



# **Agriculture Extension and Advisory Services under the New Normal of Climate Change**

## **Q & A Session**

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### **Sponsor**

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*Male:* Thank you, everyone. Now we're going to open it up for Q&A. We're going to alternate between our in-person and our online audience. \_\_\_\_\_, how many do we have on the line? We have 110 people online. Excellent.

So let's start it out. Again, state your name, organization, and then your question.

*Male:* David Schroder, \_\_\_\_\_ Food Security. Frank, you talked about CO<sub>2</sub>, and you had a lot of focus on CO<sub>2</sub>, but we know that the complex nature of climate change is also highly related to other types of gases or vapors. And they actually are much bigger and more complicated than just CO<sub>2</sub>, water vapor, which obviously we have very little control of, and that just exacerbates the problem. So, even though I appreciate that focus, but I think we've got a real problem that we've got to understand that's much more dynamic with water gases, and water vapor particularly, which we don't focus on.

*Male:* Yeah, I mean, the climate change scenario is much more complicated. We didn't realize really until 9/11 the impact that water vapor had on the transfer of energy from the sun to the planet's surface. But when we grounded all of the aircraft in the United States, we saw the clear skies with modern instruments for the first time, and we began to appreciate how much we'd underestimated the impact of water vapor. Particulate is a screening effect. It was actually pollution in the atmosphere is a good thing because it prevents some of that energy from coming in.

We didn't talk at all about the methane issue, and I don't even want to go there because the issue, it gets scarier the more you dig into it. It's a complicated picture. I just would encourage everyone to seek out information. You know, this is kind of an awareness event about climate change, as much it is a programmatic focus on extension and agriculture. But I think all of us in all of our different professions and roles in life going forward owe it to the services we work for and the people we work on behalf of to become better educated and to begin to build in some of our knowledge and responses into the things that we can have control of.

And this comes down to the person stuff, using public transportation. You know, when you're in the hotel, not dropping the towels on the floor. All the little stuff matters because it adds up if we can all begin to get in line and start doing the things we should have been doing all along.

*Male:* We have a question from online.

*Female:* Yes, Francois Lategan from – associate professor in agricultural economics, an extension at the University of Fort Hare in South Africa,

asks traditional land tenure systems and the scarcity of suitable extension technology tend to slow down the rate at which technology spreads amongst communal farming systems. How do we increase the rate of adoption?

*Male:* Well, we're going to have two examples. Do you want to talk about it?

*Female:* I didn't hear all of the question.

*Male:* Okay. It's about the --

*Male:* Could you repeat the question?

*Female:* Sure. It's about how to spread appropriate technology amongst communal farming systems.

*Female:* That's a challenge, and it's going to become more of a challenge. We've been experimenting with use of farmer field schools and on-farm experimentation, and making sure that our agronomists don't deal directly with farmers, except as absolutely necessary. What they do is they train community – elected community farmers, who then train the community in on-farm plots. But it's a critical question, and it's something that national extension services are seeking to improve.

*Male:* So I just want to add a couple comments about that. In the old days, right, when we had a normal client or a stable client, really the acid test is whether farmers came to you. I mean, when you had a really good technological solution, really actually controlling the message was more of a problem than getting farmers to adopt. And we used to have a general rule of thumb that you needed to be able to have a 20 to 25 percent demonstrable impact on the productivity of whatever component we're looking at before you would have large-scale and rapid uptake by farmers.

The challenge going forward is farmers aren't going to be operating in a stable environment. That environment isn't changing, so it's going to be very difficult for them to foresee what might be appropriate and effective under these training circumstances. So, you know, one of the first challenges, and we had it up on one of the graphics, was for extensionists to get the idea through – and talk it through with farmers that the environment isn't changing. It's not a belt tightening. But we'll have to deal with the continual process of change.

And as Gabe pointed out, if you get a disruptive vent, a largely disruptive vent, that actually is a huge teachable moment, a learnable moment where things have happened at such a degree that farmers are ready to try things that they hadn't been willing to try before. And particularly if you have

some demonstration plots, you have a few lead farmers, innovators out there who have adopted a technology, use them as points of diffusion. Bring as many farmers as you can in to see with their own eyes and talk to their colleagues, their fellow farmers about how that new technique, that new practice actually withstood or tolerated or was resilient to whatever impact they had just all experienced. That's a huge, hugely important thing.

Farmers talking to farmers is so much more effective than extensionists talking to farmers. So we have to be able to engage, again, these traditional social networks, farmer innovation, and using this human-to-human contact to the extent possible.

*Female:* Hi. Can you hear me?

*Male:* Yeah.

