EVI versus leaf area index, and a bunch of these different kinds of measures.

And then that design phase allowed us to say, okay, for this growing environment, this appears to be the sweet – this appears to be the kind of index formed out of these different measures that gives highest value to the farmer, that maximizes the economic wellbeing of the farmer, and meets a minimum quality standard.

I think as we generate more experience, then this kind of take it slow and careful approach will give way, but I think we're still at a stage now where I think we're starting to get some ideas about what happens and what works well. But it's still a little bit of a work in progress.

Julie MacCartee: Great. Thank you, Michael. Tara, I wanted to send a question your way from Elon Gilbert, who said that he's interested in knowing more about the characteristics of farmers using index insurance, guessing that these might be the better off farmers, those already stepping up in agriculture, and participants in value chains, rather than the women, poor, and the – I guess – I'm not sure I fully understand the end of his question. But – so yeah, how inclusive index insurance can be, and what types of farmers tend to be adopting it.

Tara Chiu: I think what I'm – yeah, I think you're trying to say that it seems like it would be easiest and perhaps most immediately adopted by farmers who are relatively well-off and already well-connected into various value chains, and/or other kinds of opportunities. And I think that – and Michel and Jen, please do jump in. I think that's probably in large part correct, depending on the design of the

insurance product.

For many of the projects we have tested, such as for cotton farmers in West Africa, that's obviously a relatively integrated value chain, and the access to that product is limited and targeted. On the other hand, as we think about the potential for integrating agricultural index insurance more as a social safety net triggered by an index, and especially in cooperation with the government, I think that has a potential to speed up and increase access, perhaps improve targeting for at least social protection assistance in the event of an emergency or a shock, compared to if a shock occurs, and then ex post, governments or donors or others are trying very hard to find who is suffering and how to get them the money. I think having that as an automated system could potentially be more inclusive in that regard. Michael, Jen?

Jennifer Cisse: Yeah, thanks, Tara. This is Jen. Just to add on, and I'm not sure you mentioned this program specifically by name – if you did, I apologize – but one example of this is the Kenya Livestock Insurance Program, which is supported by the government of Kenya, and targets vulnerable pastoralists specifically.

So while premiums that are paid fully by the farmer may attract farmers that are maybe higher up in the value chain and working on cash crops and maybe less vulnerable, there are certainly ways of implementing index insurance programs in ag that target the most vulnerable. And this gets back to Michael's brief comment on subsidies, which is that we need to make sure that these programs don't hurt people if they're paying for them, but even if it's the government that's supporting them, we still want them to be efficient use of government resources.

So the Kenya Livestock Insurance Program is an example of an index-based livestock insurance program that is targeted specifically at vulnerable households. Oh, and that uses automatic payments through M-Pesa. You don't need to make a claim. The money automatically shows up. So that speaks to the direct disbursement that Tara was mentioning.

Julie MacCartee: Great. Thank you, Tara and Jen. Let's move on to a couple of questions on bundling, and I think these are directed at Michael. So Michael said that many, many farmers simply can't afford the premiums, and there are a lot of governments that can't afford to subsidize it. So are there any farm supply companies that bundle the insurance cost with the cost of inputs, such as seed and fertilizer?

And then Cathy Perry said, are financial institutions covering the cost of

insurance as part of a bundled package in a loan package? So two different types of bundling options. Is that happening?

Michael Carter: Okay, those are great questions. So Tara mentioned some work that was done in Ghana on what I like to call interlinked credit and insurance. That's a very interesting idea, because if a loan is insured, then perhaps the lending institution might be more willing to make the loan, and we see some evidence of that in the work in Ghana.

But also, farmers may be more willing to take on the loan when the loan is insured. So there is – there's many instances of farmers who may have a contract available to them, but in terms of prudentially managing their own risk, particularly risk to collateral assets, having insurance available to them makes them more willing.

