

BUILDING A SAFE FOOD SYSTEM: THE ROLE OF COLD CHAIN LOGISTICS IN FOOD SAFETY OF PERISHABLE FOOD

PRESENTATION AUDIO TRANSCRIPT

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Julie MacCartee:

Hello, everyone. On behalf of Agrilink, Feed the Future, and the USAID Bureau for Resilience and Food Security I would like to welcome you to our webinar today on the role of cold chain logistics in food safety of perishable food.

Julie MacCartee:

Today our panelist from the Business Drivers for Food Safety projects will discuss what constitutes and effective cold chain, how it affects the health and nutrition of consumers, and what can be done to increase the efficiency and effectiveness of temperature control systems in the developing world in order to improve food safety and quality and reduce loss.

Julie MacCartee:

My name is Julie MacCartee and I am your Agrilinks webinar host with the USAID Bureau for Resilience and Food Security. I will be your facilitator today, so you'll hear my voice periodically especially during our question and answer session. Before we dive into the content, I would just like to go over a few of our usual items to orient you to the webinar.

Julie MacCartee:

First, please do use the chat box to introduce yourself, to ask questions, and to share any resources that you might have that are relevant to the discussion today. We love for our webinars to be interactive and so the chat box is the place to do that.

Julie MacCartee:

We will be collecting your questions throughout the webinar and our team of experts on hand today may be able to answer some of them directly in the chat box. We'll also have a longer verbal Q&A session after the presentations are complete.

Julie MacCartee:

One tip I would like to highlight, and I'll call this out later as well, is that if you're having any trouble seeing the detail on some of the slides, you can put the slides into full screen mode. If you hover over the slide presentation pod, you'll see four little outward pointed arrows that will allow you to put the slides into full screen mode. And also, it can get rid of the chat box, if you find that a bit distracting temporarily. And then, to bring it back to the regular view you can hover again and select those four little arrows again.

Julie MacCartee:

One last thing. We are recording this webinar today and we will email you the recording, the transcript, and any additional related resources once they are ready. We encourage you to share those with your colleagues and they'll also be posted on the Agrilinks website.

Julie MacCartee:

Okay, I think we're ready to diver in. So I am going to introduce our first speaker and then we can get started with the content. So I would like to welcome Lourdes Martinez Romero to provide an introduction to the topic today and introduce our two main speakers.

Julie MacCartee:

Lourdes is an agricultural economist in the Bureau for Resilience in Food security within our relatively new food safety division. She works on low income consumers and micro, small, and medium enterprise's access to safe nutritious food systems in local and international markets. So I'm excited to welcome my colleague Lourdes to give us a brief introduction. Lourdes.

Lourdes Martinez Romero:

Thank you, Julie. Welcome everyone and thank you all for joining us today. Before passing the microphone to our experts, I wanted to highlight why we are here today.

Lourdes Martinez Romero:

Over 800 million people are hungry and this number is growing. COVID-19 added additional distress and various projects say that around 130 million will go hungry in 2020 due to the pandemic. The negative impact of COVID-19 on hunger and malnutrition will persist for years if not decades.

Lourdes Martinez Romero:

After the pandemic suffice, we will need to build back, but we can't do it in the way prior to the pandemic. We must build back stronger. Investing in a stronger food system is key.

Lourdes Martinez Romero:

We see improvements with safety as an integral part of the theses efforts and that they directly impact our [inaudible 00:04:08] resilient and nutrition objective. Of course, there are challenges to make our food safer for all, but we also see tremendous opportunities as a result of all these transformations.

Lourdes Martinez Romero:

We know that 60% of the food value is added after collection, some 20% of retail and 40% in between. The in between also known as hidden middle, which comprises the processing, packaging, transport, and other off farm activities is essential for getting safe foods from farm to fork.

Lourdes Martinez Romero:

Tens of thousands of these businesses exist today in the low income countries in which we work. Companies like Real Food in Nigeria, [inaudible 00:04:56] in Kenya and consumers in rural and urban areas are relying on these enterprises to access safe nutritious food.

Lourdes Martinez Romero:

However, they have to be [inaudible 00:05:08] micro, small, and medium enterprises, what we call here today growing food businesses informal and in formal markets.

Lourdes Martinez Romero:

There are millions of consumers [inaudible 00:05:22] multiple food safety obstacles. They come from various to accessing affordable credit and finance. They lack training to implement the safety best practices. They face an enabling environment with more hurdles than incentives to successful adopt improved food safety practices.

Lourdes Martinez Romero:

Sometimes the small changes among food traders and people working in markets can have a big impact on mitigating food safety risks within food system's. I think [inaudible 00:05:56] good hygiene and temperature control are two critical components to keep food safe as it moves through the food system.

Lourdes Martinez Romero:

Temperature control systems are often inaccessible for many of these growing businesses. So improper food hygiene practices may not be well understood. USAID has partnered with food enterprise solutions to implement a safer future business drive for food safety. This program is developing cost effective approaches to operational research that tackles growing food businesses challenges with both harvest and food management.

Lourdes Martinez Romero:

In addition, business drivers for food safety want to help growing food businesses find a business case for food safety so that changes can be sustained and transformative building a better [inaudible 00:06:48] to serve all consumers.

Lourdes Martinez Romero:

This webinar is just one in a series of knowledge sharing sessions to introduce existing technologies that are proven to be effective, but need to be disseminated and accepted by the hidden middle.

Lourdes Martinez Romero:

Finally, it is not just a business case of [inaudible 00:07:11] address food safety. Contamination of food by either chemicals or bacteria lead to [inaudible 00:07:17] lots of important resources and unnecessary deaths.

Lourdes Martinez Romero:

One in 10 people worldwide become ill from consuming unsafe food every year. Low and middle income countries lose around 110 billion per year due to loss [inaudible 00:07:35] medical costs.

Lourdes Martinez Romero:

Up to 70% of diarrhea [inaudible 00:07:39] is caused by unsafe food and water. 420,000 people every year die due to food borne diseases. 125,000 are children. I believe we need to keep repeating these statistics over and over so we'll remind ourselves why we care and must find a transformative case for food safety.

Lourdes Martinez Romero:

We need to support the system transformation because these remain the most effective pathway out of poverty for the world's poor. With private investment leading the way, the whole system needs to work cohesively towards a security, decrease malnutrition, and end hunger.

