TECHNOLOGIES FOR MANAGING FALL ARMYWORM: LESSONS FROM BRAZIL

PRESENTATION TRANSCRIPT

AUGUST 22, 2018

Presenters

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Julie MacCartee: Good morning, afternoon or evening everyone. On behalf of Agrilinks, Feed the Future and the USAID fall armyworm task force I would like to welcome you to today's webinar on technology for managing fall armyworm. This is the first in a three-part webinar series on three consecutive Wednesdays and we hope you will register for the other webinars as well which will cover a suite of dissemination tools next week and the essential issue of pesticide use to combat those pests in two weeks. And you can find links to those webinars in the box at the bottom left of your screen and we'll also make sure to highlight those in the chat box.

So my name is Julie MacCartee and I'm a knowledge management and learning specialist with USAID bureau for food security and I'll be your webinar facilitator today. So you'll hear my voice periodically. Session at the end. Before we dive into the content, I'd like to go over just a couple of items to orient you to the webinar. First, please use the chat box to introduce yourself which many of you have done already and let us know where you're joining from. The chat box is your main way to communicate today and we encourage you to use it liberally to post your questions at any point, to share resources and to discuss this topic with your colleagues. We'll be collecting your questions throughout the webinar and we'll answer some of them along the way and the rest we'll hold till after the presentations.

You'll see that there are several key resources available for download in the downloads box on the left of your screen. If you'd like to grab a copy and all of those resources are also posted on Agrilinks, our fall armyworm resources page. Lastly, we are recording this webinar and will email you the recording, transcript and some additional resources once they're ready. And those will also be posted on Agrilinks. Ok.

To bridge into the content, I am going to pull up two poll questions that we had just a couple of minutes ago at the beginning as you were joining and reveal the answers to kind of get us rolling into the fall armyworm content. So just a moment. We are pulling these up. The first question is to test your knowledge of how fall armyworm effects which crops and to reveal the answer. For the first question, it is actually more than 80 different crops including grasses so quite a pervasive pest.

And for the second question, what is the economic value in USD of crops damaged by the fall army worm annually. And we actually – actually $6 billion which is a crazy answer. I see most people selected $260 million. That was actually my guess. But $6 billion is the correct answer. All right. We're going to go ahead and hide these poll questions again.

And next I will be bridging into our speakers. So I'm going to introduce our initial speaker who will be giving an introduction and then he will introduce our further speakers. So I would like to pass the microphone on to Brian Conklin who is a senior ag advisor for the fall armyworm team at USAID. And he'll be giving an introduction to the topic and to our speakers. Brian?

Brian Conklin: The fall armyworm. Great. Did everybody hear that introduction? It sounds like my microphone was just turned on. I want to welcome everybody to the first of three webinars dealing with the fall armyworm. This first webinar this morning is going to highlight key agriculture technologies that can be used to control the fall armyworm. Our session will also revisit a recent study tour in Brazil where African policymakers had the opportunity to see the impact of these technologies firsthand.

Brazil's story is one of agricultural transformation. Fall armyworm is the number one pest confronting farmers of Brazil. And yet despite this challenge, Brazil has increased its productivity fourfold in the last 40 years and is set to take of US maize production in the next three years. Brazil's agricultural transformation and access to innovative technology came about through key changes in its legal and regulatory environment. These changes open the door for private sector investment and the technologies that follow. And so, policy leadership is critical if these technologies are going to be available in African countries.

And I think that's the gist of where we're leaving in today's webinar. We want to highlight these technologies. You'll be able to see the advantages. You'll be able to see the weaknesses to some of the technologies. But you have to realize that none of these technologies would be, are going to be available if there isn't a press to making open and transparent changes within the enabling environment for private sector investment.

Our first speaker this morning is Dr. Joe Huesing. Dr. Huesing is USAID's lead scientist and entomologist for the fall armyworm team here in Washington. And he's going to be highlighting this list of technologies being used to address the fall armyworm all within an integrated test management framework. Our second speaker will be from Embrapa. Embrapa is Brazil's premier research organization. Dr. Antonio Purcino is a scientist and director of Embrapa Maize and Sorghum. And Dr. Purcino will highlight Brazil's policy leadership and investments and research that have helped them deal with fall armyworms.

These presentations and resources highlighted in the webinar today are going to be available and posted on the Agrilinks website along with the resources that will be highlighted in our webinar a week from today. And so, we're going to encourage you to tune in for the next two Wednesdays for webinars that are focusing on fall armyworm and tools that will help you deal with this pest effectively. Thank you again for joining us this morning and with that I will turn things over to Dr. Huesing. All right. On to you, Joe.

