



# RISKY BUSINESS: FOOD SAFETY CONCERNS IN AGRICULTURAL DEVELOPMENT

---

WEBINAR AUDIO TRANSCRIPT

JULY 13, 2016

## PRESENTERS

Ahmed Kablan, USAID/Bureau for Food Security

Delia Grace, International Livestock Research Institute

Jagger Harvey, Kansas State University

## MODERATORS

Angela Records, USAID/Bureau for Food Security

Julie MacCartee, USAID/Bureau for Food Safety

*Angela Records:*

Well welcome to today's Ag Sector Council webinar where we will discuss food safety concerns in agricultural development. I'm Angela Records. I'm a science advisor and plant pathologist with USAID's Bureau for Food Security and I'll be your moderator today. This webinar is hosted by Agrilinks, Feed the Future's technical knowledge sharing platform. Agrilinks hosts regular seminars and special events to facilitate the exchange of knowledge among practitioners. Visit [agrilinks.org](http://agrilinks.org) where you can contribute to online discussions, submit resources and post to the blog.

Ok. So our speakers today are Ahmed Kablan, Jagger Harvey and Delia Grace. Dr. Kablan serves as international public health and nutrition advisory with the USAID Bureau for Food Security. His work focuses on factors that lead to negative nutritional outcomes and nutrition integration. Dr. Jagger Harvey is director of the Feed the Future innovation lab for the reduction of post-harvest loss led by Kansas State University. He's an expert on mycotoxin contamination of crops. And Dr. Delia Grace leads research on zoonoses and food borne diseases at the international livestock research institute in Kenya and the CGIAR research program on agriculture for human nutrition and health. Ok. At this time, I will invite our first speaker to present. Dr. Kablan?

*Ahmed Kablan:*

Thank you Ms. Records and good morning everyone. Thank you for joining us today, this morning for a presentation or webinar on food safety and hopefully this will be the first one in a series of webinars to cover different aspects of food safety. The thing that we want really to cover in this aspect is why food safety is a concern in international agriculture and connection to government and for us at Feed the Future. If we look at the Feed the Future result framework the top two targets or the top two objects indicated for our success are in the both nutritional status and the reduce of poverty. So we really want to focus on these two things.

And the way I see it food safety and such can affect these two things, the poverty from the income side and from the productivity and it affects the nutritional status. It affects the reduction in illness. And hopefully during this presentation we will try to convince you the importance of food safety aspect on these two high goals and targets. If we look at the recent WHO report on the food borne diseases, you would see an astounding numbers that about eight in ten people who are suffer from food safety. And about of those if you look at the small sectors of children under five they consider up to 40 percent of the food borne illnesses burden with about 125,000 deaths every year or 30 percent of every year.

In Africa alone more than 91 million people are submitted to fall ill and about 137,000 die every year. And about 60 million children under the age of 5 fall ill and about 50,000 of them die from food borne illnesses. And if we look at the major causes for food safety over the major categories and Dr. Grace and Harvey they will touch more specifics on those but we have the pathogenic causes. You have bacterial, viral, pathogenic and then you have toxins which are chemicals. A toxin is produced by either pathogenic or nonpathogenic chemicals and those – if you look at the major categories and again this will be covered later in the webinar pathogenic sources present the majority of all food borne illnesses.

The way that we look at food safety, if you look at the nutritional outcomes, the nutritional status on childhood nutritional status reduced something, you have to look

at this from multiple areas. So you have the food based issues where you would have to give them safe, healthy, nutritious diet and here you have the food safety concerns from pathogenic, bacterial, viral and you have of course from the fungal toxins, mycotoxins and then you have of course other chemicals involved. Also you need to look at the microenvironment and the macro environment.

And the micro environment it is what is inside the condition inside the child's gut and intestines and that's why it said environment is very important. The gut microbiome and how healthy is that is very important factors. And then if we look we have to look at the food base which is of course if we have everything good and we do not diverse diet then that is not, we will produce an impact. So we need a healthy diverse diet, fruits, vegetables of course, animal source food is a major component of any healthy diet especially for growing children in development. We can look at the legumes and of course the way we're able to use this so it's social behavior change component is very important.