Lourdes Martinez Romero:

I hope you enjoy this presentation and look forward to hearing from you during the discussion portion of this webinar. I now want to introduce our first speaker Dr. Douglas Taren.

Lourdes Martinez Romero:

Dr. Doug Taren is a professor of public health at the Mel and Enid Zuckerman College of Public Health at the University of Arizona. His research focuses on the interaction between parasitic diseases and the nutritional side and food security. Dr. Taren is also principle investigator on the business driver for food study of the primary food safety challenges in micro nutrient dense supply chains, which will be part of in a few months a part of the technical learning series.

Lourdes Martinez Romero:

After Dr. Taren, we'll hear from Mr. James Rusty Eason. Mr. Eason's an expert in operations of third logistics and cold storage facilities. He has been an investment strategist for several private equity firms and venture capitalists as well as for the IFC, DFC, and USEA.

Lourdes Martinez Romero:

He has conducted operational studies and investment mapping for several USAID projects throughout Africa, Central Asia, and Middle East. He has trained executives and managers in proper cold supply chain management and operation of cold storage facilities. That includes all levels of food safety, knowledge, and capacity building.

Lourdes Martinez Romero:

Mr. Eaton worked for the business driver for food safety as a sub contractor [inaudible 00:10:00] consultancy and training a Nairobi based woman owned business.

Lourdes Martinez Romero:

This morning's presentation first Dr. Taren will discuss threats to retaining nutrient value during food processing and packaging. Then Mr. Eaton will walk us through food safety challenges in cold chain logistics.

Lourdes Martinez Romero:

Now, let's get started. Over to you Dr. Taren, thank you.

Doug Taren:

Thank you, Julie and Lourdes. I want to thank everyone at Food Enterprise Solutions for asking me to present today. I give my gratitude to everyone who is working at USAID Feed the Future Program as this work is incredibly important to help meet many of the sustainable development goals.

Doug Taren:

I also want to acknowledge the support I got from [Uvinia 00:11:02] [Varivoda 00:11:02] who helped with providing me numerous documents as background information. I'm also pleased to be here with Rusty as his presentation will provide information on how to operationalize processes that maintain the nutritional value of food.

Doug Taren:

I plan to present an overview of what I think are some salient issues when it comes to food processing, the cold chain, and how these steps fit into food systems in order to provide not only a safe food supply but also a nutritional food supply that can be supported by small businesses in low and middle income countries.

Doug Taren:

This overview is not comprehensive, but I do hope that it stimulates conversations when we get to answers and questions at the end.

Doug Taren:

I do want to remind everyone that what is being presented today is just a portion of what is in a food system. There are many aspects of a food system that can affect the nutritional quality of food. This includes not only the areas of science and technology, the processing itself, but also it is dependent on policies, how markets function, and nutritional qualities also influenced by social organization in the biophysical environment.

Doug Taren:

The majority of my presentation is going to be on the science and technology. I know that this slide is busy, but I do believe that it is extremely important [inaudible 00:12:43] value chain interacts in both a domestic and international markets and ultimately influence not only diet but also as illustrated on the right side, poverty, food security, and malnutrition, which has a social outcome for which we all want to improve.

Doug Taren:

This is from the work of Linda [Valdustan 00:13:03] working with the Slingerland's group in the Netherlands on agriculture and nutrition and aligns well with what [Weirson 00:13:11] labeled in 2015 as the hidden middle. The parts in orange. This midstream portions of the food system is highly relevant to consider in addition to agricultural production in terms of achieving [inaudible 00:13:23] sustainable development goals to reduce poverty. Specifically, the hidden middle is responsible for 30% to 40% of the added of value of food in the value chain in low and middle income countries.

Doug Taren:

As I start presenting about food processing, I want to take a few minutes and talk about light and it's effect on food. It is something that deserves more attention that it sometimes gets.

Doug Taren:

Light is everywhere. It can have a tremendous effect on the [inaudible 00:13:59] and chemical content of food and nutrients. It also needs to be considered when being transported. In the right situations when those little photons in light come into contact with oils they can lead to chemical reactions that result in the presence of one dioxin, benzene, tirizine, and lipid peroxides, which are toxic.

Doug Taren:

Lipid peroxides are the leading cause for having oils go rancid. Lipid peroxides are also highly toxic compounds that diffuse into the cell and then nutrients are used reduce them with enzymes such as

catalase peroxisome [inaudible 00:14:35] thus making many nutrients less available to consumers and the public.

Doug Taren:

Additionally, peroxide may lead to diseases such as colitis, impaired immune system such as systemic lupus erythematosus, and vascular damage that can exacerbate liver disease, cardiovascular disease, cataracts, and retinopathy.

Doug Taren:

The final availability of the nutrients on this slide are affected by light, specifically UV light. Many of these are probably known to you as oils or fatty acids and that's why oils are kept in containers. Light is also the reason that milk bottles have basically been replaced by opaque containers to preserve the vitamin A, vitamin D, and riboflavin that it contains.

Doug Taren:

I want to bring your attention to the flavonoids as they are important antiinflammatory compounds in food. They also provide color to our food. Flavonoids are yellow, red, blue, and purple. [inaudible 00:15:43] are blue, red, and purple. And corsican is yellow and present in many herbs, fruit, and onions. When light decreases the availability of these compounds it not only decreases the nutritional value but also the color of the food. It's easy to remember this as it's a theme that I will be bringing up later.

Doug Taren:

Now, I'm going to move to a study that was done on light out of Turkey. These researchers wanted to compare the effect of pasteurization in the use of UV as a method for processing milk for both safety and shelf life.

Doug Taren:

At the same time they studies the effect of these two processes on the vitamin content in both cow's milk and goat's milk. They focused on vitamin A, vitamin B2, riboflavin, vitamin C, and vitamin E, which are all heat and light sensitive. They were careful about how they handled the milk samples after collection and kept them in a thermal bag with an ice pack at 10 degrees centigrade, and immediately analyzed the milk samples.

Doug Taren:

What they reported is that the nutrient content of the milk continually decreased with great UV and with each additional expose to UV radiation the nutrient content decreased even more. Vitamin C was affected the most, followed by vitamin E and A, and then vitamin B2 or riboflavin.

Doug Taren:

Based on their work it is clear that one should not use UV light for treating milk, if you want to maintain its nutrition. Additionally, similarly results have been reported with florescent light when milk is stored in glass over a several day period as may happen in the store.

