

# SECURING THE HARVEST: POST-HARVEST STRATEGIES TO INCREASE RESILIENCE

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## PRESENTATION AUDIO TRANSCRIPT

**APRIL 30, 2020**

### PRESENTERS

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*Jagger Harvey, Kansas State University*

*Georgina Bingham, Vestergaard SA*

*George Opit, Oklahoma State University*

### MODERATOR

*Julie MacCartee, USAID Bureau for Resilience and Food Security*

Julie MacCartee:

Hi everyone, and thanks for your patience. We are ready to get started. On behalf of Agrilinks, Feed the Future, and the USAID Bureau for Resilience and Food Security or RFS, I would like to welcome you to our webinar today on Post-Harvest Strategies to Increase Resilience. My name is Julie MacCartee MacCartee and I am your Agrilinks webinar host with the USAID RFS Bureau, and I'll be your webinar facilitator today, so you'll hear my voice periodically, especially during our question and answer session.

Julie MacCartee:

Before we dive into the content, I would just like to go over a few items to orient you to the webinar. First, please do use the chat box to introduce yourselves, as many of you have done already, and also use the chat box to ask questions at any time and share your resources. We love our webinars to be as interactive as possible. And also, one exciting piece of news is that this webinar marks our all-time record in registrations with over 1,000 people registering, which is pretty cool. I think it shows that post-harvest loss is a really important topic, and also that our audience has caught onto the fact that if you register, even if you can't attend, you'll get the post-event email with the recording of the webinar and with additional post-event resources.

Julie MacCartee:

We'll be collecting your questions throughout the webinar today and we'll be asking them at a Q & A session after the presentation. We'll also try and answer some in the chat box along the way. You'll see that the slides are available to download in the file downloads box on your screen and we also have a few recommended links there. And lastly, as I mentioned, this webinar is being recorded and we will email you the recording transcript and additional resources once they're ready, and they will also be posted on Agrilink.

Julie MacCartee MacCartee:

All right, I'm going to go over the agenda and then introduce our speakers and we can dive into the content. So the agenda for the webinar today, we will start off with an introduction from Ahmed Kablan on the importance of reducing post-harvest loss to nutrition and food safety. Then Dr. Jagger Harvey will cover creating resilient communities through reduced post-harvest loss. We'll have Dr. George Opit speaking on using post-harvest loss mitigation technologies to build resilience in poultry farms in Dormaa, Ghana, and then Dr. Georgina Bingham on improving livelihoods of small holder farmer communities with innovative post-harvest storage and a great trading platform. And then we'll head into our Q & A.

Julie MacCartee:

So allow me just to introduce our speakers and then we'll roll into the content. So Dr. Ahmed Kablan is senior science and research advisor for the Food Safety Division in the Center for Nutrition with the Bureau for Resilience and Food Security at USAID and he is the program manager for the Feed the Future Soybean Innovation Labs, the Innovation Lab for Reduction of Post-Harvest Loss and the Nutrition Innovation Labs.

Julie MacCartee:

And Jagger Harvey serves as the director of the Feed the Future Innovation Lab for the Reduction of Post-Harvest Loss at Kansas State University. And at this lab he is working with the team to ensure that their work is effectively translated into information and interventions and capacity to address post-harvest loss issues, specifically in Bangladesh, Ethiopia, Ghana, Guatemala, Honduras, Nepal and beyond. And Georgina Bingham is senior technical specialist for Global Partnerships and Food Security at Vestergaard, and within this role she has brought two new food security products under the ZeroFly brand from development to launch.

Julie MacCartee:

And last but not least, George Opit is a professor of Stored Product and Post-Harvest Pest Management in the Department of Entomology and Plant Pathology at Oklahoma State University and he is also the team leader for the Feed the Future Innovation Lab for the Reduction of Post-Harvest Loss. So I would like to pass the microphone over to Ahmed Kablan to give our introduction. Ahmed?

Ahmed Kablan:

Good morning everyone and thank you Julie MacCartee for the introduction. Thank you everyone for joining us today for this webinar event. It's just such an important topic when thinking about, especially in the current situation. And right now when we are looking at how critical and how important it is to have every gram of food safe, stored safely and available for consumption. When we are seeing the consumption of staples have spiked due to the current situation of COVID-19 and how critical it is to ensure that farmers who are working and worked hard to produce their food, that they have it safe, stored safely for their needs and available for the market when they need it or when there is a need and demand for it.

Ahmed Kablan:

At the Post-Harvest Loss Prevention Lab, we have studied and researched different technologies and several programs that have worked in different countries in order to test, validate, discover what are the technologies available out there to help farmers and processors and aggregators to ensure this thing is [inaudible 00:05:45] Those kind of losses can happen in multiple ways. It could happen as a loss in the quantity or physical quantity due to damage by pests or environmental conditions or could be also loss in the quality of the food, the nutrient degradation. It could be also sedimentation of the food that will

render it unsuitable for human or animal consumption, a nutrient degradation which means food will be consumed empty of any useful micronutrients just as when it's consumed just to be a source of [inaudible 00:06:25].

Ahmed Kablan:

Under the [inaudible 00:06:29] and this webinar, we will talk about different technologies that are part of the bigger technologies available out there that could help farmers, producers, aggregators, private sectors conserve and save their harvest as part of a package of technologies that are available out there. There is no one can say this is better than other technology. What we're trying to say is to Britain what USAID under the beautiful readiness of food security and that this one program have done in order to help contribute to addressing this problem. Thank you again for listening. I'm looking forward and it's exciting gauging the session.

Dr. Jagger Harvey:

Great. Thank you on that. This is the- sorry Julie, go ahead.

Julie MacCartee:

No, I was just also going to think I'm going to pass it over to you, Jagger.

Dr. Jagger Harvey:

Great. Thanks everyone. And good morning. We're really excited to have such a large and diverse group join us for this important topic today. As we all know we're facing stark global threats to food and nutritional security today, but as a research and development community, we've been confronting a lot of these challenges for some time now. So today we're considering an essential key to reducing poverty, to improving nutrition, and keeping farmers, communities, and countries from backsliding in the face of multiple shocks that they're facing right now. Resilient communities have the ability to withstand shocks such as drought that can threaten harvests and disease. Now more than ever, it's critical that we safeguard our hard won harvests for the benefit of all.