So if we look now at the several of the base where we work in Feed the Future and you look at the major foods offered in the grain base and that is what we have on the left side. The goal is to improve the diet diversity for better nutrition and we want to add more fruits, vegetables. We want to add more of the animal source foods, eggs, milk, chicken, fish, and etcetera. And this is really ultimately the goal that we want to have and that will result in *[Break in Audio]* nutrition. And with this comes the concern of food safety.

The more we are moving – so if we look at this graph when we have a low diet diversity you are also having a low concern in terms of food safety because you are having limited batches that could contribute to food poisoning or food borne illnesses. As you increase the diet diversity you are also increasing the factors that could be introduced through the food that could contribute to an increased illness. You are adding more entry pathways for pathogenic bacteria and viral and others.

You are adding for to produce more fruit and vegetables you need to more import. You need to use more pesticides. You are using more chemicals in the environment. You are introducing different types of mycotoxins that could present a risk on the health. So and of course with the animal source food and with the eggs, milk, etcetera you are also adding another medium to introduce bacteria growth, microbial growth and the delivery for microbes.

So if we don't have – if we don't approach it from a comprehensive systemic way where we will have the whole value chain considering the safety and entry point for food pathogens we will not be delivering a huge favor here of when we are improving the diversity because we might introduce a lot of pathogens that will ultimately lead to severe illnesses. And if we look at food safety and food security you need in order to achieve the optimum health, you need to combine the work between food safety and food security.

And to achieve food security of course we know the factors for it. It is the access, utilization, availability but also we need the food safety component first. We don't want to balance one over the other. We need to have both of them in checks and balances throughout the whole value chain. And just if we look at it from the side of the farm,

from the production side all the way to the serving, all the way to the table now the concern of course we have in the field, major concern especially when we work with Africa and Southeast Asia and other countries we have mycotoxins, fungal metabolized that are produced in the field and those are toxigenic and the famous one and the biggest suspect is aflatoxin.

But at the same time we had through the soil, through the fertilizers, through the irrigation system, through the storage, through the receiving, through the sourcing. We have entry points for other germs, for other bacteria and viruses and microbes and chemicals to enter the supply chain and our food. And that's where we want to be paying attention to it and trying to prevent this process. And if you, we want to consider this time of contaminant of course – sorry. I think this slide is relatively small. But we have the chemical. We have pesticides sprayed in the food, freezers, refrigerators, drugs, etcetera and we have biological and biological could all, what I call the pathogenic, viral, bacterial, fungal and finally this is the ability of the variation of preparation, the human factor, physical from hair, gloves, etcetera. Those – they are still important but not as major concern as the biological and the chemical.

Causes of food contamination of course the entry point for them. Again I can't reinforce this could be cross contamination. Could be during the sorting, it could be the handling, the could be personal hygiene but where we can control from the ag side we are looking at it from the production side, during the transport, the storage, through the whole value chain. For the factor of personal hygiene that's where we want to improve the essential hygiene practices from handwashing, from using the soap and the preparations and storage of the food, etcetera, covering the hair, etcetera, etcetera. But safe food preparation, safe food handling it starts in the field all the way to the point where we are consuming it.

Now if we want to look at some of the challenges that we face at USAID in terms of food safety challenges. Of course the biggest one and everyone talks about it is the budget, low budget living and we don't have really a stand-alone food safety project. One of the things if you go and look for information especially where we work and the, where we have in developmental program, one thing that's lacking is data. We don't have a lot of data. We don't have also a lot of interventions that are feasible, programs that where we can't say this will work 100 percent. And of course we have limitation on funding to carry out research and grants.