Doug Taren:

Now, I'm going to pivot and talk about the heat as the foundation for why cold chains are so important. Of course, you all know that there are optimal temperatures for food and a specific product.

Doug Taren:

This table is just a reminder that deep frozen food need to have temperatures way below zero degrees centigrade. Even chilled food should be kept near zero. And then, there are some perishable foods that could be stored at higher temperatures such as melons and some fruits.

Doug Taren:

I now want to show you there results from a study Touati and colleagues on the effect of storage time and temperature on the quality of fruit nectar. This is an example of how food quality for the consumer and nutritional content are related.

Doug Taren:

What these researchers did is expose the nectars of oranges, the left graph, pears, the middle graph, and grapes, the right graph, to different temperatures for a 30 day period. What they showed was that increasing the temperature led to significantly more browning of the nectar decreasing its quality for consumers. It also showed that it was much worse at 37 degrees compared to a 25 degree centigrade and the difference with 25 degree centigrade was not as great.

Doug Taren:

At the same time these researchers measured the nutrient content for phenols. Remember those things that have different color in the nectars, from oranges, pairs, and grapes? The ascorbic acid in oranges and pears, carotenoids in oranges, and total anthocyanins in the grape nectars.

Doug Taren:

They showed that the phenol content of pairs decreased, that's graph B, and that there were large desegregates in the content of these foods regarding vitamin C, carotenoids, and for anthocyanins, with increasing temperature and time. This is a good example for the importance of maintaining temperature below 25 degrees centigrade and better towards five degree centigrade to maintain the nutritional value of food and the quality of the food for the consumer.

Doug Taren:

Now, I'm going to turn to somewhat the opposite end of the spectrum and talk about how heat can be used to make nutrition more available over a longer period of time by addressing drying as a food processing method for preserving the lifespan of a food product.

Doug Taren:

The first thing I want to say is that drying food can help inactivate microorganisms that can lead to infections and some of the microorganisms that can devalue food products. It's also important to take into account that even after drying of food to maintain their flavor, appearance, and nutritional value and with low humidity.

Doug Taren:

There is also a problem with conventional methods of drying outdoors. In addition to the issue about exposure to light, which I spoke to, heat can lead to decreasing the nutritional value of food as with the example that I provided with fruit nectars. And it's important to note that there are safety rules for drying and it can decrease the quality of food if not done correctly.

Doug Taren:

As I noted before, studies have shown that vitamin content ... I'm just off a bit, sorry everyone.

Doug Taren:

As I noted before, studies have shown that the vitamin content of food is decreased with increasing exposure to heat and air. However, there are ways the loss of nutrients in food including sulphites in blanching as another example. Blanching can help reduce but not eliminate the loss of nutrients of things like vitamin D1, Vitamin A, and Vitamin C, how the water soluble substance can be lost due to the blanching in water.

Doug Taren:

However, I do want to state that dried foods on a weight basis are often more nutrient dense in energy and micronutrients compared with their fresh state. This can be a very valuable way to have nutritious food available year round for individuals specifically children who are at high risk for undernutrition.

Doug Taren:

Now, I want to talk about the other aspect of drying that can actually increase the value of food. The recent publication in Food Reviews International showed that the price of raw fish before drying in India is about 31 rupees per kilogram and by the time it got to a spot market after drying it was worth 295 rupees per kilogram. Almost 10X greater. The price at a full market was slightly greater at 374 rupees

per kilogram and a price increased to a whopping 1,480 rupees per kilogram for an online market, which is almost 50 times great than the raw product.

Doug Taren:

Now, the last example I want to provide is about the importance of temperature on eggs. Currently there is a resurgence of interest in the field of nutrition about how eggs can help the growth and nutritional status of children. Eggs have a good nutritional content in terms of protein and other micronutrients. However, overall eggs do not lose much of their nutritional value if stored properly.

Doug Taren:

What is interesting is that the quality of the eggs, and that is usually measured by the height of the yolk, deteriorates faster than the nutrients during storage. Eggs can also be dried, but this also has to be done carefully as too much heat will lead to the Maillard reaction that decreases the bio availability of the egg protein.

Doug Taren:

I want to tell you about a study conducted by [inaudible 00:24:29] and colleagues at the University of Agriculture in Makurdi, Nigeria. They measured the quality of eggs under three different conditions. They had eggs kept at ambient temperature, which could've been greater than 27 degrees centigrade in Nigeria, refrigerated eggs, and eggs that have their shells lined with a thin coat of vegetable oil.

Doug Taren:

You can see how quickly the egg quality decreases measured by the hawk unit. That's a measure of the yolk height compared to the diameter of the white when being stored at ambient temperature. But just by putting a thin [inaudible 00:25:05] of vegetable oil on the shell, and the quality of the eggs stayed almost the same as refrigerated eggs.

Doug Taren:

What of interest is that there was less microbial growth in the eggs when the quality was also maintained. For this table you can see that the total plate count for bacteria, the top three rows of data, and the yeast and mold count, the bottom three rows of data was the same for the three groups at the start of the study.

Doug Taren:

What is of interest is that the total plate count for bacteria significantly increased by a power of 10 after two weeks for the refrigerated eggs and by 10 to the second power in ambient temperature, but stayed relatively unchanged for the oil coated eggs. This was also true for the yeast and mold counts. Although

these counts did continue to increase over four weeks, the oil coated eggs continued to have less microorganisms than the other two groups.

Doug Taren:

I do want to conclude with what I think are the two important take home messages. First, food processing has mixed effects on the nutritional value of food. It depends on the type of processing, the food components, like the nutrients, and the food product itself. And second, processing, those again are electric properties, the microbiological aspects of food, and nutritional status, are intimately associated with each other during food processing.

Doug Taren:

With that, I thank you for listening. I am able to turn this over to Rusty who will start his presentation.

Julie MacCartee:

Thank you, Doug.

James Rusty Eason:

Good afternoon, everyone.

Julie MacCartee:

I think we are going to pull up a few-

James Rusty Eason:

Good afternoon, everyone.

Julie MacCartee:

Oh. ... questions. Hi, Rusty. We were hoping to just pull up a few polled questions before we got into your part of the presentation for our participants to weigh in on in response to Doug's presentation. So we'll just sit here for two minutes so that you can let us know how important you think are retailers are concerned about having their products keep their nutritional value during storage. What do you believe that egg producers consider to be the most important variable to consider? We'll broadcast these results. And also, which food processing method you believe can be implemented or modified the easiest in low and middle income countries.