Dr. Jagger Harvey:

So if we consider an already bleak year was forecasted for severe hunger and famine and the added or covariate shock of the COVID-19 pandemic threatens to setback progress on improved livelihoods if left unchecked. So as we consider post-harvest losses and the role that addressing those can play in ensuring that communities are resilient, there are a few key facts that stand out. Up to a third or more of what is produced and harvested is lost. After harvest in sub-Saharan Africa grain losses alone, the post-harvest loss, are greater than all us global food aid.

Dr. Jagger Harvey:

But these losses are readily addressable through targeted research for development. And the approach that we take and many other innovation labs take is to enhance national capacity. So capacity development, and to tailor and validate adapted interventions that can be deployed in our partner countries. If we consider the research investments, up to 95% of research investments are on the production side versus 5% on the post-harvest side. So this fairly small amount of relative investment stands to play a tremendous role in safeguarding food and nutritional security.

Dr. Jagger Harvey:

So a few days ago, the head of FAO and also Feed the Future themselves, countries, and the world recognize that we're facing a challenge on an unprecedented proportion if it's left unchecked. So with the pandemic and then the other shocks such as the locusts in East Africa and other things, we really need to make sure that we aggressively reduce post-harvest loss. We need to save everything in a stable and safe and nutritious state that we've harvested.

Dr. Jagger Harvey:

Post-harvest mitigations have been shown to reduce hunger, increase income and nutritional status and post-harvest loss innovations and partnerships are available and ready to be scaled and being scaled in ways that would address the pandemic spread, but also reduce food security issues related to that.

Dr. Jagger Harvey:

So post-harvest loss issues have common biophysical drivers and common features that farmers around the world face. So here on the left you can see that in Kenya in 2010, when I had just moved to there, the Kenyan government found that there were high levels of a fungal toxin from a fungus that naturally occurs in the environment and produces a toxin called aflatoxin. They found that there were high levels of aflatoxin in the maize or corn harvest and they condemned the maize harvest for Eastern Kenya. Obviously that's an important thing to address and a big challenge to confront that, and that's one of the issues that we're working on. But also here in the U. S. we have mycotoxins also threatening U.S. corn harvests and it was estimated that in a bad climatic year we could have up to one point \$6 billion losses in corn in a bad year just due to aflatoxin here in the U. S.

Dr. Jagger Harvey:

So, as Ahmed was introducing us, there are range of different types of post-harvest losses. First, there are post-harvest losses to stored product crops. So these are durable, they can be stored for a long time. They include grains, legumes, roots, tubers, oil seeds. Also post-harvest losses are are a critical factor in horticultural products and perishables that require a cold chain and also in animal sourced foods. So although we're going to be focusing on a narrow section of this today, but an important section, store product crops, there's a community in research for development and in the innovation labs which are addressing other features of post-harvest losses as well. And here on the right you can see some

pictures from our labs work in Nepal where we found aflatoxin is an issue in corn and chilies, you can see there. And we found ways that we can address that.

Dr. Jagger Harvey:

So there are quantity losses. So if you have insect pests like the bruchids on the chickpeas, there on the bottom. They can cause quantity losses of the stored grains, but also quality losses as well, which can have important impacts on economic impacts and health impacts. As Ahmed said, you can have degraded nutrient content but also food safety issues, which can spike with shocks, so they can get worse if you have added shocks. So again, these fungal toxins, these mycotoxins are a critical issue globally, but also pesticide residues and some of the interventions we have to mitigate post-harvest loss can actually eliminate the need to use pesticides, which are often used dangerously, if at all, in a lot of our partner countries.

Dr. Jagger Harvey:

So what we're working towards is really a marketplace of post-harvest interventions. It's not one size fits all. There are a lot of drying and storage interventions that are already available on the marketplace. And given that we're working with so many different commodities, with so many different socioeconomic challenges with the different actors and the farmers, the aggregators along the value chain, we need to come together and we are coming together as a community to make this marketplace of post-harvest loss interventions available. So one of the keys to addressing post-harvest loss is drying and storage. That's one of the main things that we focus on. But also processing is critical because this can help in terms of preserving nutrient content and shelf life, and adding value. Also, it's important to have diversified uses. So despite our best efforts, even here in the U. S. we still have contamination by these mycotoxins and as awareness raises in our partner countries and people become aware of them, we need to make sure that the contaminated commodities are not focused in on the most vulnerable and least informed consumers.

Dr. Jagger Harvey:

So our innovation lab, the Post-Harvest Loss Innovation Lab has been running since 2014. We've worked in four core countries, Guatemala, Ghana, Ethiopia and Bangladesh. And we've helped address mission and in-country priorities in Afghanistan, Nepal and Honduras as well. And we have, we have worked to enhance human and institutional capacity in every country and we have drying storage and extension innovations available for transfer. So we have a diversified research for development strategy. First, we align with Feed the Future and Mission Priorities because we're all part of one team and empowering our national partners to address key constraints to agriculture and health. We empower national research leaders. These are really the change agents and the champions to addressing these problems. We conduct multidisciplinary research to inform evidence-based stakeholder driven strategies. And again, we cultivate a marketplace of innovations, not just from our program but from all over the place for different value chain actors.

Dr. Jagger Harvey:

And we use private sector partnerships as you'll see today to reach and propel innovations into you. So it's not enough just to research them, we need to have the right research questions and partnerships to get them into scaling. And we aim to leave a more resilient system. And when we step back from our projects, have self sustaining post-harvest loss mitigation measures.

Dr. Jagger Harvey:

So today we'll hear from George Opit and Georgina Bingham and we're focusing in on one of our countries, Ghana. So the importance of dressing, addressing post-harvest, loss of that along the value chain to help establish scaling pathways for information and technology, but also to benefit more consumers is really critical. There've been continuing challenges to scaling different technologies such as hermetic bags. So our strategy is diversified. We're working with small holder farmers, the private sector, and also poultry farmers as well. Poultry are critical in nutrition and food security and to alleviate poverty. Along with milk, eggs are one of the highest nutrient content foods and poultry are a stepping stone out of poverty, especially for women. So as we discussed today, please consider, we have innovations that are starting to scale and we're eager to partner to see them secure the harvest. Thank you.