And Tara, a great example of that is the work Tara alluded to that was originally carried out in Mali, and is now being scaled up by Sofitex, the largest cotton company in Burkina Faso. In Mali, we were able to do a randomized controlled trial, and these were farmers that were being begged by _____, the local cotton company in Mali, were being begged to plant more cotton, and financing was available, but farmers were prudentially managing their own risk, because they knew that even though it was a joint liability loan with their neighbors, they knew that if they didn't repay, if they were unable to repay because of a crop failure, their share of the loan, their neighbors weren't going to be happy with them. And in fact, neighbors tended to take away each other's plows and bicycles and kitchen tables, so sort of local collateralizations. And farmers were extremely cautious.

And the proof of that – without insurance. And then when the insurance came along, we saw this roughly 33 percent increase in farmer investment. So nothing changed for these farmers. The opportunities were there. But then that was an interlinked credit and insurance product. And so when farmers knew the loans were insured, they actually invested substantially more.

So if you sort of do the arithmetic on that, which we've done in some papers, and there's some briefs on this, if you're interested, you know, basically, farmers were giving up approximately 25 percent of the potential income every year in order to manage risk. And by giving them a new insurance option, they were more willing to make more investments, because they felt like their families and their collateral assets were safer.

So I think bundling of credit and insurance can make the proposition – can make the loan proposition better for the lender, but also, importantly, can make it better

for the borrower. Bundling with inputs is also a great idea, and it's sort of related, because – and this is actually the project I mentioned briefly in Tanzania and Mozambique. In that case, we have a bundle of improved maize seeds, and they're actually drought tolerant maize seeds, which are not drought proof, but are drought tolerant. The drought tolerance maize seeds are bundled with an index insurance product.

So the prior harvest in Tanzania, in our study area, roughly 50 percent of the farmers had a terrible drought, and those who had the insured maize seeds actually got replacement maize seeds for use this year. So we're actually just about to launch the end line study for that, but we're anticipating that the insurance – having insured maize seeds is going to allow those farmers to continue their investment in these higher quality and partially risk mitigating seeds.

I think farmers find it very attractive when the insurance is tied into a specific yield increasing input, because it just makes the whole thing much more concrete. And this comes – there's a lot of work in what's called behavioral economics. People are much more willing to ensure things that they already have. In this case, the farmer has the money that she's going to invest in maize seeds. They're much more willing to ensure things they have than things that they don't have, which is like, well, maybe next year's income will be lower or higher. So I think bundling is really important.

The third thing I will mention, and this, I don't know of it having been done, but when you get into the – into organized value chains, if you're talking cotton, you're talking cacao, you can think of a number of products, you know, someone – the companies that are part of the downstream companies in the value chains have a huge amount to benefit from increased output.

And so if you ask yourself if farmers are restricting their production as a way of managing risk, who's going to benefit if the farmer has insurance, and if the farmer therefore increases production? In the case of cotton, it's clearly the farmer's going to benefit from producing more. That's the 25 percent income increase I mentioned. But the cotton companies are also going to benefit, because they make their money on the throughput of processing that cotton and selling it on the world market.

So something we have that I at least can't think of an example of, but I think would be really interesting to explore, is if you have a high quality index insurance contract, farmers have confidence in it, increase their investment, then the – there's a real material interest of the downstream intermediate processor in that, and there's certainly a case to be made to think about sharing the cost of that insurance contract between the processor and the farmer herself.

Julie MacCartee: Tara, did you want to add anything, or shall we move on to another question?

Tara Chiu: I just want to add briefly, because this has come up in the what window, and I think it's an important note, is that for these kinds of bundled interventions, whether it's with a credit product or improved seed or just regular seed, I think it's really important to make sure that the farmer is aware of what's happening to ensure that they are aware that the insurance is attached to that loan, to ensure that farmers are aware how that insurance payment will be distributed, whether it will go first to the bank and then to them, or first to them, and they can use it how they want, presumably to repay the bank. That needs to be very clear to the farmers ahead of time. Otherwise, if it happens in a way that farmers did not anticipate, it could really distort one's – I just have general concerns about that, if farmers don't know what they're buying or how it will work, with regard to that particular product.

