Fishing for the Future: The Why and How of Nature's Most Abundant Protein Source

Presentation Transcript

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Zachary Baquet: Welcome to the July Ag Sector Council, brought to you, sponsored by the Bureau for Food Security here at USAID and implanted by the Knowledge-Driven Microenterprise Development Project. And my name is Zachary Baquet, I'm the Knowledge Management Specialist for the Bureau for Food Security and just wanted to give a brief kind of overview of today's – how things are going to go. So when the presentation is going on, please hold your questions until the end. We'll have a roust opportunity for Q&A then. Please, if you have your cell phones on you – kind of silly thing to say, but – please put it on silent or vibrate with that.

And I just wanted to point out we have upcoming events. Please note that for August, we will not have an Ag Sector Council. We take a brief hiatus to sort of take in all the evaluations and feedback that we've gotten over the earlier part of the year and try to make adjustments and improvements for you. We will start back up again in September. The EAT Project, or the Enabling Agricultural Trade Project, is – we're working with them. They were going to do a presentation on commodity exchanges. They just recently had done a briefer on that. So if you go to the EAT Project website, you can find out more.

For October, we're going to do a presentation by the MEAS Project. So that's Modernizing Extension and Advisory Services. And they're going to be talking about climate change, the impact of climate change on extension and advisory services.

Also, I'd like to draw your attention to the Agrilinks blog where not only this presentation but other past Ag Sector Councils can be found, well Agrilinks itself but the Agrilinks blog also has little snippets from the presenters there that give you the high points and then you can find the additional resources as well. But the blog has been very active this month and we have lots of new posts that you should check out – video interviews from the Food Security and Nutrition Networks meeting in Addis Abba last month. We also have some new posts by the ____ project with the Fostering Agricultural Competitiveness Employing Information Technology, Communication Technologies and they're talking about a project in Kenya with – M farmer and agribusiness meets the app economy in Kenya. So please check those out as well.

And with that, I'm going to hand it over to Rob Burtram, who is the Director of the Office of Agricultural Research and Policy with the Bureau for Food Security and he'll be doing the introduction.

Rob Burtram: Thank you, Zachary. Good morning everyone and we have almost a full house, here, which I think is pretty remarkable for the mid- to late-July but I think that's a signal of how significant the issue of fish and fisheries are in our world today and Zachary told me earlier that we have quite a few other agencies, State Department, EPA, USDA, NOAA, represented here and, of course, we have people around the world who are joining us electronically as well. So welcome to everyone.

So I think, as I said, fisheries and fish issues resonate in a special way here in the United States and around the world and I don't think it's just because a lot of us eat fish are like fish; I think it – and I don't think it's just because the global fish production, I think the value of it in 2010, Harry Ray tells me exceeded $215 billion. So it's a huge chunk of the global food economy. It is also surprisingly, maybe at least to me, 80 percent of that is produced in developing countries or harvested in developing countries.

But there are a lot of questions that arise. We've all seen the stories about artisanal fishers being displaced in places like West Africa. I've even heard it linked to the rise of piracy in East Africa and the migration out of West Africa to Europe – that the overfishing that's taken place, of course not by those artisanal fishers, but by modern fleets that may or may not be using sustainable approaches. So there's a lot of questions that arise, I think, of who is benefiting.

There's also another compelling issue in the fish sector that runs right across our work and food security and leaks it very dynamically to the environment and natural resource side of AID and that is the question of intensification may be best exemplified by aquaculture all the way through to extensification in capture fisheries. And I think we know now, and I think we're going to hear more this morning about how the future of those two important sources of fish are intertwined and linked.

So we want to, I think, get a sense for the long-term sustainability of fisheries. We also want to find out, or need to, either this morning or in subsequent discussions, how we can wisely and environmentally soundly intensify fish production, and we need a strategy I think that encompasses both capture fisheries and aquaculture, and of course, I think it also is clear that both the public and private sectors need to be involved.