Julie MacCartee:

It's always interesting to see our audience perspective on these questions and our presenting team will take this into account. Interesting. Thank you all for weighing in. It's interesting to see that it seems that

about 50% of people believe that drying is perhaps the lowest [inaudible 00:28:25] method in low and middle income companies to preserve nutritional value of food products. Great.

Julie MacCartee:

All right, I think we can go ahead and move along to Rusty's portion of the presentation. Thank you all for weighing in on these questions and please do continue to post your questions for the presenters in the chat box. We will ask as many as we can after Rusty's presentation. So Rusty, I'll pass it over to you.

James Rusty Eason:

Thank you. Thank you so much. It's a pleasure being here. I want to thank FES for bringing me on board as well as USAID. It's an honor to be here. My topic is food safety in the cold chain. We want to define the cold chain and how food safety meet.

James Rusty Eason:

According to the World Health Organization the global estimates of food borne diseases find children under five account for most of the death in the world. This is due to poor handling and storage techniques and multiple other facets. I've got a real live picture of the cold chain in parts of Africa. This needs to be solved.

James Rusty Eason:

I want to define a cold chain. It is a temperature controlled supply chain from farm to fork. We need to make sure that we get it as cold as possible within the first four hours after harvest to the optimal temperature.

James Rusty Eason:

Some of these methods include shading on the farm. As you can see I have an example of shading there in Egypt, a collection center along with shading. Plastic air crates for air circulation. As well as determining the handling of the product. You can only fill up so much and that way they don't over handle it because bruising and tears and things of that nature. So returnable plastic crates are very important.

James Rusty Eason:

Pre cooling on farm. Again, as I said, the first four hours is critical to extending the shelf life, some product up to 21 to 30 days.

James Rusty Eason:

In long-term storage blast freezing is necessary, especially in the meat protein and sea food. This is quick freeze technology that brings the temperature to minus 18 celsius within 24 to 36 hours depending on

the amount of product you need to run through the system. After blast freezing or chilling, you have to have cold storage to have an unbroken cold chain. It's better to not start the cold chain than break it anywhere along the line.

James Rusty Eason:

And then, of course, refrigerated vehicles are very well important because at least every supply chain you're going to have the product in the transporter vehicle three to four times before it hits the end user. This is the most expensive link in the supply chain as well. So it's critical to have refrigerated transport.

James Rusty Eason:

Now, I want to just discuss briefly from a private sector third party logistic cold chain expert the culture of your company has to, doesn't have to, but needs to engage in planning and monitoring food safety management systems. It has to be a foundational core competency or value that the company finds, if you're going to be a proper cold storage. So you want to create a culture in your company where food safety as well as safety in food defense is as important as the bottom line.

James Rusty Eason:

Compliance to regulatory agency. This is the base for any food safety management system. It is not the end all to be all. It needs to sometimes be towards international markets rather than just domestic regulations.

James Rusty Eason:

Third element here in the food four key elements is traceability. This is critical not only from the production or the harvest of food. It has to be traceable throughout the supply chain. Some companies use block chain to capture temperature, data, pricing, all the way through the supply chain. Traceability has to happen as well as the data has to be defended in how are you going about keeping your data correctly. So it boils down to every aspect of the food commodity.

James Rusty Eason:

Again, as I said, the food safety management system has to be the foundational stone of organization that is feeding the world. Your documents need to be in accuracy and in place. Employee training has to happen quarterly. It needs to be a weekly, daily, type of situation. Internal audits, not just waiting on third party audits, but your management, senior management has to issue audits around their particular food safety management system. And then reporting an [inaudible 00:33:55] action as well.

James Rusty Eason:

Recently over the last few years threat assessment, critical control points, and vulnerability assessments have become vital to success food defense. So you have no one that can adulterate your product. In developing markets, unlike the US and maybe Europe, security around these types of warehouses or transport vehicle is critical. And some want \$20,000 US a month in cost just to defend depending on the size of the company.

James Rusty Eason:

Vulnerability helps mitigate the threat. So these are important aspects to pay attention to when you're setting up your food safety management system.

James Rusty Eason:

The critical areas for contamination. For me, I don't want to overstate section of the supply chain over another. I think it's all critical. It's one seamless responsibility of each stakeholder. We use this slide here to show that from farm or sea to for, whether you're in agriculture production or whether you're the consumer, there's a responsibility for each stakeholder along the supply chain to maintain proper handling, and storage, and hygiene to maintain the quality and the temperature of that food.

James Rusty Eason:

Now, the companies are looking at the consumer. How are they taking it from the retailer? Are they going directly home? There are studies taken around that area to make sure that their product gets to the table in its intended quality.

James Rusty Eason:

So we want to deal with the business reason for food safety not just from a profitable standpoint. Safe and quality food extends the life of a human, reduces food borne illnesses. This economically burdens many countries. This is vital to food safety.

James Rusty Eason:

Market access. Some markets are just not accessible with non certified food. Let's say it that way. It needs to be certified. It needs to be monitored. It needs to be controlled. And so, certification allows you to market access that typically would be domestic or local.

James Rusty Eason:

It also gives you brand advantage over local competitors. People look for these symbols such as British Retail Consortium or ISO. In the food industry everyone wants to see who you are adhering to and which regulations depending on your link in the value chain.

James Rusty Eason:

I want to speak about a few cold chain solutions. This is not an exhaustive list by no means, but these are some things, some small solutions, some larger solutions, that can be put on the farm or in a dry warehouse to operate cold chain in different methods.

James Rusty Eason:

So mobile pre cooler and mobile blast freezer. There's some technologies out of Turkey and India that brings the product to four degrees or to the right temperature in four hours.

James Rusty Eason:

Mobile blast freezers. These are important. For example, here in Kenya during the COVID crisis, when it first started processors were shutdown. Social distancing took place. Farmers had nowhere to go with the poultry. They turned them over to me. I gave them a short-term solution. I could not store it. I operate a 5,000 metric ton facility here and we could not store it because we could not remove the heat fast enough.

James Rusty Eason:

So I gave them some dry ice. Wrapped it in some paper we dipped and then stored it. Dipped it in the dry ice, then froze it, and then brought it into storage. But there was roughly about 150,000 birds that were lost during COVID because there is no blast freezing within East Africa except for the upscale processors.

