Agriculture Sector Council Day Break Seminar

Applying Peanut CRSP Research to USAID Initiatives

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Presentation transcript

Participants

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Sponsor

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Male: Good morning, everyone. Welcome to the Ag Sector Council seminar series. My name is Zachary Baquet, I'm the Knowledge Management Special for the Bureau for Food Security, who is supporting this seminar series. I'd also like to thank the knowledge-driven micro-enterprise development project that helps us put on this series and makes it available online, for those who are participating online via webinar.

This is the October Ag Sector Council. It's applying Peanut CRSP research, our collaborative research support program research, to USDA initiatives. I'd like to point out that the next Ag Sector Council will take place November 30th. This will be done by Dan Goodall with WinRock. He's going to be talking about USDA collaborative efforts towards transformational, scalable, and sustainable change in rural Bangladesh.

This is going to be going over what's called the REAP Project, or the Rural Enterprise for Alleviating Poverty project in Bangladesh. So that should be fairly interesting. Also, in addition, I'd like to point out and highlight the AgriLinks blog. AgraLinks is where you'll find all these past Ad Sector Councils, as well as information about future Ad Sector Councils, as well as other AgraLinks sponsored events. We also have a library on AgraLinks that has additional resources that you can – if you join Agra Links – you can comment on that, upload your own resources as well as upload events to our events calendar.

But I'd like to highlight our blog, which has become quite active. We recently had several posts from the Ag Share Fair. This is a sort of knowledge-sharing conference that took place in Rome at the end of September. It's jointly put on by IFAD and others to share knowledge around agriculture. We had members of the KDMD that participated in this. We're sharing their experiences.

So I invite you to check it out, as well as be able to comment on it as well. With that, I'd like to invite Joyce Turk, senior livestock specialist for the Bureau for Food Security and also the USA manager for the Peanut CRSP, to introduce our speaker, Tim Williams, for today's talk.

Female: Thank you, Zachary. Is this on? Good morning everybody, thank you very much for coming today. It's my pleasure to introduce to you Doctor Tim Williams, who has, for 40 years, driven to achieve public health and development goals through research on peanut science and a peanut value chain. Tim received his PhD in Crop Science from the University of Rhodesia – now Zimbabwe – and afterwards, he joined IPERSAT in India, where he spent 9 years leading the peanut research on drought, plant nutrition, yield potential, and genotype environment interactions.

Following his service to IPERSAT, he spent six years at the Sahelian Center in Niger. IPERSAT as well. Researching peanut, cowpea, and millet cropping systems. Tim joined the University of Georgia and the Peanut Collaborative Research Support Program in 1995 and became its director in 1997. He has focused on streamlining research management, and on the market and use aspects of the peanut industry.

His current professional interests span the entire peanut sector, and opportunities to involve agriculture in the realization of good health. He has developed a strong interest in microtoxins, particularly in the prevention and the chronic health effects of human aflatoxicosis. His research has established that aflatoxin is immunosuppressive, and is exasperating the HIV epidemic, vitamin deficiencies, and malaria in Africa. Under Tim's leadership, the Peanut CRSP has become a world leader in documenting human exposure to, and the public health consequences of, aflatoxin.

He has authored over 130 publications in scientific journals and book chapters. He's also responsible for numerous inventions placed in the public domain. Among these is a soil moisture probe that he co-invented in 1985, and which NASA recently selected for the most recent Mars probe to confirm the existence of water on that planet. With that, I would like to turn the mic over to Doctor Williams for his presentation this morning.

Male: Good morning. I'm going to talk to you about the program that I've become involved in. I'm going to focus not so much on the science, but on the applications of this to what USAID's present initiatives are. Now, the presentation is going to be divided into four sections. We're going to go

through a set of introductions, so that people understand what the CRSP program's all about, what peanuts are about, and what the present CRSP program involves. I think I move on and look at Peanut CRSP experience and expertise in terms of production, processing, nutrition and child survival, and microtoxins.