The challenges are large. We all know that with rising global incomes, the demand for all animal source foods is rising. I believe that the projected fish demand is supposed to rise by about a quarter, just in this decade alone, which is astonishing if you think about how much that means – I think another 35 or 40 million tons of fish needing to be produced. And then I think the other challenge that we think about is that there's a lot of unexpressed demand. There's people we'd like to be able to have eating more fish but it's so expensive for them, even though it's one of the key – and it's often the sole source of the protein in the diet or the animal source protein. So the challenges are very significant. I think this morning we're going to hear something about those challenges and hopefully some of the answers and I think we're very fortunate at AID to have colleagues like Richard Volk and Bryan Gillooly, who I think span actually the kind of issues that we've been talking about.

Bryan has worked in oyster aquaculture. He has his master's degree in fisheries and aquaculture from Oregon State University. He also worked on fish and agricultural systems in Ecuador while he was in Peace Corps. And Bryan is relatively new to the agency, as part of the development leadership initiative.

Richard Volk is known to many of us as one of the agency experts in fisheries and he combines an incredible background and that natural resource management along the coast of the Gulf in particularly the state of Texas but estuarine environments which are so critical to fisheries sustainability and which were so threatened in the last, the oil spill at Deepwater Horizon that we all followed with such anguish.

So anyway, I think it's great to have you both here. It's wonderful to see the agriculture and natural resource size of the agency coming together because the

solutions for both like in a joint effort. So welcome and I don't know who's going to begin but let me turn it over.

Bryan Gillooly: Well, good morning ladies and gentlemen. Can you all hear me? Like to say thank you to all of you for coming and thank you for those of you that are listening online, either domestically or overseas. I want to give a quick shout out to all the DLI's that are in the room and the DLI's that are overseas right now, particularly the DLI's that are in our critical priority countries. I'd like to say I hope you're all doing well. I hope you're all safe and I hope you're all coming home very, very soon.

The title of today's presentation today is Fishing for the Future: The Why and How of Nature's Most Abundant Protein Source and I will be presenting today with Richard Volk.

To get things started, I want to define a few terms. I often hear these terms are used interchangeably and often incorrectly, so I went to clear up any confusion this morning. When we use the term aquaculture in today's presentation, were talking about aquatic farming. I hear it referred to as fish farming, but that isn't completely accurate because it does include shellfish and aquatic plants. It can be a natural environment; it can be in controlled environments and any type of salinity, from freshwater to saltwater.

Fisheries, on the other hand, is very different. It is the harvest of a natural resource. So you can imagine that the strategies for promoting either are very, very different. You often refer to as a fishery due to the species that is being caught. So the salmon fishery. Or the gear type that is being used; the long-line fishery or trawl fishery and it often – we talk about where that fishery is actually located – the Marine zone; or whether it's located inland. I'm sure you've all seen "The Deadliest Catch," you know, the Alaskan King crab fishery in the Bering Strait. That's how we refer to fisheries. When we talk about fisheries, it's more akin to hunting. This is more akin to farming.

Like was mentioned, I'm new to the agency. I'm a new foreign service officer, so my institutional memory is a little bit limited as far as to what we've done in the

past with fisheries and aquaculture. What I would like to say is that this is not new to the agency by any means. Right now in our Feed the Future countries, we have four focus countries – Bangladesh, Senegal, Ghana, and Cambodia. Also we have some countries that are not Feed the Future countries that are focusing on fisheries – the Philippines, Indonesia. We have the Coral Triangle Initiative Program, that's working with a number of different countries that's including global climate change, food security, and fisheries. And then we have the Marea Project in Central America and the Caribbean.

I would also like to give a shout out to our aquifers colleagues at Oregon State University. We have our own Harry Ray here in the building that has been working on Aqua Fish, our collaborative research support program, for over 25 years. They have been working all over the world and I just mentioned a few countries here, Bangladesh, Ghana, Tanzania, Cambodia, Mali, and Vietnam.

So, why fisheries? Why the hype? Why are we connected it to food security? Why is it so important? And what I would like to mention here and one of the takeaways that I want all of you to go home with is that fisheries is incredibly important but I think it's very poorly understood. I think it's underfunded. I think that in most levels of government, it's actually ignored and once you see how important it is, you'll realize that things really need to change.