Dr. George Opit:

Yeah. The innovation lab for the reduction of post-harvest loss is using post-harvest loss mitigation technologies to build resilience in poultry flocks in Dormaa, Ghana, and that is the focus of my presentation. The PHLIL Ghana team comprises the management entity, the in country coordinator, and private sector players. On this walk with researchers from the fields of entomology are: engineering, engagement, gender and youth, and for safety. [inaudible 00:18:37] are drawn from multiple disciplines and from multiple institutions. They are collecting information that should increase the adoption of the [inaudible 00:18:53] From the perspective of PHLIL, operations might have factored that increased profitability should also enhance resilience of a poultry business.

Dr. George Opit:

Some of the challenges that are faced by poultry farmers in Dormaa, Ghana that are targeted by PHLIL include seasonal maize price fluctuation. In Ghana, maize prices, considering harvests, can even double or more than double. [inaudible 00:19:35] fluctuations in extra production and [inaudible 00:19:38] mortality of bugs, are other challenges faced by this poultry farmers.

Dr. George Opit:

The last two challenges on this slide can be caused by poor quality feed and that poor quality of feed could be the result of using maize, which is heavily infested by insects for the [inaudible 00:19:58] of the

feed. That poor quality of feed, too, can be a result of using maize, which is high in mycotoxins levels for the food production of the field. PHLIL is addressing this challenges, by working to increase the use of the grain re-moisture system and Zerofly hermetic bags by poultry farmers. The grain with [inaudible 00:20:29] is currently made in Kumasi, Ghana by specific technologies. Each of these devices cost about 500 to 550 Ghana cedis, which is the equivalent of \$90 to \$100 U. S. dollars. Zerofly hermetic bags are made by banko in Kano, Nigeria. Each of these bags, so it's from nine to 12 Ghana cedis, which is equivalent of \$1.6 to \$2.2 U. S. dollars.

George:

2.6 to 2.2 US dollars [inaudible 00:21:00] more all the solutions to these challenges. Seasonal price fluctuations can be addressed through longterm swift stores of maize. Feed based fluctuations in egg production and mortality of that can be addressed using good quality maize. GrainMate and ZeroFly hermetic bags, facilitate both longterm storage of maize and also the availability of good quality maize. PHLIL is working to increase the use of GrainMate and ZeroFly hermetic bags by poultry farmers through conducting on-farm demonstrations. We have found that these demonstrations are quite effective, and these demonstrations typically involve explaining in detail to the poultry farmer and their staff on how the GrainMate moisture tester works. It also involves explaining in detail why it's important for each poultry farm to own a moisture tester. In the last 12 months of the 103 devices that have been sold in Ghana, 22 have been purchased by poultry farmers in Dormaa.

George:

The demonstrations also involved side-by-side comparisons of storage of maize in ZeroFly hermetic bags and polypropylene bags. Polypropylene bags are the common method for the storage of maize in Ghana. These demonstrations last three months, at the end of which maize in each of the bags is weighed and then also the quality of maize in his bag is assessed. From the demonstrations that we have conducted, on average over the three month storage period, the maize in the polypropylene bag loses a weight of roughly 10%. The weight of the maize in the ZeroFly hermetic bags on the other hand, remains more or less the same. The quality of the maize in the ZeroFly hermetic bags also remains more or less the same.

George:

These demonstrations have been very powerful and convincing because they are conducted in the setting of the poultry farmer's own storehouse. It involves the poultry farmer and their staff participating in setting up the demonstration and they're using their own maize. Of the roughly 5500 ZeroFly hermetic bags that have been sold in Ghana in the last 18 months, approximately 3700 of these have been purchased by poultry farmers in Dormaa. As of right now there's a number of pending orders by these poultry farmers for the purchase of ZeroFly hermetic bags when they're supplied.

George:

I'm now going to take a moment to tell you about the [Evans John's 00:24:41] Poultry Farm, and I do this as a way of highlighting some of the successes that we've had as PHLIL in increasing the use of ZeroFly hermetic bags by poultry farmers. Evans John's Poultry Farm is owned by Evans and Josephine Yeboah. When we first met them late in 2017 their poultry farm had only 5000 birds, 5000 birds. Evans and Josephine have not heard about the GrainMate moisture tester, they have not heard about the ZeroFly hermetic bags. So setup the demonstrations of the two technologies, just like I described a few minutes ago. And shortly after those demonstrations were completed, Evans on Josephine purchased and started to effectively use the two technologies.

George:

Fast forward to today, Evans John's Poultry Farm has grown by five times. They have 25000 birds. As of right now, they have maize in 1750 ZeroFly hermetic bags. As you can see on that picture on the left, those are some of the 1750 hermetic bags that contained that maize. In fact, Evans and Josephine are requesting to be supplied more bags so that they can purchase them to store the rest of the maize which currently is in PP bags for safe long-term storage. Evans and Josephine are also marketing agents for these ZeroFly hermetic in Dormaa, and their example has made the marketing of the bags much easier among the poultry farmers.

George:

Some of the things that PHLIL is working on right now, and will be working on in the near future include importation of 45000 ZeroFly hermetic bags from Nigeria to meet the current demand in Ghana. We're also working to optimize the distribution channels for ZeroFly hermetic bags, and are working to increase the use of hermetic bags by small holder farmers and aggregators in Northern Ghana. A good percentage of the maize which is used by poultry farmers in Dormaa comes from Northern Ghana. Therefore, it's of interest to us that the maize is of good quality. Already, there is some use of hermetic bags in Northern Ghana, for example, some of the crop aggregation centers are using these bags. Late in 2019 we were also able to sell 750 ZeroFly hermetic bags in Northern Ghana.

George:

Some of the research areas that PHLIL is working on right now include looking at how storing maize in ZeroFly hermetic bags affects boiler performance when that maize is used for the preparation of feed. We're also investigating whether keeping maize on elevated platforms in the field can result in a reduction of mycotoxin contamination. We are also investigating small skills [inaudible 00:28:38] of sorting as a means to mitigate mycotoxin contamination. We are also working to identify ways to increase the participation of women and youth in technology adoption. And lastly, we are researching to identify training methods that can be very effective in promoting technology adoption. I hope with the information that I've provided, I have given you an idea of how PHLIL is hitting post harvest lost mitigation technologies to increase resilience in poultry farms in Dormaa, Ghana.

Georgina:

Thank you are you able to hear me just fine?

Georgina:

Perfect. Thank you. Good morning everyone and thank you George for that fantastic introduction to the projects that we've been working on and to [Jagger Ahmed 00:29:58] for setting the scene. And then we simply like to thank everybody for taking the time to join us today. That's a lot of people that we have listening into us and I hope you're going to enjoy these talks.