But also, it can distort the market. It can make farmers angry at how – and rightfully so – angry at how it happened, if they did not think it was happening that way. So making sure that that evidence is clear and that farmers understand that is important.

And then with bundled products, one thing I've observed in certain interventions is that if the insurance product is marketed with the seed and included in the seed packet, but there is additional action needed from the farmer, either to make a claim or to enroll in the insurance product, if that's not well-explained, then farmers may not know they're insured, or think they're insured, but they haven't actually enrolled, etcetera, etcetera.

So making sure that those things are very, very clear whenever you're bundling, and there is some information about this in the _____ Client Value Assessment tool in terms of ways on that checklist to make sure that farmers, one, know that they're insured, and two, understand how they are insured.

Julie MacCartee: Great. Thank you so much, Tara. We have about ten minutes left for questions, and so I ask the presenters to be relatively brief with your answers, so that we can try and get through at least perhaps three more questions. And I'd also like to call out the fact that we've put up our ending polls on the screen, and so these are always helpful for our participants to answer. Let us know some information about what you got from the webinar today. That would be very helpful.

You can also see on the top left my email address and Kristin O'Planick's email

address. She is the activity manager for MarketLinks. So you're welcome to reach out to us any time with further comments.

All right. So Michael, we had a relatively short question from Michael Abraham. Does a lack of sufficient historic weather data impact efficient insurance pricing?

Michael Carter: I know that being brief is pointed at me, so I'll try. Lack of sufficient data along a series of data going back in time is a problem for insurance pricing, and weather data is often problematic for that reason. As I've mentioned already, I'm sort of from experience beginning to think we really need to look not at an input measure, like rainfall, or even meteorological data, but actually plant growth measures.

The satellites that can be used to estimate NDVI have actually been flying around since the early 1980s. The 1980 satellites were fairly low resolution. But since the early 2000s, so going back 18, 19 years now, we have – for the entire globe we have fairly high resolution, so by fairly high resolution, I mean 250 meter by 250 meter pixel resolution information available. So that's about six hectares, so that's saying you can get a measure of plant growth for each six hectare plot, going back almost 20 years, which actually is more than adequate for pricing insurance.

Julie MacCartee: Thank you, Michael. Let's see. Another question came in from Tilapa, who said that the index insurance yearly threshold, is it decided by the insurance provider or state actors or farmers with the participation of the insurance provider? In a nutshell, who decides what a bad year is and where that threshold is set?

Michael Carter: Is it okay if I speak to that one?

Julie MacCartee: Sure. That sounds great.

Michael Carter: Sure. I think the best way to do this, I mean, you can consider options, so you can have higher and lower thresholds. The tradeoff, of course, is if we – you can imagine an insurance contract that pays every time there's any loss whatsoever. That gets to be a very expensive contract. So there's a tradeoff between degree of coverage protection and how expensive the contract is.

When we began our work in Mali some years ago, we held a series of focus groups with representatives of farmer organizations, and the farmer organizations were able to tell us when our cotton yields go below – I think the number was roughly 700 to 750 kg of cotton per hectare, they said when our yields hit that level, we are in – we are in deep doo-doo. That is, we really have trouble paying off our bills, trouble with our families, and things just really start falling apart.

So based on that information from farmers, we put together a contract that would pay off at that level, and that turned out to be kind of a reasonably priced level as well. So you can – it's certainly flexible, and I think part of a good design stage is to understand the degree of protection that farmers want, and what they're willing to pay for. Again, you can in principle imagine different levels of coverage, and letting farmers select the coverage that they want.

Julie MacCartee: Thank you, Michael. Another question came in from Stuart Collis and was directed at you, Michael. Stuart asks, can you speak to the level of interest from insurance companies and underwriters to work with the types of data being discussed here? What are the challenges to convincing them that these are viable approaches?