Joe: Good morning. Good afternoon everyone. What we're going to do this morning is two things. First, I really want to review a little bit about what we have been doing to build the response and it will be a little bit of review. But each time that we have these discussions we dig a little deeper into the response. And then also outline for you where we are in terms of building the toolkit. I want to remind everyone that a group of international experts including a lot of African scientists, US land grant university scientists put together the fall armyworm in Africa IPM technical guide. Follow the guide. This is a doctrine for the US government response to the fall armyworm.

And really the story is twofold. First, it's one of mitigation. That's the tools we're going to discuss but it's also one of transformation because what we've come to appreciate especially agronomists in the room that we probably should do a better job with our small holder farmers in teaching them basic agronomic practices. Our responses based are on integrated pest management. And this is the IPM triangle. This triangle should be your framework. I'm going to use a pointer here. I hope some of you can see it. Ok.

The triangle is not prescriptive in a sense that where each of these pieces belong. But what helps frame the triangle is what we call your protection goal. So for low resource farmers, commercial farmers in Africa, the protection goal is maize grain. That's what we want to protect. Therefore, it makes logical sense that the basis of the response to this pest is host plant resistance. And I'll remind everyone that host plant resistance includes both conventional breeding as well as biotech solutions. In the Americas, Brazil and North America, over 85 percent of farmers choose biotech as their response to this and other pests.

Another important component of biotech – or I'm sorry – the integrated pest management triangle are cultural controls. Sometimes we also call this landscape agriculture. If farmers don't choose the right genetics, if they don't adjust the ph of their soil, if they don't use fertilizer they're going to have a very difficult time controlling this pest. Another important component of the IPM response – and my screen is frozen here – ok. Is biocontrol. And these are things like ants and little wasps that also attack the fall armyworm and suppress those populations. So in many instances you don't have to go to the final solution which is typically a pesticide treatment.

My screen is frozen. Ok. So I want to remind everyone that integrated pest management is really about economics. Some of you have seen this slide before. You'll see across the bottom in that slide is time. That's the time that a pest population can build. And then across the vertical axis is the number of pests. So you can kind of see that little sort of wavy line. What that suggests is that pest populations build throughout the season and there will come a point called the EIL, the economic injury level, where the cost, where the loss in grain or the loss in yield is equal to the treatment.

Let's say you lose $10.00 to the pests or the treatment costs $10.00. That's a break even point. If you wait until that point to treat or to do something you'll be too slow. And so, we have this concept known as the economic threshold. That's the point you need to act. In Africa, that can be a real challenge. It may be as much as a week before you can come in and treat for this pest. I also want to remind everyone that doing nothing is also an option but doing nothing also has a cost.

The key to this campaign is to scout your field, scout, assess, decide, scout, assess, decide. If you look on the left where it says pre-scouting, there are a number of things that you have to do prior to assessing your field that can set you up for success. And again, these are things like the agronomics, fertilizer, etcetera. Choosing the right germ plasm host plant resistance. Using the right and appropriate type of landscape management. Dr. Antonio will talk to you at length about that and how Brazil has done that and then also then biocontrol options.

You've planted your field. You've done everything you can and now you go out every week and you check your field. You look for this pest. And there's going to be one of two things that happens. Either you don't have a pest problem or you do. Now you've got to decide to do something. This is your economic threshold, your economic injury level. And typically, the way that these, that the response is written is that you would spray a pesticide. Remember, the way we're setting up integrated pest management to use correctly is we don't want to spray. So we want to take every opportunity to decide not to spray. But at the end of the day, many people will have to.

Much of the rest of the seminar or a good part will be talking about those tools, pesticides is a big one but also mechanical controls and biocontrols are also things that can be used. Please don't be confused by the user of the word biocontrol in two different places here. I'll explain that in just a minute.

Next slide please. This is a technology table that we're building. It will be evergreen. This is not the last version of this that you will see. I'm just going to quickly walk you through this so that you can make sense of it. On the far-left column are the technologies, host plant resistance which I've mentioned. And then the technologies are further broken down where there's additional choices. So there's conventional resistance and GMAs for example. And then there's your chemistries, your biopesticides, botanicals such as NEEM and others, biocontrol and landscape management.