James Rusty Eason:

And so, Adelano Solar Cold Storage also has a water maker on it. So it captures and filters the evaporation water off of the cylinders of the cold storage and creates 80 liters a day. This is can be a freezer, but it will not remove the heat fast enough to store it. It just maintains temperature.

James Rusty Eason:

Other technologies such as [inaudible 00:38:53] is temperature monitoring and fleet management software which goes along with GPS tracking of the [Reefer 00:38:58] trucks. This is critical when you're looking at food defense. Sometimes you'll have people who hijack trucks depending on the value. In East Africa sugar is also a very high value commodity and you have to be very careful how you handle it.

James Rusty Eason:

One technology in the US I've found very unique is Verizon Connect. It's a geo fence. So if you've ever been in the warehouse industry, truck drivers will tell you they're at your warehouse, but they're not. This allows you to know exactly when they back up to a lined [inaudible 00:39:36] and alerts the supplier on both ends. The product is monitored from point A to point Z throughout the whole supply chain and wherever he goes. This is one of the most advanced GPS monitoring and tracking devices there is.

James Rusty Eason:

There are other technologies, like the Dearman Engine that can and Viking has a thermal to reduce energy loss and produce energy use. There's other operational techniques that can also reduce energy use.

James Rusty Eason:

So this is my presentation from a third party logistics in cold chain expert. I thank you for taking the time with me today. Appreciate you very much.

Julie MacCartee:

Thank you so much, Rusty and Doug. Now, we have some time for questions. So thank you to everyone who has posted questions in the chat box. We've been collecting them on the the side and we will get through as many of them as we can.

Julie MacCartee:

All right. I am going to go ahead and start with the very first question that came in from Margaret Ziegler, which is kind of a big question. We thought perhaps, Rusty, you could start by answering this question, but, Doug, you're welcome to weigh in as well.

Julie MacCartee:

Margaret said, "I would love to know if investors in the private sector or public sector are looking at innovative technologies in developing countries to use local materials for sustainable food packaging that protects nutrients and shelf life." So a question about kind of local procurement, local materials, for these efforts.

James Rusty Eason:

This is for me?

Julie MacCartee:

Yeah, [crosstalk 00:41:34].

James Rusty Eason:

Honestly, they ... Yeah, okay. There's a delay in my phone connection, sorry. Yes, there are some investors that look at these types of things. Just depends on what the need is, but there are people, there are companies here that use banana leafs and bamboo and all these different cover. For example, Twiga Food does it here in Kenya and that's invested by multiple investors. I don't know if I want to get into the list of them, but IFC's involved quite a few. So yes.

Doug Taren:

I'd like to add to that, Rusty, that I don't know about the investors, but I do know that there are some interesting new technologies that are being looked at, especially around using what might be considered more green type of products such as cellulose or using seaweed to help make packaging materials.

Doug Taren:

I'm not sure how they are for preventing light or helping with temperature, but those are resources that would be available locally, if manufacturers invest within the low and middle income countries on these technologies. Clearly seaweed. People have a coast. And cellulose is from plants. This would be an alternative to petro chemical packaging technology.

Julie MacCartee:

Great. Thank you, Doug and Rusty. All right, Doug, a question that came in the middle of your presentation about your fish drying example. [Dedra 00:43:33] [Holcrast 00:43:33] asked, "Did the fish drying example take into account weight loss during drying?"

Doug Taren:

Well, the first chain in that is the cost of the fish to maybe the first spot market. Clearly the wet weight is greater than the dry weight and that has to do with even the nutrient density of food after drying. I think that's what's important about the example I provided is that the cost of the dried fish increased even from the spot market to the full-time market to the online market. In that case the dry weight was always the same and the cost for the same dry weight went up as it went through this value chain.

Doug Taren:

But, you're right, that the wet weight and the dry weight are definitely different. So when you have 100 grams of something that's dry, that may have started off 200 or 300 grams as wet weight. So you do need to take that into account, but I don't think it's a 10 times difference. I think that was the biggest concept I saw is that the value went up 10 times and I don't think the dry weight is 10 times less than the wet weight.

Julie MacCartee:

Great. Thanks so much, Doug. Let's see, another questions that came in during your presentation to quickly ask from [Milolivan 00:45:15] [Hujangi 00:45:16] is "What is the acceptable level for YMC, which is yeast and mold count, in food products?"

Doug Taren:

I can't give you the exact count number of that. So I think that those numbers went up. I think looking at a specific reference standard would be good. I could get that to you and put that in after the conference. I don't have the exact count at this point for you.

Julie MacCartee:

That sounds good. We can share in the post event a few more resources in that regard.

Julie MacCartee:

All right, I'll move onto a question that came in for, Rusty, or a couple of questions for Rusty. Let's see, from [Sudik 00:46:11] [Jarachia 00:46:13], "Is it necessary to conduct pre cooling at the farm for vegetables and fruits, for example, carrot and lemons, or can it happen in a pack house prior to cold storage?"

James Rusty Eason:

Yes. Short answer is yes it can happen in a pack house. Typically, you don't want to be not that far away from the field that it is harvested in. But I've dealt with different suppliers all over the world and some of them do have pre cooling in the pack house, especially Egypt and the US, but they need to get it into the shade and keep it cool as quick as possible before they get there.

James Rusty Eason:

And then, the harvest times is also critical. If you can, you harvest in the morning or when it's cooler outside. But yes.

Julie MacCartee:

Great. Thank you. Another somewhat specific question for you or a two part question. John Porterfield, "Is maintaining a temperature below four degrees celsius of value for certain types of products and what types?" And then also asking, "If a cold chain is broken but the products remain below four C, can the product be safely refrozen and is this mentioned in any standard?" So a couple of questions about that level of four C and how important it is.

James Rusty Eason:

So for pharmaceuticals, for examples, is between two to eight degrees, so they typically set it between four and five. It just depends on the commodity and the requirements of the storage. Fresh fruits and vegetables same thing, its optimal temperature. There's commodities storage manuals that's provided by several colleges as well as GCCA, Global Cold Chain Alliance, that will identify which ones should be at which temperature.

James Rusty Eason:

The other question was? Again, repeat the second part.

Julie MacCartee:

Sure. It was about, if a cold chain is broken but the products are maintained below four degrees, can it be safely refrozen?