So when I make statements like that, especially here in the agency, I realize I need to connect it to economic growth. This is an agency that is interested in poverty reduction and we're really interested in poverty reduction through the avenue of economic growth. So fishery is very important as far as employment is concerned. There are about 200 million people that are directly relying on fisheries, marine fisheries, for source of employment. When you expand that out to aquaculture, to their dependence, you're looking about at a half a billion people that are employed in this industry. And the kicker is 95 percent of them are in the developing world. When you talk about the net export value of fish products, it's about 17.4 million US dollars. We talk about the value chains of coffee. We talk about the value chains of rice, but the net export value of fish products is greater than the combined net export value of coffee, rice, sugar, and tea.

Male: Is that billions?

Bryan Gillooly: Yes. So let's talk about the sunken billions. This is a very important study that the FAO did and the World Bank did and they look at the loss of economic rents. The foregone economic rents in our fisheries worldwide. And it is a lucrative business but what we can see worldwide is that about $50 billion a year is being lost at this is due to mismanagement of our fisheries. If you expand that to the past three decades, you're looking at $2 trillion that is being lost in our fisheries. I put the small chart on here. They're projecting in the future that this is just going to get worse. We're talking about $90 billion were going to be losing a year due to foregone economic rents due to the mismanagement of our fisheries.

Fisheries' a very important source of protein. We hear this a lot. A third of the planet is relying on seafood for more than 20 percent of its animal protein. In some countries, this is more than 75 percent. So if you look at Sierra Leone, it's 75.7 percent, for example, in this chart that we have here. In Africa, one in five people it's their only source of protein.

Health and nutrition – we use this statistic a lot. About 2 billion people worldwide are undernourished; fish is the primary source of omega-3 fatty acids in the human diet. It's also a very important source of vitamin A, zinc, calcium, and iron. These are important in infant development, as far as their brains are concerned; ocular development for infants. It plays a preventative role in a number of human illnesses and it's an important at these key stages of human life, from pregnancy to breast-feeding too early childhood.

There's also a connection between fisheries and HIV. Our fishing communities are some of the most vulnerable to HIV. We often don't make that connection. HIV prevalence rates in fishing communities are between 4 and 14 times higher than the national average in those countries. And that's higher than other mobile populations, like the military or truck drivers and it's often higher in these countries than people that are using syringes to inject drugs.

So I hope I explained a little bit – we have limited time – about the connection between fisheries and other development arenas that we all work in but I want to focus right now on the current state of our global fisheries. And it's not a very pretty picture to be honest with you. Back in 1883, Thomas Huxley talked about how our marine resources were inexhaustible. They thought that I fisheries stocks were inexhaustible; that they were infinite and you flash forward to 2006, and you have Boris Worm and his colleagues predicting by the year 2048 that we will have a global collapse of all fisheries stocks that we're currently fishing. Now, say what you want about Boris Worm's data and his analysis – there's been a lot of controversy and this is probably one of the most controversial fisheries articles that's ever been written, but the point is clear, and they state it in the article, that if this happens this is a serious threat to global food security, worldwide.

If you don't like Worm's data, that's fine. This is some statistics from the FAO. If you look back to the 1970s, our fully exploited species is changing very much. It's not going up; it's not going down. But the scary part is that our under exploited and our moderately exploited species, I mean, are on a significant decline and even scarier is that our over exploited and are depleted species is on the rise. So what does this mean in layman's terms? It means that 75 percent of our global fish stocks are either over exploited, fully exploited, or depleted – and that's today. That's not 2048.

This is one of my favorite graphs because you can go to rural Oregon or you can go to West Africa. You can ask a fisherman when he started fishing how many fish did he catch and how many fish is he catching now, and they can all draw the same graph. This is not just a global problem. This is a fisher problem at the individual level. They realize that they are fishing harder and they are catching less fish.