Of course we have too much focus on mycotoxin and that's of course because we need to focus. Focus is very important. But we are focusing a lot in our research programs on mycotoxins. We have not paid enough attention to other sources of food borne illnesses such as pathogenic ones or bacterial and viral. We need more coordination. We need more integrations between our different offices and bureaus and we have different players that can very important and each one will be involved from global health, from humanitarian bureau and our food security and others. And we are – we need to enforce the more coordination and involve the interagency players including USDA and others such as FDA, CDC and other donors as well.

We have – again we need the evidence base for what will work better and we need better evidence linking the food safety to our high level targets such as funding and poverty. A diverse diet is very important and at the same time food safety implication

as I mentioned earlier increased with increasing this diet diversity so we need to be careful as we are doing this. And we have a value chain focus of course as you know and that is we suffer this sort of problem from the overconfidence in the sound practice and sound economy in the value chain with handling food safety. But that's really not the issue. If we don't have – if we have a lot of our functions that's when problems start to happen. We don't – we want to minimize a number of assumptions during our implementation of the program and our work to reduce the failures.

And in terms of the importance for addressing poverty. And again if we don't have a sound food safety system, a sound food safe and clean food that will affect the trade. That will affect of course the people consuming the food and that will affect the nutritional outcome. And we can't reinforce – of course we all know about the food safety moderation act and it will of course affect the trade. If we can't reduce our food and products from the agriculture in Africa and Southeast Asia like in America where we work that can be sold and transported globally, then we are affecting the income for these farmers.

And in order – one of the things we start, we talk at USAID, we start by establishing an agency wide food safety working group that is to improve the coordination among our different bureaus within the agency. And we have members from food security, global health and from our colleagues at the humanitarian bureau on Food for Peace. And this is very important to start understanding the problem's magnitude and acknowledging it. And we are looking for integrating our food safety and food equality as part of our nutrition programs and if you look especially in the first 1,000 days.

Of course we have – we acknowledge and we understand mycotoxins are very important and particular challenges especially where we work due to the nature of the development of crops such as maize or rice or wheat for that which are targets for our crops for mycotoxins. But at the same time we'll also understand the other points of entry for pathogenic contaminants. And thank you for us in Feed the Future. And you can Tweet at FeedtheFuture. I think that's the Twitter handle. Yeah, Julie, agrees with me. Thank you.

*Angela Records:*

Thank you, Dr. Kablan for an excellent talk. All right so let's move over to our next speaker, Dr. Harvey.

*Jagger Harvey:*

Good morning, everyone, and thank you for having me today. I want to talk a bit about mycotoxin contamination of crops in terms of both agricultural development in developing countries but also as an issue that's faced by farmers here in the United States and then really in countries around the world. So it's a big challenge. It's very complex and at the same time we do know quite a bit about it. If you bring the right sets of people together in the right partnerships and if we as researchers and policy makers and others challenge ourselves to really make the best use of the information at hand, empower the national partners on the ground in the countries where we want to have impact and continue learning as we go along and challenging ourselves. Really I think we're seeing some emerging success stories that should give us quite a lot of encouragement in facing this daunting challenge.

So mycotoxins are essentially chemicals that are produced by different fungi in the environment and that typically resides in the soil where we grow crops around the

world. And as the name suggests they are toxic to human health. And this is really a unifying challenge. They contaminate crops broadly. Some farmers and some crops may face more acute problems with this. It may be more recognized in some parts of the world but really this is something that the more we look into it's something that farmers around the world can really relate to and that we need to pay attention, draw lessons from diverse geographical and socioeconomic context so that we can all make sure that we have safe harvests around the world.

So on top of being toxic to human health they also carry over into animal source foods. So if livestock consume contaminated grains for example like on the left you can see the maize that's been contaminated by fungus and produces aflatoxin. If farmers sort out these moldy grains, then these can carry over into the livestock animal products. So zeroing in on aflatoxin which is what I've been working on for quite a while now, what this is it's produced by aspergillus fungi. These reside in the soil in fields in the tropics and subtropics extending as far north into Texas and the southern U.S. and even beyond.