James Rusty Eason:

Refrozen is not a good process. I mean, yes you can, but you're going to allow the bacteria to start growing back and then freeze the extra bacteria. What you're doing is you're going to do away with the taste and the whole quality of that product. You just don't want to do that.

James Rusty Eason:

So, if you start a cold chain, you need to continue it. If you don't, then sometimes if you can get it to the retailer quickly enough then that's what happens. I'm speaking from a development market standpoint, not a developed market. So sometimes you just have to do what you have to do, all right?

Julie MacCartee:

Mm-hmm (affirmative).

James Rusty Eason:

So it's best not to refreeze though, if it's already been frozen.

Julie MacCartee:

Great. Thank you. Another question for you, Rusty, and [Lloyd 00:49:36] [Lepage 00:49:36] posed this question broadly to the audience as well. And so, we're certainly always interested in our participants helping answer each others questions or add to this discussion, but Lloyd asked, "What top three policy changes can African Governments make to release rapid scale up of cold chain and dehydration in their countries?" Rusty, we thought you could kick off this answer.

James Rusty Eason:

Wow. Okay. What policy change? First, the importance on food safety. So various countries I've been in they don't have standards or food safety standards written. For example, some countries are implementing right now national food safety alliance associations and then they need to be budgeted, funded, and enforced. So in a lot of African countries standards are not written.

James Rusty Eason:

Our Kenya, East Africa community has some, but there are others that do not. I've worked on some of them in [Benin 00:50:50] and in West Africa quite a bit. That's the thing.

James Rusty Eason:

And also, they need to deal with the [inaudible 00:51:00] alimentarius and understand it. It has to be written based upon the culture and these kind of things. So the standards are missing in a lot of these countries.

Julie MacCartee:

Great. Thank you so much, Rusty. All right. Another important question that was targeted towards you, Rusty, came in from [Ashagree 00:51:37] [Yurgist 00:51:37] who said that, "USAID has installed several chiller in milk collection centers in Ethiopia, but most are inoperable due to electric inaccessibility and cost. Can you comment on how a cold chain can be implementable in developing countries even if a cold chain contributes a lot to ensure food a food an animal source like milk and meat?"

Julie MacCartee:

And then, another question came in from [Tomisian 00:52:08] [Mabula 00:52:08] who said that, "Most African countries are facing the challenge of energy. Electricity is not available all the time to all people. Is there any way to help this so that most developing countries can adopt food quality and shelf life?" So on the whole a question about energy accessible in developing countries being inaccessible or costing too much and how that affects cold chain accessibility.

James Rusty Eason:

Right. And cold chain is a heavy energy user typically depending on how you design it, but there are difference companies that's looking at the milk value chain. One of the issues there though is during the collection process or the collection center a lot of the companies don't have infrastructure in place to handle that part correctly. Even though the small holder farmer who's catching say 10 to 14 meters a day and they carry it to a collection center, there's no traceability for each individual farmer. So that's a food safety issue that happens in all of East Africa and Ethiopia as well.

James Rusty Eason:

There are some solar milk chillers that's out there. Adelano has one. DGrid energy has one. There's a company out of Germany called Redavia that's looking at all of Africa to help implement solar power. Wind power is another option for these types of things. There has to be investment.

James Rusty Eason:

So some of that, let me go back to policy here a little bit. If you're going to contract farming or if you're going to work with small holder farmers, then the buyer or the supply chain managers have to invest in

them as well. So there has to be a understanding that if you're an off taker or a buyer of this product, that you need to invest into the types of technologies that make the product more safer.

Julie MacCartee:

Absolutely. Thank you, Rusty. All right, another question came in from [Mira 00:54:30] [Chandra 00:54:30]. "What are the costs associated with these technologies?" And Rusty, I think she was referring to the list of cold chain technologies that you [inaudible 00:54:39]. "Is it reasonable that small and medium enterprises in Feed the Future target countries can afford them?"

James Rusty Eason:

That's the preconceived ideal, to be honest with you, but I've lived in Africa for 10 years and I've been to probably 7 to 10 countries in the last five years. Money has not always been the issue. It's been more about sometimes understanding or do they want to part with that money?

James Rusty Eason:

So there are cheaper solutions. I mean, you can get from \$10,000 to small scale solar cold storage, from \$10,000 to \$150,000. Blast freezers are going to be anywhere between \$30,000 to \$100,000. But I can say this. I mean, people need big size warehouses. Blast freezer issues are with them. But feeding into an already sizeable infrastructure because these costs come down and the energy uses come down the more product you have through it, which is through put.

James Rusty Eason:

If I can more 100 million pounds in one facility. That's better than doing 100 million pounds through 300,000 of these things just from a environmental standpoint. There need to be operational efficiencies and balance. They're considered experientive, but it depends on your production and your volume.

James Rusty Eason:

And then, because as you're in the food industry, logistics should cost about 25 cents a kilogram, okay? Just to be honest. All the way through the supply chain, all right? I work with one of the largest companies in East Africa currently that does this all day long and I've done it in the US as well. The margins are basically the same. It's just where the money goes to.

Julie MacCartee:

Thanks, Rusty. I'd also like to highlight that [inaudible 00:57:00] that finding cost effective ways to implement technologies and practices that make a return on investment worthwhile for small and medium business is a key objective for decision drivers for food safety project, which his being highlighted today. And this is the Food Enterprise solution. So definitely there will be more coming forth from the business driver for food safety project.

Julie MacCartee:

All right, let's see. Another good question from Katherine [Purie 00:57:38] and also, Katherine, thank you for sharing some resources and links on training in the chat box. Katherine asked, "If any research or analysis has been carried out on what scale of operation and S&A should have to be able to afford these types of equipment?" So linking affordability with an ideal scale or size of operation.

James Rusty Eason:

You want me to answer that one?

Julie MacCartee:

Sure that would be great?

James Rusty Eason:

Yeah, so I won't say no professional study that I know of, but I do this all the time. Literally, I'm working on an ROI project right now for another country, Georgia, that actually brings the blast freezing technology to a small older farmer.

James Rusty Eason:

And so, I'm taking the retail sector of the QSRs and restaurants have these blast chillers, blast freezers, and you can use that on a small scale operation as a 40 kilograms every 48 hours to minus 18 Celsius. This product costs \$3,000 US. It operates at about \$30 a day and that's with four employees operating it.