And the reasons for this – I mean there's a lot of them. And you can have a whole seminar series on just those slide. I'm not going to spend too much time on it; Richard's going to get into it. Overfishing. We've gotten better at fishing as a society. We're fishing harder. We're fishing faster. We're fishing longer, and we're fishing better. We have bigger boats. We have bigger engines. We have bigger nets. We have longer lines. We have fish finders. We're very good at fishing.

We also have to contend with global climate change and its evil cousin or evil stepsister, ocean acidification. So what is happening is we have too much CO_2 in the atmosphere. That CO_2 is getting into the water. It's creating acidic conditions that is just devastating populations of coral; devastating populations of larval oysters; and it's terrible for larval fish.

Marine pollution – we all know about this. It's coming from plant sources, sewage, sediment, oil. It's a huge problem and subsidies is something that we don't often talk about is one of the causes of the global threat to fisheries but what is happening is we're spending between $12 and $20 billion a year in keeping people fishing when they should really be looking for another source of employment.

In this last point is probably the most controversial point. There is a conflict between wild fisheries and aquaculture. And it comes down to this unsustainable feed. About a third of what we're taking from the ocean is being produced into fish oil and fish meal and that is then being fed to livestock and farmed fish, predominantly. What that means is that we're fishing wild fish and we're feeding it to farmed fish and this is an unsustainable model. Aquaculture industry, for a number of years, a lot of research has been done to find a sustainable feed and it's – we're working on it but we're not quite there yet.

So the point I want to get across here is that this is completely unsustainable and we cannot continue to face wild fish and feed them to farmed fish. I hope I have painted a very dark picture for all of you and I hope you all have absolutely no hope in the future. Richard is going to talk now and hopefully he'll give you some solutions; tell you what we're doing as an agency; and give you a little bit more hope.

Richard Volk: Gee, great. I love being set up like that. Thank you, Bryan. Thank you all, Ag Sector Council, for inviting us here today and all of you for showing up and showing your interest in fisheries. This is a topic that's very dear to those of us in the NRM field and increasingly helpful, as Rob pointed out, with our ag colleagues, our climate change, our economic growth, our democracy and governance, our health colleagues. This is an agency-wide issue. It's no single

sector. I would like to, again though, state that I wish we had time to talk about aquaculture as well as fisheries. We don't have that time. It's deserving of its own special seminar and hopefully, we can get Harry Ray and some of the other experts in the agency here at some point. I have been asked to talk more about the tools and the approaches for managing fisheries. So I'll probably touch on some of the same points that Bryan made, but hopefully get into the how of fisheries management and conclude with a couple of examples from two of our programs; one in West Africa, in Ghana, and one in the Philippines.

But just to, I guess, add some emphasis to what Bryan was just talking about – this particular graph says a lot to me. This represents data from the 1990s of displacement of industrial fishing capacity from the North – Europe, Russia, and East Asia, to Africa, and these are not numbers of vessels but these are total access years. In other words, 114 access years have been granted and the 90s to East Asia to come and fish within Africa. Similarly 124 and then 637 from Europe. So you can well imagine the competition that is going on between the industrial fleets of the developed world and the people trying to make a living and have food security in Africa.

So some of these are some of the same statistics; 80 percent of our fish that we eat here in North America is sourced in the developing world. The demand clearly outstrips supply, both in the developed and developing world and we are dealing in Africa, in some places in the Canary current and the Gulf of Guinea, where these stocks are 98 percent fully exploited, over exploited or even collapsed. And I don't think we can overstate the importance of not only fish for protein and calories but their contribution to early childhood development and in overall health of these people. Essential fatty acids, micronutrients, including vitamins and minerals, are key. So the question is, you know, who's going to win this competition for fish and how will it all pan out?

Now I also want to be very clear that we have many different kinds of fisheries; from small-scale, near shore, traditional, artisanal, subsistence fisheries to larger scale industrial, commercial fisheries that operate on the high seas with blast freezers and large hulls and stay out at sea for months at a time. We're going to be talking today about the small-scale fisheries because naturally, as a bilateral donor agency, this is what AID has a strategic advantage of doing. It's not to say that the other fisheries deserve any less attention but in reality, we have other USD agencies working on many of the harder questions of illegal

fishing on the high seas; the World Bank is, FAO is and we need to connect with all of that that there's a huge deficit of attention being paid to small-scale fisheries.