These affect a range of crops so as the crop is growing in the field you can get infections during flowering. Insects are feeding on the developing grains. Also at harvest if you place the cobs of corn for example on the soil you can get contamination with this fungus. And then if you don't dry and store properly it can either introduce the problem if it's not there or compound it if it's already there. So in human and animal, in humans first of all it is recognized to be lethal in high doses with acute poisoning. It's also known as a potent carcinogen so it causes cancer. And it's been associated with stunting children's development and also immunosuppression and blocking nutrient absorption. So in other mammalian systems like in livestock for example it can suppress the immune system. It seems like it may be doing that in people as well. And even if people have enough nutritious food it's potential, it's possible that having aflatoxin in their diet could really keep them from having good nutritional status nonetheless.

So this is something that's at the front of people's minds and the public does know about it in different parts of the world. Here you can see that the Kenyan government in 2010 tested and found high levels of aflatoxin in the maize harvest that year. And then the question is what do we do from there? How as a research for development community can we empower these governments who are taking these types of responsible steps so that we make sure that everyone has enough food and safe food.

So during the time Samuel Matiga for himself is from Kenya was working with Rebecca Nelson at Cornell University in the U.S, and he came and worked with me in a lab that I established in Kenya at the bioscience eastern and central Africa hub. And the point of that hub is when their researchers want to address the issues in agricultural development these are high end labs that they can access on the ground in Africa. And you can find out more at their website.

So Samuel Matiga did a survey of village maize notes and found that 39 percent of the maize during this 2010 outbreak was above the legal limit including some maize samples from farmers that was very high above the legal limit so scary levels and it shows the fact that the government took measures. He also found that in western Kenya there were high levels of mycotoxins as well so we need to keep our eyes even in places which are not recognized as hot spots for these issues.

So then the aflatoxin risk again now we know it's a big challenge and it's very complex in terms of when it becomes a problem, whether we can predict when and where it's going to pop up, which type of season is risky. And that's because it depends first on the type of crop that you're growing both in terms of the crop season and also the variety and type of crop. Since the fungus there in the local environment is what produces it what fungus is there and if it has the potential to produce a live toxin, how is the feed crop managed in the fields, are there prevailing environmental conditions during the growing season that predispose the crop to more contamination and how is the crop being treated after harvest. All of this comes together to determine the relative risk of contamination.

And at the recent U.N. environment program, U.N. environment assembly a few months ago they discussed the fact that with climate change it looked like crops are going to be more and more stressed and these fungal toxins, mycotoxins as well as plant toxins themselves are going to become more of an issue and more frequent in places where they are already recognized as a problem and it will extend into Europe and North America as well further than it has in the past. For example, a study by Felicia Wu recently estimated that the annual loss to the U.S. farm industry could be as much as \$1.68 billion a year with the type of changes that are being anticipated with the climate change.

So here's a study out of Europe showing under different scenarios of climate change the spread of aflatoxin risks in here for maize so again you can see from left to right different scenarios, different amounts of climate change. Again this is a problem that we all need to be focused on and there are lessons that can be drawn the more parts of the world that we look at solutions. So then what it comes down to for us as a community is we need to reduce these toxins for all farmers and consumers in a really diverse set of contexts. So in order to do this we really need to look along the value chain so all the way from planting to consumption.

And in order to do that first we need to do, to look at how do we prevent contamination in the first place which of course is the ultimate goal. And then even in places like Texas where crops are very well managed you can still have conditions that simply overcome our best efforts. *[Recording plays over speaker]* it becomes a problem and how do we handle that when we have these contaminated commodities? So looking across the spectrum from where we can have the contamination occur at different steps and then what we can do to address it, what we need to do is consider how we can integrate these different interventions, see which ones are most locally adapted, most affordable, also considering issues like empowering women in agriculture that's critical for development and improving livelihoods.

So if we look first at pre-harvest so when the crop is in the fields there is a technology called biocontrol which uses variants of the fungus that naturally occurring that is incapable of producing the toxins and this basically competes out the fungus in the environment which produces the toxin. This is something that's used in the U.S. and is being deployed in places like east Africa. In addition to this also we can see win wins with good agricultural practices.