In the next column we outline efficacy. This is just a relative scale of the efficacy. Four is the best, GM crops would completely control those pests. Other solutions will work as well but not quite as well. We then talk about safety and throughout the table we'll use a combination of colors. Green means you're rock and roll. Yellow means you need to be a little careful or there's some issues you need to address. And then red means watch out. So for conventional pesticides, personal protection, personal protective equipment is important.

We then add a set of columns on cost. I think that's self-explanatory. And as Brian mentioned that final big block there needs prior to implementation are largely around things like infrastructure and policy. So for example, GM crops, even though that's the major way that farmers in the Americas control the pests is an issue in Africa because policy needs to be addressed. Likewise, that's also an issue although not as great with pesticides. Next slide please.

What I want to do is maybe talk about two or three of these tools just to kind of walk you through the kind of decision process you'll use as a practitioner. This is host plant resistance, conventional, genetically modified. There is a lot of good germ plasm out there with decent resistance against the fall armyworm. It can be effective and it's very safe to use. A farmer just puts a seed in the ground essentially. Some of the constraints however are that these technologies are largely in hybrid maize and they're regulated. These are regulated articles of commerce. Even conventional seeds are regulated. And so again the policy issue is a big one here.

Next slide please. I want to talk about two different types of biocontrols. There's natural and there's augmentative. And so, a natural type of biocontrol is what you see here. These are all the good what they call the so-called good guys, ants and ladybird beetles and things that will feed on fall armyworm. But of course, every technology has its ups and its downs. The ups on this is that they do feed on fall armyworm. The bad side is they feed on everything. The good predator insects will also feed on other predators. They tend to only be really effective when pest populations are high. They're also very hard to predict in terms of their efficacy.

Next slide please. Biocontrol can also be used almost like a pesticide. This is an example that Brazil uses, trichogramma. This is this little tiny wasp that gets onto

eggs of the fall armyworm and stings it and effectively kills it. And these are released inundatively weekly. They're raised in what in what is called a biofactory and they're taken to the field and the timing is pretty critical for their use. Now the constraint to that of course is you have to have a biofactory. These are also regulated and there's a lot of infrastructure in terms of perhaps getting these to the field. So again, this is another consideration that you need to make.

Next slide please. The biggest part of this response as you might guess, in the absence of conventional or GM technologies are pesticides. And the key things that we have to address here are the active ingredient. What you're spraying is important. All homeowners know this. Efficacy, hazard and exposure, how poisonous is it and will I be exposed to it. Quality is a big issue across the continent, fraud as well as cost. And I kind of like just broke this into maybe three categories.

The first are the synthetics. There's some very, very good new chemistries coming out. Fortenza Duo is one. Uphold is a misspelling there is another. These are primarily based on biopesticide type formulations as well as with other formulations that will make them very effective. There are botanicals. You all know these. NEEM is probably the biggest one that's used. Just remember NEEM is based on an active ingredient as a direct – if people brew this up on their farm you don't know what the level of that active ingredient is. There are others that are being used such as . Just recall even though this is a natural pesticide it does kill fish. It's very toxic to fish. And finally, there are several good biopesticides that are available and this is something that we're working on right now with policymakers.

Next slide please. Where we're at in this campaign – one before that. Where we're at in this campaign right now with the pesticides is at the risk assessment and field data stage where we've gone in and we've looked and we're doing this work in conjunction with USDA FAS as well as University of Oregon, University of Florida where fall armyworm is endemic as well as our own BEOs and MEOs in the bureau. We've looked at 61 pesticides that are recommended against fall armyworm. We've identified eight already that are highly hazardous. We want those to go away. We're working with policymakers on that.

We've got another bucket that have a high risk to either aquatic life, wildlife, pollinators or biocontrol agents. We want to limit their use. We've scaled this bucket down to 10 to 15 that are lower risk for especially low resource farmers. And finally, what we're trying to come up with is this list of six to ten efficacious low risk pesticides that farmers can use. And remember for our clientele, Africa has a lot of very good commercial farmers. It has a whole lot of low resource farmers that don't have protective equipment. They don't have training. And this is a bucket of materials we want to use for them.

So in conclusion – last slide please. Follow the pest management guide. There are a lot of guides out there. This is a guide that's our official doctrine. All of our supporting material, pest management decision guides, etcetera that will be talked about next in a week or so or two are drawn from this. A lot of other guides look similar. Don't be fooled. This is the real deal. Follow the IPM triangle. It's the key. This is about scouting and economics. Get out in your field early and often and technologies are the key. Am I supposed to now introduce Dr. Antonio?