And as we see here on this slide, they are responsible for actually a little bit over half of the total catch around the globe, but they are comprised by far the largest numbers of people earning a direct living off of fisheries. As much as 96 percent of the fishers in the world are involved in artisanal fishing, including women and youth. Now, these are complex fisheries. As you can see on the left, a large-scale fishery, you know, this is obviously a simplified schematic but typically involves a single port. Vessels coming and going and offloading. You have a ready access to their catch data, their landing data, and a single stock or a couple stocks are being hit – a single management plan and so forth.

In contrast, small-scale fisheries are highly complex. They're spread out across the coast, across the landscape, and as we'll see in a minute and Ghana for example, there are 310 landing sites across the entire coast of the country. Each, with several hundred vessels coming and going, landing fish; each with very limited catch data being collected or monitoring of whether the gear types are legal or illegal. And so it's a complex situation involving multiple species in most cases; involving different management units; the need to decentralize across the landscape to actually manage these fisheries.

So I guess it's no surprise that we might consider weak governance as one of the major, if not the major, causes of failure in fisheries management today. There is a desire by these national governments to retain control, to have centralized authority, have top-down regulatory control, and that becomes problematic in this complex situation. The main problem is that there is no control over who and how many fishers and what type of gears are allowed in these fisheries so this open access nature of the resource is contributing to overfishing and adding fuel to the fire are the subsidies, whether it's fuel, gear, or technology that governments fold into the fishery and make it additionally profitable for more fishers to remain in the fishery or to certainly not exit the fishery, because it remained slightly profitable. All of that leads to the overfishing that we've talked about. I've mentioned the paucity of catch data and in knowledge of our fishing effort and here – just a point.

You know in the OECD countries, when we have fisheries that are valued at X number of dollars, 17 percent of that total value, on average, is plowed back into the management of the fishery, through the governance, the institutions, but primarily as well the catch data that is important for understanding the fish stocks. Typically, however, in the places where we work in small-scale fisheries in the developing world, it's less than one percent of the total value of that fishery is being plowed back into the management. In the case of Ghana, it was less; it is less than two-tenths of one percent. We're not getting the data we need to understand the fishery and the governments are not putting in what is necessary to enforce and achieve compliance.

So I think we'll get into some of these other issues in a moment; degrading ecosystems with habitat and pollution, altered flows of fresh water to estuaries are very important, as the engines of growth for fish stocks. Climate change of course is overlying all of these threats, and then I think we should not forget the power to instill the positive incentives. So there are the approximate drivers of change but then there's the larger picture of what is it that's driving the socio-economics of a fishery; the political will to achieve change and these are things that have to be considered in what we call an ecosystem approach to fisheries management.

I want to just talk briefly about shifting baseline, because we all tend to think of the world as it was when we were five years old, ten years old. That's our model, our conceptual model. A scientist named McClanahan studied 1,200 photos at over a 50 year period at landing sites in the US, taking a look at the composition of catch and here's a typical Sunday afternoon, recreational fishermen out and taking a snapshot with, I guess his wife and his kid. And these are large groupers and there were some large sharks 50 years ago. Twenty-five years later, there's a few sharks. They're pretty small. A few small groupers and jack fish, but that's it. That's the composition. Twenty-five years later, again, this is what's left. This is what we think of as normal. These snappers, which used to be trash fish, thrown away 50 years ago, are now the derbies that we go after. This is what constitutes our baseline. And so this concept of a shifting baseline is really important if we're ever going to begin to think about total productivity and total composition of what constitutes a healthy productive ecosystem.

So this is a throwaway graphic. I hope it's obvious that the basic problem of fishing, of overfishing, is too many fishers going after too few fish and that's important because as we overfish, we wipe out the larger fish and over the past 50 years, today we have the abundance of the large predator fish, the cod, the swordfish, the tunas – have been reduced by 90 percent across the oceans. We have less than ten percent of the large fish remaining in the oceans today. We're fishing down the food web. We're going after the smaller fish. When Dan Pauly came out with this over a decade ago, he was saying, we're now eating the bait fish and pretty soon will be turning to the jellyfish in the plankton.