So just by making sure that farmers use feed stillage to reduce drought stress, use the appropriate amount of fertilizer, pay attention to planting times, potential injure

cropping, also looking at which crops are less susceptible to these where they're farming we can have a win win because healthier crops are typically as a rule of thumb less susceptible to disease just like in animals. So if we have higher yields then it seems like this is a good driver to get resource for farmers to adopt and spend our resources on measures that can also improve the safety.

In terms of at harvest we need to look at harvest time and avoid soil contact. That's a very simple thing that can be done which can reduce risk when farmers harvest onto the soil. And then at post-harvest if it's not an issue already it can become an issue with the introduction of \_ from the environment. But if it's an issue already pre-harvest then it can become very bad again. So here we have to look at testing. If we can't tell if the toxin is there then it becomes challenging to address. And when it is there, there are ways of decontaminating or sorting. Maybe we could look at alternative uses. In the U.S. you can use it for certain types of feeds where the livestock are less susceptible and people won't be exposed but it really boils down to proper drying, making sure that the grains are dry enough and storing it properly and through that measuring the moisture as well. And beyond this if we can look at mathematical modeling and diagnostics that can be taken out into the field then we can identify hot spots as they're occurring and then take care of this problem as it emerges.

So in terms of post-harvest loss this includes losses in quantities so in terms of its impacts you can lose a lot of your harvest and in terms of quality such as with these toxins. It's estimated that a third of the loss, a third of what's harvested locally is lost. This is particularly true in developing countries where this can be even higher. And in terms of mycotoxins this should read there's some other types of post-harvest loss. There's not enough of an evidence based and methodologies need to be strengthened. So if we consider this holistically we need to look at what's being applied elsewhere, how can we adapt it to different contexts and really transform the limited success that we've had globally to secure so much of the harvest that's lost by taking things off the shelf, adapting them with partners on the ground and putting them into use.

So the Feed the Future innovation lab for the reduction of post-harvest loss is based here at Kansas State University. It has partners, top researchers from across the U.S. and also internationally and it's been – we've been running for two and a half years now. And what we're focused on is putting top researchers from around the world together including at U.S. land grant institutions and looking at how we can just adapt and deploy technologies to address this problem. So we focus on potentially post-harvest loss and food waste of seeds and durable staple crops so grains, oil seeds and legumes focusing on drying, storage, insect, pests and toxins making sure that we build capacity in the countries and focus on nutrition and gender issues.

We focused on maize in Guatemala and Ghana. We're looking at chickpea, maize, sesames and wheat in Ethiopia, rice in Bangladesh and with a buy in from Afghanistan tree nuts, raisins and wheat. So again we're looking at integrating \_\_\_ so looking post-harvest how can we get the right drying technologies to make sure that they have storage so adapting storage technologies and then making sure that we can actually measure moisture out there. And making sure again that we involve the right people on the ground so that this will be a sustainable solution and they can help us to address these issues moving forward.

So in Bangladesh we have a success. We've adapted a dryer originally from Vietnam which was originally wrapped in bamboo mats and you have a furnace. And this does a very good job of drying rice. And when paired with the right post harvest storage solutions like the fixed bags here from Purdue University and the moisture meter that's been developed in the program by Paul Armstrong at USD ARS a low cost moisture meter, this is really a package that's being trained – farmers are being trained and this can be deployed to significantly reduce losses in rice.

In Ghana at again a university engineer has adapted a solar biomass hybrid dryer which looks like a greenhouse. It has a furnace and essentially this can dry quite a lot of grain at once. And this has been deployed in one of the biggest markets in the region along with adaptive storage technologies you can see this Ghanaian maize storage water tanks that have been adapted for storage and with the moisture meters. So already there are 1500 people or so benefiting from this and we're looking at scaling up outside the project. So considering the road ahead where you can see the corn being dried here on the road and exposed to all sorts of different potential food safety and post-harvest loss issues how do we integrate all of these strategies together?