James Rusty Eason:

It's a very high end stainless steel, very good equipment that you can use it as cold chain as a service, but the cost per kilogram runs about 75 cents on that machine. But the one I showed on my presentation from Turkey is a 25 ton unit, which is basically a 40 foot container retrofitted into a pre cooler and blast freezer. It costs two cents a kilogram, all right?

James Rusty Eason:

So the volumes of where you want to get to is about 25 tons. Where that's basically a truckload, all right? So that's where the price of blast freezing comes down, pre cooling comes down. And so, as I said earlier, the volumes are key. And that's basically for a small scale farmers is between 22 to 25 ton to make it cost effective and you can still hit the target market even if it's on the domestic side. Because that two cent of cost per kilogram, that's a sweet spot, to be honest with you.

Julie MacCartee:

Thank you, Rusty. All right, we've got a few more questions that we're able to squeeze in. Let's see. All right, to Rusty, a question from [Jorey 01:00:42] [Tukez 01:00:42], "What do you think of charcoal or sand as a evaporative cooling system as an alternative to solar a cooling system?"

James Rusty Eason:

Oh, zero inner cooling chamber. It works. It lowers probably two to four degrees, if I remember correctly. It's a solution that works above that temperature range. Field heat is not going to be removed. It will extend the shelf life. It's not going to get it to the right temperature, if you will, for that product, but it is better than nothing. Let's put it that way. And it will extend a few days.

Julie MacCartee:

Very interesting. Thank you. All right, a question has come in from Margaret [Zieglar 01:01:36], "Are there best practices or effective examples of technical assistance especially for business skills like negotiating contracts, tracking inventories, implementing food safety protocols, that the sponsoring organizations here can share with us? How can we get to scale with business skills and SME development?"

Julie MacCartee:

Rusty or Doug, whichever of you would like to weigh in on this, that would be great.

James Rusty Eason:

I can weigh on it, if we need to. I've done business development diagnostics-

Doug Taren:

Well, [inaudible 01:02:17]. You start.

James Rusty Eason:

Okay. I've done business diagnostics in several countries on [inaudible 01:02:24]. They just need access to the material, the training, and the capacity, and all that is available. I currently live in Kenya and, as you see, Brighthouse Consultancy is an organization we work with. I've done these diagnostics in Nigeria with Roberta.

James Rusty Eason:

So it's something that needs to happen. It's negotiating contracts. I do it every day for small scale businesses here. So yes, it needs to be done because it's missing because they need to understand what the buyer are looking at, why food safety's important, what does it do for them, how do they get into the market, how do they compete on a contractual level?

James Rusty Eason:

And so, there's been a lot of middle man beating up over the years of these guys that come along in the middle, but it's because they know how to negotiate contracts. It's because they understand the market a little bit better. Maybe not to the level of what they should, but they have a little bit better skill set of handling that negotiation.

James Rusty Eason:

And so, that's where the farmer is. If we're going to go from farmer to plate quicker, they have to get trained in that type of a circumstance.

Doug Taren:

Well, I wanted to add to this, Rusty,-

Julie MacCartee:

And Doug [crosstalk 01:04:07]-

Doug Taren:

... is that-

Julie MacCartee:

Yes, go ahead.

Doug Taren:

What I wanted to add is that clearly you have to know the field, right? You have to know about the cold chain, what you're negotiating with. So you have to have the content, but you also have to have the communication skills. The communications skills on how to negotiate are incredibly important in the strategies that you use.

Doug Taren:

I direct a training center and I'll put down the website in the chat, the Western Region Public Health Training Center. We have lots of no cost short modules on communication and negotiation. Not specifically to this field, but in general what those skills are needed and what one needs to have. And so, I will give you that as an example.

Doug Taren:

I'm sure there are also a lot of other online resources on negotiation and communication. There's [inaudible 01:05:11] communication to make sure you can get to, as you know, the famous book on How

to Get to Yes, if that's what you want to do during those negotiation, but you have to know what your value is and know what you need to get out of the contract.

Julie MacCartee:

Thank you so much, Rusty and Doug. And thank you for sharing those resources in the chat box.

Julie MacCartee:

Okay, we have just a few more questions to get through. One is from Virginia [Sopela 01:05:51], "How do you incentive in the food safety and cold chain practices in the absence of regulatory enforcement? How do business drivers differ for export oriented companies where companies focus on the domestic market in Feed the Future countries?" I'll toss that out to, Doug or Rusty whoever would like to weigh in.

James Rusty Eason:

I can do it, I guess. Again, the food depends on your buyers. I can give an example in Egypt, for example. Again, I just told you they begin to do a national food safety authority here recently over the last two, three years, but there's an organization they're an exporter association that has created their own brand, if you will, called [Heyya01:06:56]. They have their own quality standard they set from the private sector side. They set up this association. They set up their standards.

James Rusty Eason:

And then, in the 1980s I believe it was, I believe USAID helped them with this, and then they have reached markets outside of Egypt because their standards match the international standards. So grapes, pomegranates all go out under Heyya until recently. The National Food Safety Authority has come along and started implementing it.

James Rusty Eason:

And so, it has to be market driven, buyer driven, and then a required cold chain will come along with that because right now there's nothing that's more extending a shelf life better than cold chain but lower the temperature than anything else. So this is how, again, it's got to be consumer demand and market driven.

Julie MacCartee:

Great. Thank you. I can see that [Russ 01:08:14] [Buster 01:08:14] just posted a question to the audience. He's requesting that you please send in examples of your experience or approaches or best practices, lessons learned, et cetera, in building capacities among post harvest supply chain experts seeking to expand the community of practitioners in that area. So you'll see Russ's email address in the chat box so please do reach out to him if you have lessons learned in that regard.

Julie MacCartee:

We have seen a lot of great resources and links come in through the chat box. We encourage all of you to be on the lookout for the host event email for this webinar where we will send you the recording, the transcript, the chat box Q&A and answers, and any additional resources that we would recommend.

Julie MacCartee:

All right, I am checking to see if we have a couple last questions that we can squeeze in before we wrap up today. I will toss one out from Bonnie [McClackerdy 01:09:25] who said for both Doug and Rusty or whomever would like to answer, "I assumed that these technologies are not all the same in terms of avoiding food safety hazard and risk. So in the list of cold chain technologies that you provided some may be better for avoiding food safety hazards than others. Do you know of a source that places a food safety lens on technologies or innovative processes?"