Georgina:

So I would like to take this opportunity to walk you through a journey that started back in 2010 when the company that I worked for decided to develop a food security portfolio in addition to establish public health and water purification businesses. So I'll take this presentation and teapots starting off by explaining the development optimization and validation of a new post-harvest storage technology that you've already met in the previous presentation. Then move on to describe a new decentralized community based peer-to-peer micro warehouse trading platform for commodities that's been specifically designed for engaging small holder farmers and supported by a mobile app that's similar to Airbnb and Alibaba, which I'm sure many of you have come across, that allows direct trading between small holders and entrepreneurs who can then share profits later via mobile banking and also get increased access to technologies, markets and they can share knowledge.

Georgina:

I've been working for Vestergaard, a Swiss based family owned global health company, working under a humanitarian and entrepreneurship business model for over 10 years and we focus on developing tools for the most vulnerable in society and we're perhaps better known for our long lasting insecticidal, malaria bed nets and Lifestraw water purification tools. But in 2010 the company, as I mentioned, decided to branch out and add food security to its agenda, particularly with an impending food security crisis. And as Jagger has pointed out this morning, that's likely to be upon us much sooner than we had expected with the current pandemic

Georgina:

So our food security team has been working together with several partners in particular as you've seen the post-harvest innovation lab and also USDA. She developed post-harvest storage loss mitigation tools and over the last 10 years we've taken the tech... So approved for long lasting insecticidal malaria bed nets to burn insects from entering or for that matter, leaving food storage bags. A huge issue, as has been already excellently explained by a professor, with one single fumigation these insecticidal bags could allow food to be stored for up to two years. So this unique packaging technology required, as you

can imagine, vigorous evaluation and validation to ensure not just its ability to protect the nutritional content of food durability for multiple heavy users over 24 months, but also probably importantly its safety profile.

Georgina:

This technology allows a controlled release of a WHO, FAO, EPA approved insecticide called Deltamethrin that moves to the surface of the bag material and just the right amount to stop the insect damage. This means that there's no need for spraying or mixing of insecticides into the food. That also significantly reduces exposure of pesticides within the environment. And also to end users. Well I missed the most important part, apologies. The food commodities that we tested were also analyzed throughout lifetime of the bag. This one shows none of the insecticide residues are above the US EPA and E-Codex limits. And then we also did various toxicological evaluations confirming the safety for users and consumers alike, including children that may be contacting the bags.

Georgina:

So in collaboration with the post-harvest innovation labs and other partners, we realized early on that if we were to reach our target groups, small holder farmers, even one fumigation wasn't appropriate. So we reached out to experts in the hermetic backfield, Picks, GreenPro and global food packaging expert and they advised us and suggested various different options for us to be able to add one single hermetic liner inside this insecticide treated outer bag. So I always think that a picture tells a thousand words and here we can see the standard polypropylene woven storage bags with one fumigation after a year's storage in the foreground. The bags are almost completely destroyed by insects. I can tell you if you go and touch those bags, they'll crumble and almost full parts and it's heartbreaking seal that crop lost. But the stack at the rear should be undamaged and intact, ZeroFly bags.

Georgina:

And as I mentioned earlier, these bags have been validated by professor Oped's group under the Post-Harvest Innovation Lab and I just put a few snapshots of some of their excellent publications just for your information. So once we reached the market with a post-harvest storage technology that finally seemed appropriate for small holder farmers and even at the similar price points [inaudible 00:36:46] hermetic bags, the price still seems too high for... It's more for the poorest farmer. So we had to go again and redesign the bag with the aim, internally, we gave ourselves the challenge, to be half the price of hermetic bags in the markets, including our own first-generation insecticidal back with symmetric liner.

Georgina:

And the idea that the business and engineering teams came up with was to not only laminate or coat the insecticide on the outside of a standard polypropylene bag, but also laminate a specialized hermetic

layer too. This cup plastic required and hot. And so as you can see here, reduce the bag price from \$1 right the way down to 50 cents, this is cost price. So we were pretty excited at this point. And so, this also meant that we could start to develop local production as the film with the special properties could be shipped to standard bag producers. This can be done in pellet form, film on roles, but it's only a fraction of the weight of shipping entire bags and separate liners.

Georgina:

Thus, we were able to significantly reduce our carbon footprint, times a market and policy even further. You can see on the right hand side the layers of this new specialized bag. So we start with the standard woven bag and then we have the glue layer, and then we have [EDOH 00:38:35] which is the hermetic barrier, and then another glue layer to tie it all together, and then lamination containing the insecticide. One of the key issues impacting global food security in developing countries is that small holders who account for 50% of food produced globally don't have the available cash flow to store large parts of their harvest and lack safe access to affordable crops storage.

Georgina:

And as we've heard already, insects feeding on the crops after the harvest multiply and destroyed the economic nutritive value of the crops within two to four months and after six to nine months it first become completely inedible. And so these can also increase molds within these, these food commodities and these molds produced substances called aflatoxin. Ms. Jessica talks about a little bit and these are linked to higher rates of liver cancer, something that's observed in much of Sub-Saharan Africa. Small holders find themselves in this kind of poverty harvest, poverty trap and are forced to sell their crops just after harvest when the prices are low to cover loans, expenses from the year past and they're not able to benefit from price increases in the months following the main harvest.

Georgina:

Since they can't keep the crops throughout the year, they are forced to buy back in the lean season when the prices are high and it's this sell-low, buy-high behavior that traps smallholders in poverty very often. So clearly it's not just technology that's lacking in these communities. The current value chain is simply not favorable to small holder farmers. So we wondered what if we could disrupt the system and address the challenges and what would that look like. It would need to be close to the farmers, run by local entrepreneurs, have sufficient, safe, easy to use, decentralized moving away from the warehouse receipt model, scalable, and perhaps most importantly based on sharing profit back to the farmers themselves.

Georgina:

And so Chombo was born. Chombo means container and Swahili, and the first pilot was designed in Kenya using shipping containers. So the name [Ariah 00:41:27] seemed to stick. The ZeroFly Chomba

platform consists of a starter pack that allows you for [inaudible 00:41:39] of a local micro warehouse. A local entrepreneur where post-harvest losses are reduced to almost zero using the hermetic bags. The other platform component is a mobile application and it allows farmers, micro-warehouses and consumers to be connected and able to buy and sell crops.