This is an important graphic, so I want to spend just a minute on it. It's your typical yield versus effort graph. As you increase fishing effort in terms of numbers of people, boats, engines, technology, to the right on the X-axis versus increased fish yield going up the Y-axis and you can see it makes sense that as you increase effort, you actually increase yield up to a certain point. At the apex here, is what we typically call maximum sustainable yield. Okay, there's some questions about that but the point of this is that as you go beyond that – and my pointers not working real well here – but as you go beyond that, you start reducing your total yield, your total sustainable yield, and you incur costs – social, biological, economic costs. You might have more people making a living or a poverty level living off of the fishery, more people employed, but you're really starting to operate at a net economic loss. If you want to achieve food security and profit and perhaps even some export potential, you have to incur management costs and rebuild the fishery back up to this point.

So that should underline some of our next discussion about some of the tools. The tools – and these are the basic ones, in my opinion, for small-scale fisheries management. We need to work to decentralize – to get out of the capital cities and have our fisheries extension officers and data officers and monitoring officers out and working together with fishers and the communities in a co-management way. Call management is simply shared responsibility about fisheries management.

At that point, we are able to – whoops, sorry – at that point we are able to go from a top-down regulatory approach to actually implementing some meaningful controls on the fishery and will talk about input and output controls in just a minute and use rights. These are controls on the fishery which limit the number of people, the number of hooks in the water. And then of course, we

need to be thinking in terms of ecosystem approach, which I'll talk about in a minute.

A key point, though, is that – and I want to emphasize this – is that every fishery has to be considered in terms of the context of that country, that fishery. In context of that ecosystem, the fishery itself, the governance that's existing on the ground, and so everything needs to be contextually designed and sequenced in the right manner and will talk about that in just a second.

These are just some quick examples of input controls, gear restrictions, licensing, area and time closures – think of these as controls over what it takes to fish and be able to be part of a fishery, as opposed to what comes out of that fishery. The output control then limit what size of cake you can take; what size of catch; what species and even a total allowable catch or attack. And then finally, use rights is a form of both input and output controls but think of these as just simply limiting the number of entrants to the fishery, providing them with only a certain number of catch shares or a certain place where they are allowed to fish and this can be allocated either on an individual basis or – as we're starting to experiment with in some places – a collective basis, a village level or perhaps a stretch of coast.

Now, I'm going to talk to him in just a minute, I'm going to mention in just a minute something called growth control and maintenance. This is a conceptual framework that we've developed in the Philippines especially, but think of what I just talked about as the control aspect of the fishery. We're trying to control how much participation in outtake from the fishery there is. This now is the growth component of that. So if we can couple the control is actually increasing the stock through things like marine protected areas and no-take reserves and here, you have an example of where no sanctuary existed and a fishermen and a diver are going after very, very few fish to appoint a year later where a no-take reserve has been declared over a reef area and we now begin to have a refuge for fish, a return of some healthy community structure. Hopefully the reserve has been put into the right place so it's protecting critical habitat as well as spawning grounds for certain species, and all of this will hopefully – and does, it's very well proven lead to increased productivity gains through spillover effect. These larger fish then reproduce and larvae spill over, fish spill over, and the whole system becomes more productive in as little as two to four years and we have plenty of evidence that this is the case.

We keep talking about big fish. Why are we all worried about big fish? If there's plenty of fish and there's a lot of little fish, why should we care? Well, if a picture is worth a thousand words then I guess a picture of a big fish is worth a thousand fish. Think of it that way and that's what this shows is a large fish with reproductive potential that far dwarfs the other sizes of fish in the age structure of the fish population.