*Female:* Okay. My name is Syd Hamilton, and I'm a doctor of plant ecology. I'm currently a AAAS fellow in the bio-energies technology office at DOE. And my question is about this conservation agriculture, which is a new concept for me, as well as technology, innovation and implementation. And of course I'm going to be interested in it from the plant perspective. So what are some of the technologies that you find most favorable, plausible, applicable that are specific to plants? For example, synthetic biology or gene manipulation, things like this, or other – using, say, the plant microbiome as a way to develop adaptive, ecological, evolutionary programs for increasing biomass productivity.

*Male:* [Inaudible comment].

*Female:* I'll start, yeah.

*Male:* Okay.

*Female:* The conservation agriculture concept, which I think you said you weren't familiar with, it maintains permanent vegetative cover on the soil's surface all year round. And the – one of the standard combinations is maize with beans, and not clearing the soil residue, but then planting the maize plants into the bean residue. And what we're using more and more, both in Africa and in Latin America, is conservation agriculture under a dispersed tree system. And the key principles are permanent vegetative cover, which increases organic matter in the soil, increases water retention. And the healthier plants are more resilient to climate change.

*Female:* \_\_\_\_\_ that will increase resilience or drought tolerance, per se, or UV?

*Female:* Okay. Not necessarily because in that system, you can apply improved maize and bean varieties that are themselves more resistant at the same time that you're building up the soil properties that help the plants be more resistant.

*Male:* Just want to add a couple of thoughts. As \_\_\_\_\_ said, healthy plants are actually able to tolerate a lot of different conditions. They're less attractive to pests. They're resilient to diseases, in addition to other kind of abiotic stresses.

You know, this is the time to think outside the box, and you're in a great field to do that. You know, whether you're taking the perspective of the Land Institute and looking at taking 100-year breeding program onboard to develop perennial varieties of some of our important grain crops, or whether you're looking at going back into that genetic treasure trove of indigenous crop varieties, this is the \_\_\_\_\_ and the \_\_\_\_\_ and all of the \_\_\_\_\_ millets and sorghum varieties that are out there in forgotten parts of the world, and trying to screen back through those with relevancy to new and emerging conditions because we've never done that before.

We've gone back and looked at these genetic gene banks for what was. We aren't doing that. We're going to look for what is going to be, and that's a great undertaking. There was a – I had the fortunate opportunity to work for a study produced by the – funded by the USA and produced by the National Resource Council called “The Last Crops of Africa”. We went back in and looked at underutilized or non-used \_\_\_\_\_ in semi-domestic crop species. There's a huge \_\_\_\_\_ trove, thousands of varieties out there that can be rescreened, looking at their ability to contribute \_\_\_\_\_ breeding programs for these future conditions.

You may very well find some real gems out there. But some of the modern techniques you're looking at, I'm really not the person you should be asking, but you're asking, I guess, the right questions.

*Male:* Brett, the study you just mentioned, was that submitted to the Development Experience Clearinghouse, or is the findings from that somewhere available?

*Male:* It's a three-volume series. It was done in the early '90s, 1992. The first volume came out in grains, and we ran out of money and couldn't publish the other seven volumes. They sat around for a decade looking for just some money to get the fully publishable volumes out. Noah Veetmar and Mark Dafrin, who used to work for the National Research Council, were spearheading that effort. Bit by bit, additional resources were found, and two subsequent volumes have come out, one on vegetables, the other on

domestic and wild fruit species.

But the material's been out there for a long, long time. It includes nutrition. It includes environmental tolerances. It includes economic potential, and on and on. And there are these big, nice, fat books. You can go to the National Academy of Science Press and buy them right now.

*Male:* Okay. We have a question from online.

*Female:* Yeah, there's a couple about the resources available to extension agents. Kevin Pfath, a Peace Corps volunteer from Jamaica asked what the immediate knowledge gaps for extension are. And Aaron Encliff from Engineers Without Borders Canada, who is stationed in Ghana, asked the – given the decreased investment in extension and the increasing need for different innovative extension services, how to make extension services higher quality and more efficient in their delivery.

*Male:* Okay. So, yeah, how do we do more with less? *[Laughs]* This is the great one to think on your feet with. You know, you can't, in some respects. You really can only do what you can do. And if you're just an individual, or you're in an individual in a small program, then you're going to be working at those kind of levels. Certain of the medias can help us to have farther reach; rural radio.

Farm Radio International has got a 30-year experience with being able to reach farmers, farming communities with relevant broadcasting. Being able to do some of that social surveying first to find out what farmers are interested in. Getting farmers engaged in the broadcasting. So it's, again, farmers speaking to farmers and having live call-in programs.

I was in a lunch meeting in the middle of Morocco, and the guy got a call from a live – a government official got a call from a live radio program with a farmer who had a technical question. And he stepped away from the table for five minutes and gave the answer. It went out over the national broadcast airwaves in Morocco, and he came back and joined us for lunch. But it's that kind of connectivity issue that allows individuals to reach more people than they might be otherwise.