Georgina:

And able to buy and sell crops. The payments are done through the app.

Georgina:

I've lost my slide.

Julie:

Sorry about that Georgina. We'll get them back one moment.

Georgina:

It doesn't matter. I can keep going.

Julie:

There we go.

Georgina:

Yeah, sorry. Payments. Pay with all of them through the app, which allows the platform to automatically share typically 40 to 80 percent micro warehouse profits with the farmers when prices rise after a period of storage.

Georgina:

The size of the profit share is generally adjusted based on local conditions. But since micro warehouses take on all the risk, it makes sense that a big part of the profit would naturally stay with them. So what we've been working with is a split of 10 to 15 percent of the profits going back to the farmer. So what this does is it affords small farmers, entrepreneurs, some protection against these price fluctuations and decreases the risk of price shocks in this vulnerable market.

Georgina:

Also since the Chombo apps based transaction model does away with the need for physical money exchange or hard copy agreements, it enables reduced person to person contact, potentially reducing

impacts of diseases like Ebola, Covid-19, on food security and the economy. It also provides an opportunity for directly scaling out tools that bolster the resiliency of low income farmers such as the hermetic bags, the moisture meter professor that describes seeds, dryers, and also sharing information on good agricultural practice. It also allows the possibility of sending out messages with information such as how to stay safe during a disease outbreak.

Georgina:

The profit share that the farmers receive can be used to finance inputs and kind profit partially or fully to share directly for the next harvest season. But these parameters need to be co-developed with communities, farmers, and micro warehouses. So with this platform, Vestergaard aims to assure the use of the knowledge already gained and provide ready linkup the farmers to the end users within the Chombo community that would not otherwise be possible. In order to test this business model, a pilot in Western Kenya was designed with the intention to demonstrate how agriculture can lift the most vulnerable people out of poverty in rural areas of developing countries.

Georgina:

The pilot consisted of three sponsored entrepreneurs at three locations and they would give them loans to buy greens and ZeroFly hermetic bags for safe storage at harvest. The buying price at that time in 2018 was \$90 a ton. That was August, I believe July, August, and then the selling price, nine months later in May 2019 was \$300, giving them a whopping profit of 210 US dollars per ton over a nine month period.

Georgina:

So together with the post-harvest innovation lab, we have managed to merge research private sector scaling potential with some really exciting results. The next stage building on the successful pilot in Kenya will be to establish a scaling business model establishing 500 to a thousand ZeroFly micro warehouses over the next year in Kenya and to bring this to at least 2000 micro warehouses during the next three years.

Georgina:

Next year we plan to bring this platform to Ghana and Nigeria. And below is a YouTube video just giving you some more details about this Chombo model.

Georgina:

As a company we sat down and developed the following quite ambitious targets based on the sustainable development goals and are actively looking for partnerships in order to make these goals a reality. And with that I just really want to say thank you to our fantastic partners and to all of you to take

the time to join me on this journey and I hope everyone stays well and safe during these difficult times. Thank you very much.

Julie:

Thank you so much Georgina, George, Jagger and Ahmed. And thank you so much to our participants. You have put a ton of great questions into the chat box and we are ready to begin addressing as many of them as we can.

Julie:

All right, let's see. So first-

Jagger:

Can I just talk for five minutes?

Julie:

Oh yeah, sure.

Jagger:

So thanks everyone. And I just wanted to reiterate that this is a global problem, these post-harvest loss issues. The farmers in our partner countries, such as this farmer here in Uganda and sorghum farmers right here in Kansas are facing the same biophysical factors. So as we seek to confront these abroad, there are lessons that we bring back here to safeguard us agriculture and versa. So it's really a win-win type of partnership that we're engaged in.

Jagger:

And so as we look forward into the lean season after the most recent harvest and each time we do that, what we're really asking is for our partner farmers and our target beneficiaries to stem the loss of calories and nutrients as they traverse this bleak lean or hunger season. So here our local artists in Kansas painted this and you can see, here's a small holder farmer who's just gotten through the harvest, a really hard one harvest and she needs to feed her family and get income for her family until the next harvest, if that is successful.

Jagger:

So working together, I'm confident that we can take an aggressive approach to reducing post-harvest loss. It's great to see so many people, and so many experts in different levels and taking different approaches on here. So thanks very much. I appreciate it.

Julie:

Thank you Jagger. All right, we have about half an hour to address your questions and so I think we'll go ahead and dive right in. And Georgina, I thought we could kick off. I noticed that there were a number of individuals in the chat box asking about whether the bags are available in their particular country. We had questions from Uganda, Ethiopia, Dominican Republic, Nigeria and a few others and just interested about how the access might be growing in different countries and I thought perhaps you could let people know how they can figure out or find out when they can access these bags.

Georgina:

That is a great question and it's something we've been working on since the beginning that we developed these bags because these bags require registration in the various countries, which takes time. Currently, I think we're registered in 17 countries globally and we have or are developing local production in, so we have local production, our local production in Vietnam, Thailand, and then we're working with partners in Nigeria and Kenya to produce these bags and currently the work that Professor Oakwood is doing in Ghana, he'll be using the supplier in Nigeria.

Georgina:

With the use of local production, this is going to improve our reach. As I said in my talk, it's going to make it easier to get bags to where they need to be at the right time and at the right price point. So if they wanted to, if we can maybe after the webinar we can list off the different countries and I can get back to the separate people to check on whether we are in those countries.

Julie:

That would be wonderful. Thank you. See I'm going to throw it back to the first question actually that came in for Jagger and then we'll come back to some more questions on the ZeroFly bags.

Julie:

So Wanda asked, apart from the 95% production and 5% post-harvest investment, what proportion accounts for investment in value addition or food processing in SSA?

Jagger:

Great, thank you and that's a great question. I can say that there's definitely significant investments across both the drying and storage spaces and the value addition spaces. I don't have an exact number, but if we consider USD investments in the innovation labs, they've invested in our lab which focuses on drying and storage. The food processing innovation lab, which focuses primarily on the value addition out of Purdue university. The sorghum and millet innovation lab here at Kansas state university. The horticulture innovation lab, which recently wrapped up at UC Davis.

Jagger:

So in terms of teasing out an exact proportion, I don't have that figure. However, there is across multiple different value chains and grains and horticultural crops and animal source foods, there are definitely complimentary and significant investments on both sides.