We will then take some examples of what we are doing and how we are contributing to USAID's mission, and we are going to then go on and look at some policy recommendations that evolve out of our research and out of the knowledge that we develop. This is just a picture of an African market sharing peanuts and the people that are involved in peanuts. When we look at the collaborative research support programs, which is the acronym, CRSP, we find four really important parts to this.

There's ten different CRSPs. They are all titled __ programs that are deploying US university expertise for development. They're all long-term programs. I'd like to stress the importance of long-term in Ag Research. We have – Everyone got really excited by the green revolution. The research for that started 20 years before. Bolog was starting his research in the late 40s. It took him 20, 25 years for that to translate into what became the green revolution. It's a partnership.

US universities are partnered with developing country's institutions to develop capacity to develop technologies and knowledge. Something that is inherent in, and required mandate by Title 12, is that there are mutual benefits in the USA as well as in the countries that we target. Now, this is represented here. This sort of lists the players. We've got, essentially, four parts of our network. US universities, host country institutions, US AID, and we've got development partners.

Through the ten programs, we have a network of some 500 different institutions that participate. We involve in 70 countries and we have a whole slew of participants that are involved in development in one way or another. Now, moving on to peanuts, to introduce them. A little peanut goes a long way. The adage that if you're feeling hungry, you just take a spoon of peanut butter and it will fix you for hours. There's good physiological reason for that.

Peanuts are actually about as rich in protein as vegetable crops get, about 27 percent protein. The protein is of good quality. It's balanced enough. It's for adults. It needs supplementation for some amino acids for children. It's high in oil, and that's reflected in the calorie content. This is good quality oil. It approximates to olive oil, in terms of its characteristics. It has a high value in the marketplace. It also has great health properties. People that eat peanuts actually have about half the heart risk of people that don't eat peanuts. It has this high satiety.

We started working on that to try and understand the opportunity for peanuts in hungry parts of the world. It also has significant neutraceutical properties. It drives public health, largely because of the low glycemic index and some of the protein structures. Despite all the oil in it, it actually combats obesity. That's because of the satiety effect. People don't snack so much.

It also is a great food for diabetics. That is something that can be exploited as the increasing epidemic of non-communicable diseases is reflected in podiatry changes. It's also a good intervention for blood pressure. It has high ____, which, as it's processed, releases nitric oxides and essentially does good things. It also has bioactive peptides that come from the proteins and digest. These are comparable with ace-inhibitors that are regular prescribed products. It has special nutritional values, which get used in a large – To the effect as an RUTF for babies.

It's significantly being used in the Horn of Africa at the moment. It also has flavor. You can have a whole diversity of flavor to it. I did not include antioxidants in there, but I should have. Now, peanuts in developing countries are, in a way, where I come in. I started in a developing country. But peanuts are the second most important legume worldwide. There's only more soybeans. If you take out the industrial farming of the Americas, there's actually more peanuts than there are soybeans worldwide.

It's mostly produced on small farms. It's mostly in Africa, at least, produced by a woman. They produce it. They market it. It forms, very commonly, the major source of cash. As an example of this, last week I was talking with a Minister of

Agriculture from Kenya. She asked us that we increase our effort in Kenya, because she recognized the importance of peanuts. She told me that her mother put her, the Minister of Agriculture, through school by buying peanuts, shelling them at night, preparing them, and selling them on the street. That is how.

That is typically how peanuts are in African economies. For that reason, a lot of the production and a lot of the economic value actually flies under the official radar. When we look at peanut production across Africa, there's a huge yield gap. We know that pretty much anywhere in Africa, we can increase yields three to four fold. It's not hard to do. Three or four key interventions will do it. And then, the final point, peanuts are consumed mostly where it is produced. It is consumed locally and it's often part of the daily diet for Africans.