Julie MacCartee: You can pass it to Brian.

Joe: Ok. Brian. I'm going to pass it back to you now to hand off to Dr. Antonio.

Brian Conklin: Joe, thank you very much, Joe. We appreciate the presentation and I just want to remind everybody that the field guide that Joe was referring to is, it's on the Agrilinks website. Joe's presentation and especially that technology table that Joe put up there that was very difficult to see will be available as well. So we're going to make these resources available. We'll be highlighting in depth some of these resources next week.

Let me turn the conversation over to Dr. Antonio Purcino, the head of Empraba's Maize and Sorghum Unit. And he's going to highlight how some of these technologies have brought about Brazil's transformation as well as some of the key policies and resources that led to that transformation. Dr. Antonio?

Antonio Purcino: Yes. Good morning everyone and welcome to our webinar. And I'm going to talk about corn production in Brazil over the last forty years. And what has happened in Brazil during this period of time was increased crop production. Although we have had all along the way several, the presence of several pests including fall armyworm. The reason for this conference is that fall armyworm was recently found in Africa. And a lot of people are concerned with the presence of fall armyworm in African agriculture.

What I would like to mention is that fall armyworm has been in Brazil for many, many, many years. And although it has been here with several other insect pests, Brazil has been able to change from a backward technology agriculture to a modern country producing its own food and excess food to export. But that – my next slide please, if I have my next slide please.

Julie MacCartee: Antonio, I'm sorry to interrupt. But you can either say next slide or –

Antonio Purcino: Ok. Now I can go here.

Julie MacCartee: Or

Antonio Purcino: This is sorghum which is also 40 years old. And it represents the changes that were made in Brazil concerning agriculture. Brazil is an agriculture country. And forty years ago, we were importing food. We were not able to produce our own food. And the decision was made by our policymakers to invest in agriculture research and training our scientists. Most of our scientists were trained abroad. And they upon returning to Brazil, they developed, they began to develop tropical agriculture adapted to Brazilian conditions.

And in this slide, you see a small farm in Brazil several years ago. You see a crop with which you know it's going to have low yields, very few people working on it and no machinery. Yields were very low. If this picture is from the '70s this crop would yield no more than two tons per hectare. So Brazil began to invest in technology and

capacity building. This is very important. So we could make the revolutions that we made in terms of crop production.

This is – there are two pictures of modern agriculture in Brazil. You can see here it's – first thing that we did was to construct soil fertility and been able to develop new genetic resources, new cultures and to control pests including fall armyworm. So we increased our crop yields and crop production by several fold. And the result of that, the cost of the basket food decreased by 50 percent.

So families in Brazil from the '70s to the 2000, 2018 are now spending much less money for buying food than they used to have to spend 20 years ago. So they have more money for other applications. So they have more money for education, for housing, for healthcare. So it was a very good decision to invest in technology, develop public policies and to incentivize increased crop production in Brazil. And we changed from a good importing country to a food exporting country.

And here you have some figures about corn production in the world. Last year we produced over one billion, one thousand metric tons of corn. Of course, the USA is the number one, 370 million tons of corn. China is the second 250 million tons, metric tons of corn. But again, the US is a net exporter of corn, 50 million tons per year and China is not. China is a buyer of corn. And here you see Brazil was 88 million metric tons. And we have years before we had produced over 100 million metric tons of corn which makes us now the third producer in terms of corn and the second corn export. So this is a big change from the '80s.

And again, fall armyworm was here all along. And we developed the technology to control this insect pest. And Joe mentioned about several of these technologies that were developed or introduced into Brazil. Here in Brazil, corn is not used for food, for human nutrition. It's mostly used for feed. And 45 percent goes to chicken, 20 percent to pork and 7 percent for meat production, 5 percent to other uses. I would like to point that Brazil was a good exporter, importer ten years ago and today we are now exporting about 30 million tons of corn per year. So that was a big change that was made by using adapted technology to the tropical environment and the use of modern technology and innovation. This is very important not only to develop

these technologies but to invest in trained and capable people to bring these changes in the field.

And I also would like to mention that the entrepreneurship of Brazilian farmers were very important in bringing out these changes that happen in Brazil in terms of food production. Now we have a very intensive production system in Brazil and I'll quickly point that one big change is that we are having no tillage systems, crop rotating systems and crop succession systems. And we developed a second growing season.