Julie:

Thank you Jagger, and as long as I have you perhaps I'll also address a couple of questions about data availability. One came in from Stephen Walsh asking ,or mentioning that yields gap analysis has been a useful framework for assessing where to invest on the production side. Is there a corollary for a post-harvest loss? And then we had also had Michael Omadara ask about, or mention the collecting data on post-harvest loss and other related issues as a major problem in Africa and if your innovation lab is working on that issue in any regard.

Jagger:

That's great. Thanks Julie. Thanks for these questions. Absolutely, we need to know the enemy. We need to know the drivers of post-harvest loss before we really prioritize and design and scale out interventions. So Steven, that's a great question and it's been the lack of good data on the extent of BHL and the drivers of post-harvest loss has been a critical gap. FAO has recently launched a food loss index, which is trying to tackle that. And as we as an innovation lab have moved into each of our countries, that's one of the first gaps really that we try and address, is working with our national partners to design surveys and to understand really what are the drivers of post-harvest loss. And that was one of the first things that our innovation lab did was those studies. And then from there we can prioritize at which ones that we're going to tackle and how.

Jagger:

And so, Michael's question on what was that again? Sorry.

Jagger:

There are so many good questions.

Julie:

I know. Let's see. It was, oh, recognize that you're collecting data on post-harvest loss. Mike is talking to other related issues is the challenge in Africa and elsewhere and what are innovation labs doing in that regard?

Jagger:

Yeah, so what we're doing really is we want to make sure that we not only address the specific research issues and challenges that we're directly working on within a project, but we really work to establish labs and research teams in country, so that they can work beyond the projects with us to address these issues. Because mycotoxins and post harvest losses are readily addressable with the right research and development approaches. However, they're very diverse and there's a lot of them.

Jagger:

So, essentially what we do is we make sure that we do targeted research with our in country partners playing a leading role. And so that we do characterize specific mycotoxin issues and post-harvest issues and find the types of innovations. So technologies, extension materials that can address them, but then also leave behind a leadership in the research space. People who are trusted by the general public, who are empowered by their national systems to address these problems so they can continue well beyond when our projects finished.

Julie:

Thanks so much Jagger. Let's see. We had... I'm combing through all of these wonderful questions that came in. So, let's see, I will address one to Georgina that came in several times, which is a question about whether the hermetic bags are effective against rats or is it mostly against insects. And we also had a question asking whether they're effective in reducing bruket damage. So perhaps a little bit more description of what they protect against.

Georgina:

Yeah, those are really good questions. So the insecticides that we use is an insecticide. It's not a rodenticide, but we've seen a lot of, in our field trials, we've seen lots of anecdotal evidence that rodents are deterred by the insecticide bags. And also when you have a hermetic bag, I think PICS has some nice data to show that when the bags are hermetic, rodents are also less interested. I presume it's because they can't really smell what's inside, what goodies lie inside. So that's an interesting one. I don't have what I feel is strong scientific evidence to say one way or another, but there is a lot of anecdotal evidence and a lot of users say that they see this phenomenon of rodents moving away from these bags and brukets. Yeah, we have tested a plethora of species, all the key species, primary and secondary together with a USDA Professor Oakland from OSU. And we have found that brukets included are able to be killed by the ZeroFly hermetic bag.

George:

So, Georgina, on the issue of the rodents, I totally concur because for some of those stake holders are who are storing the amazing board, the pollen bags and the ZeroFly hermetic bags in this STEM storehouse. This is the feedback you get from them. And maybe it will be a different story if they have no choice because the rodents are tracking, the maize which is in PP, bags, but not the one in ZeroFly

hermetic bags. And whether that's because they have, that choice. So what would happen if all the maize is instead of hermetic bags, that's a different story that needs to be investigated. But for now there's an evidence that you know, the rodents stay away from, the ZeroFly hermetic bags.

Georgina:

Thank you George.

Julie:

Excellent, thank you.

Julie:

A number of people asked about the difference between the ZeroFly hermetic bags and the PICS bags that were introduced by Purdue university several years ago. And there are differences in terms of effectiveness in reducing post-harvest losses and reuse. And I know that Jagger was interested in addressing that.

Jagger:

Great, thank you. And that's a great question. So again, post-harvest loss issues are so diverse and we're agnostic to where our technology comes from. Hermetic bags are a very effective technology to reduce post-harvest losses. And across our program, we've looked at which technologies are the best suited in terms of, of course efficacy, but also local availability, in some cases local production. And so we have actually used ZeroFly hermetic bags, PICS and GrainPro bags across our program. So it's really important that we not go in to our project in the research for development community with prescribed answers, but rather work with our national partners so that we can make sure that we work with stakeholders and we convene major stakeholder platforms to consider the range of interventions that could be brought to bear to solve these problems and really have a marketplace of these technologies and information available because it's through that, that really, these national systems are going to be able to sustainably address these challenges.

Julie:

Thank you very much Jagger. Let's see.

Julie:

All right, we've had a number of just questions about specific elements of the ZeroFly hermetic bags and so I thought I'd try and run through a few different ones. So perhaps to Georgina, [inaudible 01:01:22] asked, how long do these ZeroFly hermetic bags last? How many times can they be used?

Georgina:

Sorry, I was on mute. So as I was talking in my presentation, we talk about 24 months, but they last as you'd imagine as all hermetic bags. But the data that I have and the publications we have with the current formulation is definitely up to 24 months at least.

Julie:

Excellent. And I noticed that [inaudible 01:02:12] also asked, can you change the ZeroFly bags to new bags in order to prolong the storage time of grain?

Georgina:

We sure can, it just makes the bag a little more expensive. There are various things that we can do. We have other products within the food security portfolio that I've worked with the teams to develop. And depending on the attitudes you bring in, you can make them last even longer. But again, that comes with a price tag.

Julie:

Sure, understood. And then another clarification, since the bags are chemically treated, can they be reused? I think it wasn't clear about whether they can be used more than once.

Georgina:

Yes, absolutely. Multi-use.

Julie:

Okay.

Julie:

Okay, excellent.

Julie:

Let's see. We also had a couple of questions, or a concern about whether the chemical infused in the bags could cause any food safety issues for the grain inside. Is that a potential issue?

Georgina:

So, this was our very first concern, obviously as a company. And we designed some very vigorous tests and evaluations to ensure that any insecticide which did get onto the grain, would be well below safe limits as prescribed by USCPA and EU codecs.