Now, the peanut CRSP right now is a consortium of 11 universities in the USA, operating and collaborating within 11 countries. Our program addresses the full value chain, production, market development, market access, the nutrition. These two, nutrition and microtoxins, are important, because that is necessary to drive and sustain and expand the market. Throughout the whole thing, we have a capacity development emphasis. A lot of what we do is very relevant to Feed the Future. Out of the countries, our two major centers where we invest the majority of money are Feed the Future countries – Ghana and Uganda have three-quarters of our investment.

Now, put this into USAID's strategic objectives. We respond to four of those objectives. Three of them. We relate to and contribute to increased food security, sustainable economic growth, and we're going to help promote global health. In terms of the metrics that USAID has articulated, we're going to help increase the purchasing power for 18 million women. We could do that just with peanuts. I'm not saying we will, but it is possible to do that just with peanuts. We can help prevent stunting immortality through better nourishment.

This is a great food. By having increased – or even just by documenting the peanut in the economy, we would establish increased gross domestic product. On the health side of it, part of our goal is to increase maternal and under-five

mortality. Our program, particularly in the area of the microtoxins, can do that. I think we can contribute, if there's supporting and increased effort in this area, we can help prevent HIV infections. We'll come to that later. Rather than treat HIV or TB, we can contribute to the prevention of it. That's a big opportunity for an Ag program.

Now, let's look at our experience and expertise. It falls into those four major areas: production, economic development, nutrition, and microtoxins. In production, I said earlier we can increase yields two to three times for African farmers. We're doing that in Ghana and in Uganda. In some cases, it's achieved through locally produced fentrocides. Soap, actually provides fentrocide, as you can see here. That is the result of applying a solution of soap, while the picture above it shows the difference between reset-resistant varieties and susceptible varieties. Reset viruses can eliminate yield, but probably, without resistance, you will achieve 20 percent of what you would achieve without the disease.

We have these programs happening. We have done this kind of stuff in multiple locations. Processing marketing. Our first efforts focused on cleaning up aflatoxin to allow market access. But we also developed what we call "an incubator model". This developed in the Philippines, where we put people together and do the research needed by industry to satisfy their program. Through this, we actually got – over the time we were in the Philippines – converted them from being a peanut exporter to being a peanut importer. We're doing this same type of stuff in Uganda, Ghana, and Guyana.

What it's allowed us to do is to put products and increase the incomes of women through that. Accessing supermarkets, accessing street vendors with stores. Now, in the nutrition and child survival area, we started focused on use of peanuts in weaning food. In that area, we had, in conjunction with the peanut __ CRSP, we had research in Ghana that was deployed in 1995. From 1995 to 2002, the admissions of underweight, malnourished babies to hospitals went from having eight wards, in the hospital that we got some of the feedback data, to, by 2002, having no one admitted ever.

The whole management is now based on teaching people to use their peanuts, their cowpeas, and their corn to make a weaning food. We are involved in

therapeutic foods. In the Philippines, we developed fortified peanut butter that delivers vitamin A to many thousands of children. We have a school snack effort that's in Guyana – we'll talk more about that later. In the non-communicable diseases, the heart health, diabetes, that area – our research on satiety, generated as a co-product data, showed that this is a heart-healthy food.

In actual fact, our data allowed FDA to award the whole nut industry a heart health claim. I think there's 17 claims for health foods. That's one, in part, because of what we did. But the value of that, to the American peanut industry, is estimated to be $500 million a year. Peanut consumption was on a downward trajectory, because people were worried about the oil in it. We turned that around. Now, this information is used to actually market peanuts as a healthy product, and production and consumption have increased significantly since the mid 90s.

Now, in the microtoxin area, we have to recognize peanuts as affected predominately by aflatoxin, but more recently, we got engaged in fumonicin, which is a __ specific toxin. There are about 4.5 billion people that are facing uncontrolled exposure across the world. I'll show you, in the next slide, where those people are. They come from – Toxins are produced by fungi, which affect corn, peanuts, rice, ___, and many other products. But those are the major sources, because people eat so much in those stables.