So very quickly we need to be sure that we're working with the right baseline information. We need good quality information. And for that we need in countries at capacity. There are some very inspiring people working on the ground, working them in the right ways which would have big impacts. Making sure that we standardize the testing procedures is key. Making sure that we can get diagnostics on the ground where they're needed and inform that back so we understand the problem at a higher level is key. Again if we do get contamination what do we do with those grains? And then for policy makers and public health officials what really is the overall big picture for the health risks?

So in the interest of time I'll skip through these last couple but essentially what we need to do is assess the baseline of what's going on and understand potential intervention. And by working with the right partners including the private sectors and regulators and government we can tackle this very complex challenge together and continue building on the successes we're already having. So I'd like to say thanks to Feed the Future and USAID project team members here and many other, Ahmed and the council and organizers. Thank you.

*Angela Records:*

Ok. Thanks very much, Dr. Harvey. And now at this time we'll move on to our final speaker, Dr. Delia Grace. Dr. Grace are you ready to go? Ok great.

*Delia Grace:*

So good afternoon everyone. And I'm happy to join you from Kenya. This short presentation is going to summarize some work which we've been doing at ILI, international livestock research institute, and also the CRP on CGIAR research program on agriculture for nutrition and health led by \_\_\_\_\_. From research which we've been doing over the last ten years on food safety in informal markets. And this has been synthesized in some evidence pieces, one produced last year, a peer review journal article and also the first book on food safety in informal markets. So you're going to get links to all of those. They're all freely available online and please do check them out.

So my presentation is going to focus on three areas, first why food safety matters so development. Secondly, food safety solutions, what we've learned so far and then lastly

some take some messages. So food borne disease has long been considered something which was \_\_\_\_ which was food security was often regarded as something more important. Food borne disease itself was often seen as a minor trivial disease. But all of that is changes as quite recently we're starting to get our first good evidence on the high health burden of food borne disease. But secondly and also very importantly how much people in developing countries are worried about disease, the concern over food borne disease and then of course the cost, the economic cost.

But lastly – and this is particularly directed to a development audience the high possibility that well intended approaches to trying to improve food safety could actually make things worse. And that is why now as food safety starts to come very fast up the agenda is a good time to start thinking through the unintended consequences aspects of food safety solutions. So the health burden of food borne disease.

The first global assessment of food borne disease was produced only last year, developed by the world health organization. And this very excellent report gives us our first solid evidence on why food borne disease actually matters to human health. And as you can see from the report the burden is comparable to the burden of what we call the big three public health disease. That is malaria, HIV/AIDS and TB. Much, much higher than many policy makers though. Unsurprisingly most of these burden falls in developing countries. 98 percent of the burden falls in low and middle income countries.

What is quite surprising to many is that as a known burden – and I must say this report, this evidence we have on food borne disease is still relatively preliminary and has only been able to measure those burdens of disease where there was enough evidence to come up with some sort of a quantification. But still it is reasonably clear that quite a lot of the burden as you can see is due to biological hazards, the microbes, the worms. Whereas if you ask people, if you ask policy makers and consumers which we do a lot in developing countries, often their major concerns are the toxins, the pesticides especially.

And it's not that pesticides are not a problem and they're not – you shouldn't worry about them. But when you look at the great known burden it is definitely coming from the biological hazard and therefore one of the important messages coming out is that it makes sense to address efforts where burdens fall. Another interesting finding is that quite a lot of this burden comes from zoonotic diseases, that's what you can see green in the pie chart. These are pathogens which spread from animals to people.

And the import thing to notice is it's not so surprising because when we look at the foods implicated in food borne disease – and I should say here our evidence is much weaker than in the overall burden. But still there are some reasonable studies from different countries and those show that the animal sourced foods, meat, milk, fresh eggs and produce are most often implicated in causing food borne disease. And this is because these foods which are highly nutritious and we want to diversify our diets and eat more of them, are also very good matrices for the microbiological, the biological pathogens which as we see are responsible for the great burden, known burden of food borne disease. But it's not just a health burden. It's also the psychological burden, the worry, the concern over food borne disease.