Georgina:

But currently, we have the hermetic barrier between the insecticide and the food. There's almost no residue getting into the food at all anymore. So, this is really great.

Julie:

Great. Thank you.

Julie:

Combing through these excellent questions. Thank you all so much for engaging in the chat box, and also for sharing yourself, some answers to other's questions. That's a wonderful way to engage.

Julie:

Let's see. George, I think ... hold on one moment. Just lost my question for you.

Julie:

Let me find it once again. All right.

Julie:

George, an interesting question came in from Michael Omodara, which is "George, when do you think Africa will move away from bag storage? Despite the success stories recorded with the use of picks and other bags, the majority of farmers still use the woven PPE. Do you think the bag storage system in itself might need to be changed in the future?"

George:

Of course. That's a good question. So, for [inaudible 01:05:21] to move away from bag storage to bulk storage, you need to develop the infrastructure to get that done. So, I don't know whether we're in the position to do that in Africa yet, okay?

George:

So, as far as I'm concerned, for the foreseeable future, probably bag storage is going to be there in Africa. And again, I think the simple answer to that is, there's a whole infrastructure that has to be developed around bulk storage.

Julie:

All right. Let's see. I just wanted to mention, George, in one of the examples that you gave, you were discussing both maize and poultry farmers, but who is turning the maize into poultry feed? Is there an extra step there that wasn't addressed?

George:

Yeah, so that's a good question there. Where do poultry farms in Doma operate? And this is mainly caused by a number of reasons. Most of the poultry farms prepare their own feed. They have a formula for that. And this is because there's lack of consistency if they have to get this feed from agro-inputs there or something like that, okay?

George:

So, a lot of them prefer to buy the maize, buy all the ingredients that go into the preparation of that feed, and do it in their own poultry farm.

George:

So, their best-case scenario is "Okay, I have to make as much maize as possible so that you beat the price fluctuations." Straight, as simple as you can, make your own feed, so that you can guarantee that consistency in the feed. You make the feed that you want.

George:

So it's again, the poultry farmer is buying the maize, storing it, and making all the feed. So, that's how it works.

Julie:

Thank you, George.

Julie:

All right. We've had some questions come in that go a little bit beyond the storage bag question, that ask some more general questions about post-harvest loss and perishability, and thought I could pose a few of those.

Julie:

One of them was from Markandey DeCarmo, who asked a question about highly perishable products and small holder farmers. What is the alternative for small scale farmers in post-harvest management of very perishable products, which would otherwise require cool storage? Is that something that the post-harvest loss innovation lab is looking into?

Jagger:

Yeah, so we're not specifically looking into that, but I will give you an example of how we partner to look into that. So, in our work in Nepal, we looked at where aflatoxins are found, because the nutrition innovation lab had found a high levels of exposure to aflatoxins in pregnant women in Baku.

Jagger:

And so, our lab came in and partnered with them, and looked at where are aflatoxins found in the food supply? What's the source of that? And one of the things that we found was that there were aflatoxins in chilies. So, the horticulture innovation lab has chimney dryers that can be assembled locally, and that were being already piloted in Nepal. So, we talked with them and they were piloting those chimney dryers to dry the chilies.

Jagger:

Other more highly perishable foods I know can be dried and stored, but you do have a loss of nutrient content. So then, there's also questions around how to get the cold chain in place. And that is something that the post-harvest loss innovation lab is not specifically focused on. We partner on those issues.

Julie:

Thanks so much, Jagger.

Ahmed:

Julie, this is Ahmed, if I may add?

Julie:

Sure.

Ahmed:

Yeah, it's a great question. And, a similar project we did in Bangladesh, with the nutrition innovation lab and the horticulture innovation lab, where they looked at different technologies available for drying.

The project starts with looking at horticulture and fish value chain, and then we realized quickly that food safety related to storage and perishability of the food, the nutrient degradation is an issue.

Ahmed:

So they could operate it, and they start thinking about different technologies. One of the things that they insisted is the cool-box, which is, as Jagger mentioned, from the horticulture innovation lab have been developed. And they have the upgrade and the on-grade cool-box. And the issue that had been found with the cool-box adoption, it is the initial cost point. If there is someone, or the government, or other are willing to provide this for farmers, they will use it. But, the initial cost is a hindering factor.

Ahmed:

The other thing we tested in Bangladesh was the solar dryer. And with the solar dryer, there is different systems or different designs but they all do the same function, where you are concentrating the sun heat in a platform, and there is a vent where the moisture will evaporate for it. And it could be a fan to draw the air or, sometimes there is no fan.

Ahmed:

And that also works to dry high value crops, like mango and others, as well as fish. The point that Jagger mentioned, so one of the questions related to the nutrient degradation when you dry it, and dehydration is known, it's an old, nothing new method to conserve and preserve fruits and vegetables, especially high value crops, as well as some animal source food like fish and others. The factor that could help reduce the nutrient loss, is the rate at which you dry, the speed of drying and the temperature and all of these things.

Ahmed:

So, that's why there's some of the solar dryers that have designs for fruits and vegetables. They had vents in order to lower the temperature. If you are using it for something that's heat sensitive, and you don't want the temperature to be above 120 to 140 degrees Fahrenheit, because that will increase the rate of degradation.

Ahmed:

But, you want to maintain that temperature for when you expedite the loss of moisture from when they are dehydrated. So, there is technology available and the rate of degradation of nutrients, and it starts as usual with some of the heat sensitive vitamins, like vitamin C, you can control it by controlling the temperature. But, it is something that needs further validation for different types of crops.

Julie:

Thank you so much, Ahmed.

Julie:

All right, we had a number of questions come in about adoption. Of what the adoption rate has been of the grain maize and sealed by hermetic bags, and what types of methods could be used to help scale the bags? And we thought, Jagger, perhaps you could address that.

Jagger:

Yeah, thank you. That's a great question. And, as an innovation lab, we've made sure to include expertise and research on engagement and questions around the barriers to adoption. It's not enough just to make sure that a technology works, in a biophysical sense, to stop the post-harvest loss issue. So, what we've done is we've partnered with AgReach, at University of Illinois, and also Scientific Animations Without Borders at Michigan State University.

Jagger:

And we're asking research questions about adoption, about the best type of extension tools, about how to best empower local small and medium enterprises, and early change agents and adopters, so that they can get some of these technologies out there. So, it's very much part of our considerations and research.