Microtoxins impact nutrition, immunity, and trade. Now, trade is actually the least important part of this. I'm quite sure of that. It's when you start seeing what this does in nutrition and immunity that you say, "Wow, this is something that everyone needs to take into account." Now, the data that we've got, we've been able to show that there's suppressed immunity associated with high exposure to aflatoxin. This decreases vitamin A, E. Other people have shown C. In animals, zinc and iron is impacted.

People with high aflatoxin also have a greater chance of having active malaria because of the suppressed immunity. We see and we leveraged an NIH trial that was looking at maternal anemia while looking at pregnancy outcomes.

People with high aflatoxin – mothers – had more maternal anemia. We had more adverse birth outcomes – underweight children.

There is also evidence that the British have generated that there are legacy effects. Children born to mothers exposed actually are stunted and have a greater chance of being stunted. Across the world, aflatoxin exposure in children is linearly related to the Z spores. The more toxin they've got, the more likely they are to be underweight and stunted.

Now that's where aflatoxin is uncontrolled. It's a huge area and there's no country that USAID is concerned about where this doesn't apply. Let's move on to application examples. In Guyana, we started working. We were invited to go and help them set up in a remote part of the country and get in at production to happen. This is the area involved. The southern third of Guyana. It's remote.

You get to it at the end of an eight hour drive through what has been used by TV for those monster rallies where the cars sort of float down the river – all that kind of stuff. It's pretty remote. After two years, we knew that we actually had to develop new markets because the production was changing so quickly, that we very quickly were going to satisfy import substitution ___ that was available.

We looked around and we chose to change the school feeding program to base it on peanuts rather than on milk and biscuits, which were imported. Locally, they could grow peanuts and potatoes. We went through a process with that. Two years ago, we were feeding 2,750 children in that region. The program was expanding. It was employing women to prepare foods. We had 27 little cottage industries that we're operating. Because we had a market that was there, we had people coming, all the money that was being spent for the school feeding initiative actually remained in the community. So there was this huge multiplier effect, probably a tenfold increase.

There are now people with – particularly because of this, the main part of this, the certainly visible part of it – housing has changed. School attendance is better. We're going to come onto that. This here is a demonstration of it. We had increased production, which was threatening a surplus, so we looked. We

could accept that and let prices drop, which undermined the opportunity for production. We went and established that new market. We had to get some policy changes, which resulted and allowed new users involved in the industry establishment.

We created that, and with more women being employed. The nutrition of the children was improved. There was better attendance. The overall economy was enhanced. We ended up with secondary markets, because now we had little factories in the region. They could take their product and sell it on the roadside or through the local trading stores. At the mission they joined us, they ended up supporting the production of – the establishment of – a little factory. This, here – at the opening ceremony – they dressed up some little school kids as peanuts. That was one of them.

Now, if we move to Uganda, we have a program there. It's focused on crop improvement in one part. The other part of it is focused on dealing with the aflatoxin burden. But, looking at the production, our program started and enabled, in the first instance, the National Program to Test and Evaluate icrosaporieties. They, at the same time, started developing the capacity to make their own crosses. Now, they are a full-fledged ___ program. They've released six varieties that cover some 60 percent of Uganda's peanut production.

An independent economic assessment indicated that this is worth about $47 million per year. The money that we invested in it has been, over 10 years, about $1 million. That's a good return on that investment. The technologies that we've developed, the varieties, are now being distributed to the neighboring countries. We anticipate that we can have benefits in Kenya. We can have benefits in Tanzania and in Rwanda.

The national programs, actually, have never gotten seriously involved in peanuts. Now, if we move on to the global, I want to talk particularly about our toxin binding technologies. At the very beginning of our program, we established – found – that oils being produced in villages in Senegal were contaminated with aflatoxin. We were trying to find a way to address those.