This is a USAID study from Vietnam where they did a nationwide survey to look at in people's lives what were their greatest concerns. Surprisingly food safety along with employment was people's number one concern, much higher concern than corruption, access to housing, energy security. So this is something we are seeing more and more developing countries as they get to richer, as they are getting organized and as food seems to get dangerous, more dangerous people get more and more worried. And then the third aspect of course is the economic cost, the fact that food borne disease is very expensive. Part of the expense is just in terms of the cost of illness, the cost of treatments, the foregone income while people are having to be treated.

And of course in developing countries a lot of the costs are out of pocket expenses which fall on poor people who can least afford it. We have much weaker evidence on the cost of illness than on the burden of the disease. But in developed countries, in rich countries where they have good economic assessments we can see that this is really a billion-dollar problem. And in poor countries where evidence is starting to emerge there's also evidence that this is also very expensive.

But apart from the cost of illness there are other economic hurdles and costs associated with food borne disease and one of these is access to markets. Already we can see that food safety samples often exclude small farms from export markets and that's as export markets tend to grow unless you make a real intentional effort, the small farmers, the poor farmers, the female headed farm households will drop out. Moreover, even in the domestic markets where we are seeing growing supermarkets these tend to be supplied by richer and better off farmers. So we have actual burden for export and raising burden also for high value domestic markets.

But the unintended consequences of food safety and I'm going to be returning to this when I talk a little bit about the food safety solutions. Two major things, one is when people try to make food safer by formalization, by standardization, by super-marketization it tends to increase the price which tends to put foods, nutritious foods out of the access of poor people. In Kenya supermarket milk costs \$1.00 a liter but at the wet market raw milk costs around 50 cents. That's unfortunate for poor mothers. And secondly as we try to improve food safety by our valiant efforts to get aflatoxins out of the maize and pathogens out of the milk we see markets differentiating by quality and then there's a real risk that the substandard food gets targeted towards the poor.

Another unintended consequence as I said is a common response to improving food safety is trying to upgrade value chains, intensify, turn into more formal food sectors. But what we see as food sectors formalize women drop out. The informal sectors now tend to be visited just from studies, some results from studies we've done in different value chains in Africa. Informal value chains have a high role for women but as they formalize women tend to fall out. So what can be done for making our food safer? We've shown that it's a big health burden that adds a high economic cost but that also it has tradeoffs between food security and livelihoods and especially gender.

Different things have been tried to improve food safety in informal markets. The first approach often tried by policy makers is regulation. They try to upgrade new policies, more regulation, more legislation, emphasis on improving regulations. But it is quite obvious that this is not a very successful way of improving food safety because

everywhere we do these studies and we've now studied around 50 of these domestic informal market value chains we find that large amounts of foods do not meet the standards. There's a summary of some results on the screen. 100 percent of milk in \_\_\_\_, 24 percent of boiled milk in \_\_\_\_. So it's clear that this approach of trying to put standards and legislation in place is not working very well.

And in fact when in some case studies we've looked at the impacts of taking a punitive, command and punish approach in food safety and it tends to make it worse. This is a study from Uganda where we found that dairy, urban dairies were using a good number of food safety improving practices but farmers who were harassed by authorities or who believed their occupation was illegal used less mitigations. And this is something we often see. Economists will tell us about when something becomes illegal – and currently a lot of the food, maybe a third of the food in Africa is illegal. When it doesn't meet the standards then you get black markets and even worse standards. So regulation, legislation needs to be there. The framework needs to be there but not enough.

Can we modernize our way to food safety? This is very common belief among policy makers in developing countries. They think if only we could get to Wal-Mart, if only we could get to modern foods with supermarkets and chill cabinets and all the rest of it the food would be safer. But actually we're finding out not that the supermarketization although it has been greatly encouraged in many countries is much slower, is taking off much slower than we thought. Moreover, the formal sector food is often much riskier than we thought and the modern business models which we keep on trying to introduce tend to run into problems.