For instance, if you grow always soy beans in the field during the rainy reason, your soils will be occupied only 42 percent of the time. But if you grown corn, your field will, your soils will be occupied by 50 percent of the time. But if you grow soy beans, if you plant soy beans during the rainy season and then if you grow corn right before, right after harvesting your soy bean, you occupy your soil by 80 percent of the time. But now, Brazil is investing in a system where you grow soy beans and then you harvest your soy beans. You grow corn in consortium with or some kind of grass and then you can use your soils by 92 percent of the soils. So you see this is a much better use of your natural resources, your major resource which is the soil that you grow your crops.

I mentioned that a second crop appeared in Brazil during the '80s. You see the bars, the yellow bars being that it's – excuse me. The rainy season growing of corn and the red bar means that the second corn growing. So you see that the red bar is becoming more important than the yellow on. So we are now in a system where we grow more corn during our second season than during the rainy season using short season varieties of both soy beans and corn.

So this is how we grow here in Brazil just the second crop. You see this corn planting machine here on your left is planting corn over crops leftover by the machine that is harvesting soy beans. So we are doing the two operations at the same time so we can use, better use soil moisture. So we are harvesting soy beans that was planted during the rainy season and immediately growing or planting corn over the corn stover. And this picture here, this bars here, the green and the yellow bars are

meant to say that we are now using shorter season crops so we can make better use of the soil and of the rainfall and the water that is stored in the soil.

Ok. We said that insect pests are a very important problem for the farmers in the tropics more so than in the temperate environments. But its not always feasible to get good production, good yields if you invest only in insect control. You have to invest in several fields, in several technologies so you can really increase crop production. And you did this using new technology, develop new technology, training and capaciting people and developing a legal basis for this, a legal framework for the use of these technologies. Regulation, rules has to be put in place for the use of fertilizer, herbicides, fungicides, insecticides including materials. So Brazil also developed these policies, these legal frameworks to bring about these changes that we were able to do over the last few years.

In terms of genetics I said that forty years ago, our crop varieties were very low yielding. Today we have extremely good varieties, genetics. And this was done by not only by Embrapa but the private sector, by the universities and by the seed companies. And they introduced in Brazil in 2006 transgenic crops and this was a major change, a major breakthrough for fall armyworm. I'm not saying that there's a single silver bullet to control fall armyworm in the tropics because resistance will be developed and you have to use several of the technologies that Joe mentioned to you so you can cope with the problem of resistance for any of these technologies that are available, transgenic, agrochemicals and biologicals.

Ok. Another big thing that happened in Brazil was the adoption of the no tillage system and crop rotation. This is very important because at the end of the growing season you have very low water in the soil. So growing your, planting your soy bean or your corn over the stover that was leftover from previous crop is very important.

So the no tillage system in Brazil occupies about 32 million hectares of land in Brazil. And this is a major change. This has to be done if you're looking for good yields and it's possible to do. I'm not saying that it's easy to do if your soils are too dry. But this is the way that you have to go to have good yields in the tropics.

Another major recent changes in Brazil is that we are not only rotating corn and soy beans. We are introducing trees in our system. And in this picture, you will see trees in the back, soy beans and corn. And this machine here is harvesting corn that was sown or cultivated with brachiaria is harvesting corn and you see the brachiaria is left behind and you can feed your cows or your bulls here for three months. You can fatten them and you have another source of income along with the trees. And after you use this brachiaria for three months you can it with the herbicide and then you have the stover for growing the next crop.

Ok. Here is a picture where we have the corn planting, the soy bean harvest. And then what happened you see the brachiaria left is left in the field. We have the green bridge. The green bridge is a solution but is also a problem because the fall armyworm is, will feed on the brachiaria and you have to control fall armyworm on this brachiaria. So before you go for the next crop you have to and use some kind of protection against fall armyworm.

It can be either a chemical a biological insecticide. But as you can see this is a very intensive use of the soil. This is about what I would like to tell you this time and I thank you very much for your attention and I hope that the information that I passed on to you with be helpful to your country. Thank you very much.

Brian Conklin: Great. We want to thank you Dr. Antonio for your presentation and for highlighting the transformation that's taken place in Brazil. Just to highlight a couple of things that we said dealing with fall armyworm in the tropics is something that Brazil has done effectively and it's happened through the use of several technologies and I think Dr. Joe Huesing highlighted those technologies and talked about the importance of an integrated pest management concept. I want to bring this back to the fact that Brazil's transformation came about because they opened the door for the right policies in place and private sector investment and research that followed. We're going to move on from here onto some questions and answers.

[End of Audio]