Tim Phillips in Texas worked with it and found that the aflatoxin bound to certain minerals.

From that, we got involved in the binding technologies. These are safe products and finding technologies were added to cattle feed. The USDA got excited about it. We now have a major impact in the ___ industry as a result of this. Because between 40 and 60 percent of all commercial feeds, worldwide, use binding technologies – either one that we discovered or comparable product. It established a whole model, a way to develop this stuff. It is actually a very simple technology.

This product just gets added to the food – quarter percent, half percent. We'll bind the toxin. We are working now to try and translate that to human application. We have shown that it's safe for humans. We've shown that it is effective and that we can, for something that is comparable or cheaper than salt, we can protect people and we can protect the immunity in their nutrition.

Now, moving this to policy recommendations, I want to start with the microtoxin thing. We need to control microtoxins. I want to talk a little bit about the options in that, because we have a cascade of effects. We are going to improve child health. If we control Africa – the microtoxins – we can have such a broad impact on public health. We can change – just going down the thousand day-to-day consequences. Protecting mothers. We'll protect the fetus while they're nursing. They have mothers.

Mothers, if they do consume the toxin, they pass it on to their children through the milk. Studies that exist say that up to a third of mothers' milk in Africa would not be saleable by a dairy in the USA or Europe. It is contaminated. Babies' livers do not have the ability to process that.

So we have this – This 1,000 days is critical for many reasons, and aflatoxin is a factor in it. Now, when we look at aflatoxin management, there's a whole array of tools. I want to stress that none of these methods are 100 percent effective. You can have something that is clean, and a week later it can be contaminated because something went wrong in storage, or it was put in a moist, humid

environment. There's varieties that we can exist. We know how to find them. We could find them better with genomics, and that's something that we're working on.

There are varieties. There's a competitor fungi opportunity, where fungi that don't produce the toxin have introduced and grown in the field to stomp out the opportunity from harmful, dangerous ones. Irrigation is an important opportunity. Drought, in all crops, promotes aflatoxin. And then there's integrated __ management, because that works. Damaged pods are ones that the fungus can infest and grow in.

Then we get round into harvest. We need to manage moisture. We need to get the crop from wet to dry really fast. Timing of harvest is important. Harvest methods can change and influence this. Then we come to post-harvest with the storage. We have got removal options. Now, American peanuts get sorted at least five times before you eat them. They systematically work to keep and remove the crops.

Now, the technology that we bring into this – we have worked through many of these tools, and we have them as part of the toolbox for management. The one that is not widely recognized is a toxin binding agent. This technology is used, and it's recognized by the EU as a valid technology to address animal feeds. What it does, and what's important about it, is that it allows you to recover contaminated food, at least for animal use.

There are people in the States here that actually look around when farm produce or stuff that's in silos gets contaminated. They buy it at a huge discount. They add clay to it. They feed it to the cattle. The same applies to distiller's grain. This technology can be used to recover distiller's grains which have concentrated levels of aflatoxin. Now, I want to move on and look at this correlation between corn and HIV. I discovered this correlation because I was working down the hypothesis that because we suppressed immunity, we should see this is in the incidence of infectious diseases.

You can see that in actual fact, infectious diseases across these – The only one at the top level aggregation of transmissible disease, maize is the one. The maize is only and specifically correlated with HIV. That is a correlation, and we have to consider causality, which we will come to. We'll do that, perhaps, in discussion. But the other thing I want to show on this is this relationship between a particular cancer, a esophageal cancer, was discovered to be also correlated with maize in South Africa. They're working with a very small population. They established that another microtoxin, fuzerium, is the cause of that accelerated disease instance. Now, if you're looking at aflatoxins, you should actually see the liver cancer being promoted.

If the world is exposed to aflatoxin, liver cancer will be your indicator. You can see this in the rice, in the peanuts, cassava this list, because much of cassava is eaten dry or wet. Only the dry version will carry or has the risk of aflatoxin. Maize, in contrast, actually is negative, despite being a major purveyor of aflatoxin. That happens because people don't live long enough to get it.