Michael Carter: Yeah, I think because of, as I mentioned in an earlier question, the satellite data's been around for a while. I haven't experienced – doing a number of these projects, I haven't experienced any reluctance on the part of insurance companies to rely on satellite-based measures, because the data is there, and it comes in reliably, in most cases on an almost daily basis. So that's not been a problem. I mean, the first project we did – the IBLI project in Northern Kenya, the insurance company said, what if the satellite goes dark or falls out of the sky?

So we had to come up with a backup satellite, and there is redundancy in the system. So – and that actually did happen. The original satellite we were using did go dark, and we had to sort of switch over. So that was manageable, so that's not been a big problem.

Even the audit rule that I described, that actually went through with – I won't bother to name names, but it went through a local insurance – two local insurance companies, as well as an international reinsurance company, and they accepted the statistical calculations that were made based on the probability that an audit would occur. And again, as I said, that was then incorporated into the actual insurance contract and into the insurance premium. So I've found that actually insurance companies are pretty open to working with this data, precisely because it's quite reliable.

Julie MacCartee: Great. Thank you, Michael. Tara, I was hoping to address a question to you from James Wooly, who said, I would like to know about the experience with index insurance in countries affected by recurrent droughts, and also frequent hurricanes and floods. It seems already difficult to design this tool for a single risk, and they're wondering how good it can be for a combination of complex risks. Is that something you can address?

Tara Chiu: I can address, but it's going to seem a lot like I'm trying not to answer your question, and I apologize in advance for that. I think you're absolutely right, that addressing a multitude of very different risks can be very, very difficult. I do think that the first step is to really – any time we go into a newer area and we're thinking about developing a product for farmers or pastoralists, we think about what we try to do in assessment to really understand the risks they face, and to understand whether those risks are something that farmers tend to share together, or whether they tend to be idiosyncratic risks, such as maybe fires or something like that, that might affect a couple of farmers, and not a community of farmers.

So that's a first step in terms of thinking about each of the risks that farmers face and whether or not they affect random farmers, or huge numbers of farmers. And then once you have that, simultaneously doing an assessment of data availability and whether or not a reliable index can be created for those risks that we've identified. And then testing the yield history data, or to see is there actually anything that can reliably predict those things? And I think potentially if you've found a multitude of indices that could cover a multitude of different threats, they could conceivably be combined or separately sold to cover a broader swath of the risk that people face, but initially, those are my first thoughts. Michael or Jen, I don't know if you have anything to add.

Michael Carter: If I could jump in, I think that's a great question. So to me, this is the importance of trying to measure an output rather than an input. So if you can actually measure plant growth, then you're measuring – it's basically a multi-peril kind of insurance. So I mentioned a project that we did in Tanzania. That actually came about because initially, World Vision was working with a dry day index, and the very first year they implemented the dry day index, which was only to pay out when rainfall was scarce, farmers had a flood. And so farmers lost everything, and the index didn't pay, and everybody was extremely unhappy.

When we look down from the sky with satellites, you know, a field – a rice field that's been flooded and washed out, that shows up, right? That shows up as very poor plant growth. So that's the nice thing about trying to get at plant growth

measures, is that in principle, a flood or a hailstorm or a drought, any of these things, which are very different kind of climatic events, but all of which can damage plant growth, and in principle, you can cover it.

Julie MacCartee: Wonderful. Thank you so much, Tara and Michael. Well, we have had a number of other questions that have come in that we've been saving, and I'm sorry that we won't be able to get to every one of them on the webinar today, but we will send them to the presenters to look through and see if we can address some of your additional questions through a blog post on Agrilinks.

And so we remind you that this has been recorded today, so be on the lookout for an email with the recording, the transcript, a transcript of the chat with all the great questions in it, and a few other key resources.

So I would like to extend a sincere thank you to our presenters, Jen, Michael, and Tara, and to the members of the Feed the Future knowledge-driven agricultural development project, who have supported the webinar today, and most importantly, a huge thank you to you, our attendees, for attending Agrilinks webinars, for participating in the chat box, and for really being the reason that we continue to hold this webinar series. So thank you very much, and we hope to see you at additional events going forward.

Michael Carter: Okay. Thank you, everyone.

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