Aaron, I'm glad you asked that question. You know, extension practice, extension education has been the kind of forgotten stepchild of the whole agricultural development enterprise since the very beginning. It's always received the smallest portion of funding, the least respect. We've been asked to take messages that were inappropriate to farmers and have farmers yell at us because they were inappropriate, and not having good information to pass back to researchers or not being able to reach researchers. We've been in a very difficult position.

And I think this – these coming decades are going to be moments when we can shine. I don't have any of the easy answers, but some of the things you're doing in Ghana, looking at the – using the lead farmer concept; in your case, focusing on women in that program. I should mention Aaron's developing a case study, so you'll see this from the \_\_\_\_\_ webpage, a nice case study that's going to be coming out shortly on women farmers acting as lead farmers in their communities to get extension messages beyond the final reach of the public sector extension. But that last kilometer out into the village, out into the field with other women farmers. Again, this notion of farmers talking to farmers about things that matter to farmers and language that farmers use, so important, as long as they're fed with that important information.

The real challenge is getting messages right or mostly right, right? One of the worst things in the world is to be out in the field with the farmers and be very embarrassed because you got a dumb message. It obviously doesn't fit, but that's what you got from the office, and that's what you're taking out because you don't have the freedom to do otherwise. That's the worst-case scenario. You have to get right messages to bring out, and if they're only half-baked, and we're going to get into the habit of delivering more half-baked messages to farmers going \_\_\_\_\_ forward because we're not going to have the time to make them fully baked, let farmers know that. This is an idea. It's still tentative. It's a beta version. It's exploratory, but we think there's some potential here. Do you want to play around with it? Here's ways that you think you might be able to adapt it to your local conditions.

That's really liberating for the extensionists because they're not just reading off the recipe any longer, but they're engaging other human beings in the creative, intellectual process. And I think the more that we can get people's intellect and creativity engaged, the better chance we are in terms of being able to respond to a lot of these challenges we're facing.

*Female:*

I'd just like to make a comment on the content of extension. What I've seen in Latin America with reducing budgets, reduced budgets for extension, is that they're going out with packages. And it's a package for a particular crop, responding to a particular planting, fertilizer, weed pest control. And I think what we need to go back to in terms of extension content is basic agronomy, the principles of good soil management, good crop management, good water management, so that extensionists and farmers have a good, solid understanding of the basic principles of agronomy because they're going to need it. A package isn't going to do it because things are changing too fast, and they need to understand the principles, so that they can adapt.

*Female:*

Could you talk a little bit about the potential for – sorry, Linda Nemic with Accenture, Development Partnerships. Talk a little bit about the potential for using mobile phones, smartphones in the extension service area, having two-way conversations, you know, two-way communication? Because I think that holds some potential that has been piloted, exploited in some places, but really not fully exploited.

*Male:*

I'll make a couple comments, but probably it's good to go back to the Agrilinks site because there are some dedicated sessions and materials on the ICT utilization. Phones are wonderful. We all have – I have three actually. I'll be embarrassed. I have three. But being able to communicate only takes you so far. SMS messages are good for pushing out sort of static information, climate announcements, market prices. For more nuanced sort of needs, a farmers \_\_\_\_\_, forget it.

The ability to have \_\_\_\_\_ call-in centers. You know, I'm Farmer X standing out here in my field, and I've got these brown spots on my maize plants. What do I do? If that's off-center or in any way is not an easy-to-find solution, you're not going to get the response. Yeah, you indicated you can take a picture, send that back. Well, that's pretty expensive. (a) You've got a smartphone; (b) you're paying for a smartphone data plan, two very expensive things. It has to get to the right, relevant person on the other side.

One of the challenges with extension has always been taking standardized recommendation and looking at specific points of application. That only works in so many contexts and so many kinds of technologies. The idea that you'll have a centrally based expert that will be omnipotent in their knowledge of all the local ecologies and needs across the country is fallacious, and we need to get away from that, particularly with examining the powers of this type of communication.

There are needs out there that need to be custom made to each farmers' experience, and we're not going to be able to get that through a call-in show when you start talking about more detailed and nuanced kind of examples.

I've always found that there's three kind of populations looking at this ITC issue. There's kind of the technology – and I don't want to offend everyone – but there's kind of the technology geeks, right, who are looking for – we have the solution. We're looking for a problem to solve. We have the – a lot of the educators that are looking at processes, communication processes, and then we've got this sort of \_\_\_\_\_, right. And it's really important to have these different perspectives in the room together when you're talking about investments or – in program development or application.