I won't go into detail in the interest of time but this is a study from Vietnam comparing how safe, how biologically contaminated pork was in the supermarkets in purple, in the wet markets, the traditional wet markets in the darker purple and in the village in yellow. And you can see that the supermarkets have worse quality pork. And we've seen this in numerous studies now and value chains, formal sector is often no better or worse.

And here's another picture from Nigeria. This was set up as a modern, off the ground slaughter, everything good. This was World Bank money which actually funded it and 20 years after the law was put in place because we know the issues of maintenance, keeping things going it's easy to put a big infrastructure. It's hard to keep it going and keep it maintained. So 20 years later you're left with a much worse food safety situation than if you had never built this big \_\_\_ in the first place. So modernization has a role in it. These systems are modernizing but we have to be very careful because they may make things worse before they make things better.

Will good agriculture prices get safe food? Well, we know that small holders can be successfully integrated into exports chains and produce very safe and acceptable foods for the exports chains although as I mentioned earlier they will drop out unless they are intentionally included by programs and other initiatives. And there's lots and lots of pilots. We all have dozens of projects we can show where we improved our practices and safety for hundreds of farmers or even thousands of farmers. But as we know pilots never fail and pilots never scale. And the evidence of large scale implementation of good agricultural practices is I'm afraid much weaker. If you say from farmer field

schools evaluation came out a couple of years ago but basically all of the studies we've looked at attempts to bring good agricultural practices to scale for informal markets, informal domestic markets they have all showed no success. So that may not get us there either.

That all sounds rather not good news but we do find some promising examples although I must say that these are still at small scale and these still are not good examples of mass improvements of food safety in developing countries and formal food sectors. So an area we've been working with a lot is participatory risk analysis. And this is moving away from the inspect and punish model to a much more stakeholder led way of trying to improve food safety using the methods from participatory academiology and participatory rural appraisal. Part of it is methods but even more important is the approach. Here you see a researcher and the farmer. And you can tell who the researcher is because he's got better shoes but you can tell it's a participatory appraisal because of the very nice way that he is working with the farmer.

One important message, although in all of these informal markets wherever we look the hazards are high, the risk to human health is very variable. So one important thing we have to find out is is there a real risk and if there is a risk we manage the risk. We don't manage the hazards. Too much in the past we tried to manage hazards and we haven't got very far and it's also been quite harmful for the poor to manage the risks. Secondly improvements designed with people, participatory approaches with the people, for the people, from the bottom up have been more successful than many of these approaches trying to either rapidly modernize, rush ahead to the supermarkets or else the ones which are coming in, experts coming in and telling other people what to do.

For example, we did some work in Nigeria with peer training of butchers. This led to 20 percent more meat meeting the standards and the cost was much less than the cost of \_\_\_\_\_. As I said food borne disease is very expensive. Likewise, we've been doing quite a bit of work on milk, working with the informal sector, not trying to ban it, not trying to modernize it but trying to upgrade it little by little, step by step. We now have long standing projects in India and Kenya and now ten years after the project has ended studies have shown that the approach was economically very beneficial. More importantly it was sustainable and scalable. Many traders were involved, many are still in part and millions of traders benefitting.

So take home messages, food borne disease is very important for health but also for development. And the unintended consequences of well mentioned development can make livelihoods and food security worse so we have to be careful there. Most food borne disease is due to microbes and worms in fresh foods sold in wet markets and most people – the things most people worry about are not the things which make them sick and kill them and this we know very well from risk assessments that when it comes to understanding risks people's intuitions are not very good.

Hazards in wet markets are always high but the risks are sometimes low and again people's perception is a very poor guide which is why risk analysis is really important for understanding what to do. The control and command approaches to food safety have not been very successful although they have had – I'm not saying that we don't need legislation but by itself it won't work and solutions working, based on working

with the informal sector in participatory ways are more promising. So with that I'd like to thank you for listening and hope to answer questions.

*Angela Records:*

Great. Thank you so much Dr. Grace.

*[End of Audio]*