Liver cancer is manifest after 50 years of age and people have usually died earlier. The lag time on the esophageal cancer is much shorter. Now, what does this mean? I think for USAID, we need to take a holistic view of microtoxins. We need to, A, remember it is most important for health and nutrition. The __ pod, I think, is smaller. I think, very clearly, is smaller. If you sit down the estimated cost of aflatoxin to trade was $800 million.

What is the cost of 43 percent of the burden of disease being modulated by that? You're starting to talk millions of people, not hundreds of thousands of people. I think that for USAID, you need, with a program in HIV, TB, and malaria. They need, at least, to have a metric of aflatoxin exposure. I think that's really important, because when you start doing that, you start understanding – or at least be able to discount it – as a factor. The same thing applies for nutrition.

Now, I think we aren't there yet, but I think the binding technologies can be a stopgap to that. I think that to go through the conventional approaches to food quality with aflatoxin in food insecure situations, we're talking about a 10 or 20 year horizon. We can, if we wanted, deploy this clay within a few years. We

already have trials that show it's safe on humans. We've got trials showing it's effective on humans.

We need to have more trials so that people understand and there's a weight of evidence that this is not just peanut CRSP that's promoting this. We need for that to happen. We know that it's going to impact child standing because of the linear relationship between exposure and disease scores. From our data, we know that we're going to change birthrate. We're going to improve our childhood nutrition. I think it's really important for the Thousand Days.

I think, here, we need to remember that peanuts are within the context of multiple things. We can change production, but we have learned that we have to actually involve the whole continuum. We have to take a big picture on that. Peanuts are not in isolation. They're relevant to health. They're relevant to many things. On a countdown – nearly there.

I think our projects need to have that broad approach, and I urge that, as the Feed the Future tries to focus us, that we actually have some space to look at the bigger picture of where we are. We need to, at the CRSP, think about policy as part of the environment that we're working in, and perhaps have more programs in that area. I think, finally, emergency food – Peanuts are a great opportunity.

Peanuts are used in RUTFs because they are so energy dense. We have a program that's looking to join peanuts with other local ingredients to make lower-cost RUTFs. Right now, the limitation to the amount of children that can be saved is cost. And that's largely driven by the milk component. If we can greatly reduce that milk component, then we can actually treat more people. Then, we also have the opportunity to provide protection and cross-protection from other contaminated foods by adding the clay as part of the mix.

Now, in the emergency field, peanuts are particularly important because they deliver a low payload effect. There's twice the energy and four times the protein in peanuts as there are in a maize-based intervention. I think another very important thing in that first wave of response to a crisis is that peanuts

have a very low energy requirement. Peanuts can be eaten raw without detracting from their food value. In actual fact, a lot of peanuts worldwide are eaten raw anyway. People choose to eat them raw.

But if you choose to roast them, it takes a fraction of the energy to prepare them that you would spend on preparing beans or some other maize-based product. Peanut butter is curiously a great opportunity to manipulate bacteriology. We have unsafe waters. You could actually address some of this by putting peanut's probiotic bacteria into peanut butter. They survive in there. In the States, we had that issue of salmonella.

The lesson from that, for me, is that this is a good place to put bacteria. Those bacteria can also be vaccines. We could deliver live vaccines through peanut butter, perhaps without the cold-chain. Finally, as we move towards time of plan for the next five years, we set up a meeting to Bureau of Strategic Planning evaluation of where we are. This is going to be done in Malta, not because it's a holiday resort, but because it's actually cheaper than doing it in Washington. It's 10 percent cheaper to be there than to be here. The majority of the people we think are going to come to this meeting will actually come out of Africa. It's a place we can bring them and that is where we are. If people are interested to join in this, we would be very happy for them to join us as we consider what next to do for peanuts. Thank you.