Jagger:

And I know that in Doma, George and Georgina have been looking at adoption mechanisms and strategies to get the ZeroFly hermetic bags, and the grain moisture meter that Sesi Technologies run by Isaac Sesi, a recent graduate of Kwame Nkrumah University of Science and Technology in Ghana. So, we are looking at adoption and they are beginning to scale.

George:

Yeah. Jagger, can I add a little bit to that? [crosstalk 00:01:14:39].

George:

Yeah. One of the things I want to add is that, it's not by accident that we're working with poultry farmers in Doma. There's some strategy that is going into that.

George:

Why the poultry farmers in Doma? Doma has probably one of the highest concentrations of poultry farms anywhere in West Africa. And why poultry farmers? Well, they're commercially minded. They view

agriculture as a business. So, they're ready to make investments that they see as going to increase their profit margins.

George:

Two, relatively many of them are well educated. Three, they have money that they can invest in these technologies. So, that most likely, could drive the adoption of the technologies. And lastly, they're quite aggressive. They're open-minded. I mean, they're good business people, so they're looking for all kinds of ideas.

George:

So again, these are some of the things that we're using in Ghana. Say, "Okay, if these guys can be the early adopters, if the focus from us is Doma, where you have the highest concentration of the poultry farms [inaudible 01:16:02] can adopt these technologies, it will spread to other poultry farms in the middle belt of Ghana, a few that are in the North." And because these poultry farmers are supplied by small holder farmers, the information then flows from there.

George:

So again, I just wanted to add that, Jagger.

Julie:

Thank you so much. And we have about six or seven minutes left for questions, but we also wanted to bring up some poll questions for you, our audience, as we wrap up. And we just have a number of questions that would be very helpful if you would take a moment to answer. Let us know whether this webinar was useful for you, and in the bottom-right-most poll question, do feel free to share your suggestions for improvement for AgroLink's webinars going forward, or what you found most helpful about the webinar today.

Julie:

Let's see. Georgina, I know that you've been working on a few different answers, rapid-fire answers to some questions that you will post in the chat box. I also want to note that we've had, really an extraordinary number of questions come in today and we will try in the post event resources, which we will email out to all of you, to ensure that we provide as much information as we can to help answer your additional questions that we weren't able to get to today.

Julie:

All right. Jagger, I wanted to ask you a question from Jane Ambuko, which is "While governments have committed to reduce post-harvest losses to meet the sustainable development goal target of halving

post-harvest losses by 2030, allocation of resources to this cause, including research, is just 5% compared to the 95% you mentioned to production. So what strategies can be used to get more resources allocated to the important issue of post-harvest loss reduction."

Jagger:

Great, thank you and thanks Professor Ambuko. It's great to see you on here, and I really have been enjoying all of your contributions in the chat.

Jagger:

Yes, as a leader yourself, in elevating the post-harvest loss on the agenda in Kenya and in Africa, I think what you have been doing, and what we're trying to do, really, is to build the evidence base by empowering our in-country partners to do and publish research, but then also to link them with policy makers to have stakeholder workshops and discussions, so that we can raise the profile of post-harvest loss issues. But also the fact that we can readily address them, including on small holder farms.

Jagger:

So, another part of that really, is making sure that we engage policy makers. So, for example, in Nepal, we had members of the national planning commission who were at our national mycotoxin stakeholder workshop. We had members of the ministry of agriculture, ministry of health and others. And really, it helped for them to put post-harvest loss and aflatoxins specifically in that case, in a broader context.

Jagger:

So, I think continuing to work together as a community to make sure that we enhance national capacity to conduct this research, to raise the profile of post-harvest loss so that policymakers and others can assess what's the cost benefit, compared to addressing the other issues, because there are a lot of issues out there. And then, we can really have national systems taking it on.

Jagger:

I'll just also mention that our Ethiopia team also worked with the government and now the Ethiopian government has a national post-harvest advisory committee, with high level membership from the ministry of agriculture and others. And again, so if we can make sure that we have the evidence and some early successes on things that are effectively being deployed, and working in a sustainable way, and an inclusive way, we just need to continue along those lines as a community to make sure we can have as much impact as possible.

Julie:

Great. Thank you so much for that important perspective.

Julie:

Okay. I think I'll throw out just a couple more questions before we wrap up today.

Julie:

We've had just so many good questions come in. It's almost overwhelming. But certainly, we love to have all of these questions, so thank you so much for submitting them.

Julie:

I saw one interesting question from Vincent Roger was that ... Oh actually, Jagger, one question that came in a bit earlier that I think you had wanted to answer, was some alternative uses for grains that are contaminated with mycotoxins, or for any stored crop that may not be fit for human consumption. How else can they be used?

Jagger:

Yeah, that's a great question, and there was another related question about the cost of testing in the field for things like mycotoxins. So really, what we're trying to do is we're first taking a broad view of where are these issues arising at harvest and post-harvest. So, we have some risk mapping activities to identify where hot spots might be emerging. So then, we can go in with on the ground testing, and there are options for that, and identify on a farm or at a village mill, which bags that are coming in are contaminated.

Jagger:

And then from there, there are a number of different options. Typically, what small holder farmers do is they use the contaminated or just colored grains for feed, or for traditional brew or other things, but you can still have a lot of health issues from that and a lot of exposure.

Jagger:

So, some of the things we're working on with our private sector partners and researchers, are decontamination methods. So you can use gas, like ammoniation like they use in Senegal, or ozone decontamination. But also, we're working with Matt Stasiewicz, at University of Illinois, on a low-cost kernel sorter, which uses spectral sorting to sort out the contaminated kernels in a way that could potentially be deployed at village mills.

Jagger:

So, there's a lot of alternative uses. If we can identify things that are contaminated, then we can see what options are best locally suited from there.

Julie:

Wonderful. Thank you. As we have just reached the top of the hour, I think I'll go ahead and close the webinar.

Julie:

I want to thank our wonderful presenters for your depth answering of the questions, and for the content you presented today. And most of all, I would like to thank our attendees for your wonderful participation and for coming back to AgroLink's webinars repeatedly. We really appreciate the way that you have helped us build this webinar series and engaged with your community. And of course, thank you to the Feed the Future Knowledge, Data, Learning, and Training project for your wonderful management of the AgroLink seminar series.

Julie:

So we'll go ahead and close up and we hope that you all have a great rest of your day. Thank you all very much.