I've seen very inappropriate sorts of answers coming out when you've only had two of the legs of the stool present. Things tend to fall over, so it's really good to have those different perspectives there, so you can have some important dialogue going on. It saves – makes it cheaper and you have less expensive mistakes.

*Male:* One of our partners you might want to check out is FACET ICT for Ag. You can follow them on Twitter.

Do we have a question from online?

*Female:* Yeah, there's actually been a lot of really rich conversation going on online, and I'd love to share that with the presenters afterwards.

We've got one last quick question, Teshom Rigasa from UNL asked the climate change is often expressed in terms of the effect on cultivated crops, and I was wondering if you could point them in the direction of the effective climate change on the rate of losses and biodiversity.

*Male:* Well, you know, they're – that's a bit complicated, all right. So there's the temperature issue, right. And \_\_\_\_\_ had mentioned in the case of beans, if you don't have nighttime temperatures that fall below 18C, you're going to have sterilization. You're not going to have pollination taking place, no reproductive excess. So all plants will have temperature bounds about their overall survival and particularly that unique moment of reproduction, okay, their little window of reproductive success.

There's moisture stresses that also come into play, so if you're in area that is experiencing changes in precipitation. And there's some more things you can't see. In the West African \_\_\_\_\_, after 1970, when the water stopped falling from the sky, it also stopped recharging groundwater aquifers. We saw aquifers, groundwater aquifers tens of meters. And you got out of the root zones of a lot of trees that weren't depending so much on precipitation for their survival, but they were getting most of their moisture through their root system.

But you remove that water from the profile, and they died. We had die-offs of certain key species in the \_\_\_\_\_ approaching 80 to 100 percent in some areas. And it didn't have to do so much with the direct precipitation changes, but it had often to do with the loss of that groundwater. So you need to be a bit careful about looking – not careful, but you have to look in all the right places when you look at the impact.

But certainly, as any ecologist will tell you, our vegetative communities on this planet are the result of a lot of factors. There's the abiotic

conditions, soil conditions, rainfall conditions, and there's all the things that people do exert over that, where we allow certain species to live because we cut them down or because of fire or because of grading in other things. And as both of those kind of bounding conditions change, both the biotic and abiotic stresses that are applied to plant communities, we're definitely going to see a lot of transformation and change.

New species, new \_\_\_\_\_ species in particular, annuals, are going to be emerging in areas where they've never been found before. And some of our old friends are going to begin to disappear out of plant communities as whole plant communities themselves change.

*Male:* We're going to take our last question.

*Female:* Are we thinking about how we're making – oh, sorry, Patricia Langan with Making Cents. Are we – as we think about the future, are we thinking about how to adequately prepare future farmers? So are there opportunities for agricultural education in the formal and informal education systems that might be out there?

*Female:* Yeah. One of the things that we're observing is that youth are leaving agriculture in droves. It's not sexy. And so we are trying to find ways to interest them. And the areas where we've had the most success are – tend to be linked to marketing and processing at the end of the value chain, and bringing in some of the ICT aspects.

And at least in Latin America, that is how we're trying to interest them. We're getting them involved in savings-led microfinance, so that they have basic financial skills. And they're not interested in the hard labor that their parents have gone through, but they are very interested in processing, value adding and links to buyers. And so that's where we have been focusing.

*Male:* Yeah. I'm really glad that you asked that question. I mean, we have a horrible legacy with that regard. I mean, when you were bad in an African public school system, you were punished by going out and working in the school garden, school fields. If you couldn't get into one of the other hot, more sexy secondary schools, you had to go to the ag school. It was the sort of the schooling option of last resort.

And so to change that is going to take a lot of rethinking about how we have stigmatized agriculture as being rural, dumb and poor. A lot of the changes that are being forced by climate change are going to do this. Cropping is going to become profitable. You can talk to any America maize farmer this last decade, and a lot of it is policy driven, but it will be less so in the future, they're making gobs of money for the first time in a

long time. And so as that dynamic begins to change, as food security concerns at the family level begin to change, you're going to see the emergence and blossoming of urban agriculture, the peri-urban zone.

You're going to see a lot of more remittances from family members who have gone to other locations, coming back and being invested, not just in a new big house, but in pumping technology, livestock, aquaculture systems, fruit tree plantations. And you're going to see family members reexamining, reevaluating the role and importance of agriculture and sons and daughters choosing to take that on as a vocation, not just as a last result, but it becomes an attractive opportunity.

I can go to the city and be one of the millions of poor unemployed, or I can stay home on the farm and actually do pretty good for myself, and I can keep myself fed. And I don't have to deal with the rolling power blackouts and all of the other things that are increasingly happening in those rural – urban environments.

Anyways, thanks for the question. And thank you all here and those online for coming out, again. We've really enjoyed this, and I hope you learned something, and we can keep in touch afterwards. Thanks.

*[End of Audio]*