Julie MacCartee:

Perhaps, Rusty, you could take that one?

James Rusty Eason:

Say the last part of that question again?

Julie MacCartee:

Sure. Asking whether you are aware of any sort of source that places a food safety lens on technologies or innovative practices or a way that a user might be able to tell if a particular cold chain technology is better than another in terms of food safety effects.

James Rusty Eason:

That has to do with what the design build technologies could be, intended uses. For example, the technology out of Turkey is a container, a modified container, as well as Adelano turned into a blast freezer or into a pre cooler or into a cold storage water maker.

James Rusty Eason:

So you're going to have to figure out from a food safety from your food safety management system that you've implemented through a company how do you factor or design build that into your processes. When you get into the larger scale equipment, it's based upon your design workflow of your food manufacturing. This goes back to your business development needs, and your capacity training, and technology [inaudible 01:11:15].

James Rusty Eason:

You need to bring people in to show food processors at a small scale of that this is what needs to happen. We start here with receiving. We start here with cooking process or processing or slaughtering, whatever it is. We start here and then we do this. And this is how we maintain through the whole food processing system into the either blast or chiller and then into refrigerated transport. So there has to be [inaudible 01:11:48] type of system for the corporation's infrastructure. I hope that made sense.

Julie MacCartee:

Yeah. Thank you, Rusty. All right, we pulled up a poll question that we asked you all to answer a little bit earlier and, Doug, we were hoping that you might want to take a look at these and comment anything you find interesting from the audience responses.

Doug Taren:

Well, I did because one of the things I sort of thought about was how high would the nutrition content of food be within the imported. You see it's pretty much split. Nutrition itself from a processing perspective is about half and half being imported. Somewhat important to me is maybe less important.

Doug Taren:

But what I think's important about all of this, using the word too often, is the link between food quality and nutrition. Even if one goes to manufacturers and gives an emphasis on food quality, on preventing bacteriological contamination or preventing the discoloration of food, if you focus on that, you will still be preserving the nutrition content of food. I think that's one important aspect of how you can bring these two pieces together.

Doug Taren:

The other thing that I think is surprising to me is the answer about what would you want to upscale first and drying got more than half of the responses. I know this is a webinar on the cold chain. And so, I think some of the issues that were raised about cost, which I think Rusty responded to really well that it's not the cost that often is the primary prevention or barrier to cold chain. There are other issues.

Doug Taren:

But drying is something, if done correctly in different types of facilities, is a way potentially to preserve food and keep it available for people. It can be done locally. I mean, I'm not the food technologist. I'm the nutritionist on this team. But it's clear that just having food available and even if it does lose a portion of its nutrition content, you're still ... The food is there.

Doug Taren:

So you might be losing 5%, 10%, 20% of the nutritional value, but then you still are maintaining that nutritional value that can be used to feed people. And this can be done at the local level.

Doug Taren:

I did see a question earlier about technologies for local preservation like leafs, and banana leafs, and things of that sort. I think thinking about how to commercial activities and making sure they're safe bacteriologically and microbiologically is very important and doable at the local market. Probably less important at the international market.

Doug Taren:

So that's where the takeaway message is I'm getting from these poll questions that we have. I don't know if anyone else would like to comment on that.

Doug Taren:

I don't know, Bonnie, if your question is if unsafe food should not be considered food, and I agree. I mean, the aspect ... If you have a food project that leads to infectious disease such as diarrheal diseases, you're losing the nutrient content of anything that is providing. So one of the priorities does have to be the bacteriologic and the safety of the food that we consume.

James Rusty Eason:

Can I mention one other thing about drying a little bit from my experience?

Julie MacCartee:

Go ahead, Rusty.

Doug Taren:

Sure.

Julie MacCartee:

Yeah.

James Rusty Eason:

So I've been in several countries where drying herbs, and spices, and different products, they used diesel to go to the farms. These are major machines that use a lot of diesel in the day and sometimes they're off road areas and there's spillage of that diesel. So when we say up scaling drying, we also need to say upscale drying technology as well.

James Rusty Eason:

So if it's solar, out in the sun, tarp, whatever, it just needs to be handled safely because in the places I've been I couldn't breathe just to be honest. But the project that I was working with had nothing to do with

drying. It was about refrigeration in cold chain. But I have been in some situations where the drying technologies, the equipment was not handled properly. Let's say it that way.

Doug Taren:

Rusty, I think that's a great point. I think we need to always keep in mind what harm can be done by different technologies and trying to go to things that are safe both locally and globally. I think that's where some of the solar power methods that are coming in that you spoke about are really important and I'm a big advocate.

Doug Taren:

We have a solar powered drip irrigation system in [Benine 01:17:52] going on now that has nothing to do with the cold chain, but it is preventing the use of diesel and also the fluctuation in the price of diesel. So once you set something up as a solar system, your investments later on are less or more stable because you don't have to worry about fluctuations in the price of petro.

Julie MacCartee:

Doug and Rusty, thank you both so much. These are some really vital messages. And it's so great to see our audience on the webinar today really invested in food safety as a hugely important element of nutrition, of resilience, of a player in the food system. And so, I'm excited about this conversation that going on. It seems pretty certain that we'll need to continue the conversation and continue to share resources and doing research as a community going forward.

Julie MacCartee:

And so, We're going to go ahead and wrap up the webinar today. I would like to thank our speakers, Lourdes, Doug, and Rusty, and our chat box contributors Roberta and Russ for your really excellent contributions to this conversation today. I would, of course, like to thank the Agrilinks team for your tireless support of this series and all of the behind the scenes work you've been doing to make that this is pulled off effectively.

Julie MacCartee:

But most importantly I would like to thank our audience for your questions, for the resources you've shared, and for your engagement. You as always are the reason that we hold these webinars. And so, we're always interested in your feedback on what topics you'd like to discuss, what resources would help you do your job better, and the like.

Julie MacCartee:

So we are going to move ahead to a few closing polls that we hope that you will quickly give answers to before you take off. And as a reminder, please be on the lookout for an email in your in box in about a week or a little more than a week with the post event resources from this webinar.

Julie MacCartee:

Thank you all. We hope you have a great rest of your day and we hope that you will go forth and be an advocate for the importance of cold chain management in food safety and protecting against food loss. Thank you all.