This is a rather wordy slide about ecosystem approach to fisheries management. I tried to find some sort of cartoon or conceptual framework. I couldn't find one in my time. But the point here are simply that the focus on an ecosystem approach to management, as opposed to a conventional approach, is that we're now moving from a single fish stock to multiple fish stocks. We're considering the interactions of those fish stocks and their habitat. We're considering other effects on the ecosystem; pollution, the socioeconomic drivers and we'll see this in Ghana in just a moment. We're also talking about scale. We're moving from – we need to consider both the spatial and temporal scale. So we're moving up so that we are considering a migratory effects of certain species as well.

Finally, we are engaging the human subsystem. It's not just about managing the fish. It's about managing the totality of the ecosystem, which I hope we all defined as including humans. But that human subsystem in the governance, the participation, the ownership of self-responsibility that we as humans take for the resource is what it is all about.

So putting it all together, we have strengthen enabling environment of policies, laws, and institutions, hopefully bringing in fishers in a co-management, a co-responsibility, a shared responsibility way. We have some control tools. We take an ecosystem approach and very importantly, we need to bring in the private sector, the market forces. We've all heard about eco-labeling and certification. Those are just two examples of how we can gain a price premium for fish and actually push the fishery to ta da, have more value. What value means more profit for the participants? More profit for the participants suddenly means hey, we're all self-interested and doing what's right. We're going to comply rather than wait for somebody to come and enforce. In that balance of compliance and enforcement is what ultimately leads to real stewardship in the resource. That's what our ultimate goal is. So our ultimate

goal, in simple terms, should be both sustainability and profitability and they're two sides of the same coin in my mind and I think we can achieve that.

But the sequencing and timing is critical and I'm going to run through this quickly. The first step is creating shared vision; a shared sense of responsibility that yes we can reform the fishery sector. We can broaden that and educate the public to understand that. The second is really focusing on this enabling context for governance. Sound policies, laws, institutions, enforcement capacity, building these co-management relationships. We've tried – there have been many failures of saying, "Oh yeah, let's do co-management," and we have one donor run out and set up co-management. Will they forgot to actually set up the policies back in Capitol Land to give the co-managers out in the hinterland the authority to do what we've asked them to do and they've completely failed. It all has to be brought together.

Then, you're in a place where you can actually institute some input and output controls and stabilize the entrance to the fishery and finally, you can organize the value chain and really try to bring about some increased value to the existing fishery. We argue that you should never start here. You have to have the controls in place on the fishery, otherwise you are unwittingly acting like a government subsidy. If we start to add value to the fishery, more people will come into the fishery and say, "Hey, I can make a profit now." Okay? So it's really critical that we don't unwittingly had problems to the fishery by going in and saying let's organize the value chains. Let's make improvements here and there without taking a hard look at some of these other things, not the least of which is instilling an ethic of self-responsibility.

In my final minutes, I wonder just run through a couple examples. En puano, sorry, means our coast and this is our AID Ghana bilateral fisheries program and the Western province of Ghana and it's a $10 million, four-year effort to give you some sense of scale. It involves sites and the Western province in three main districts. This doesn't show up here, but that is supposed to say oil and gas and oil and gas production started two years ago in Ghana and it is driving right now a 16 percent economic growth rate in the country. Don't we all wish we had that problem, right? But it is a huge problem because they do not have governance, elements in place. It is the wild West in Western province in Ghana right now and all of that is having an impact on not only fish but all kinds of food security issues. Just real quickly, Ghana already consumes double the average

global rate of seafood. They rely on that intensely. The number of jobs – for every fishing job in Ghana that a person has a direct income from, there are seven additional jobs created through the marketing, through the boat building, through the supply, retail supply, and so forth infrastructure. And then it's important to note that a third of the total catch goes beyond Ghana's borders and supplies. Important protein to the region in West Africa.

The fishery has four main types of fisheries. We're going to talk – tuna being the other one – we're going to talk about canoes only because we don't have much time and these canoes have been growing immensely in numbers. They just shot up since the late 90s as a result of government subsidies, as a result of light fishing which was this innovative technology that now allows people to go out and put a very intensely powered light in the water at night and collect all the fish and surround them with nets and hold them in. There are now maybe 14,000 of these canoes in Ghana working out of these 310 landing sites and so we called this effort creep. We are gradually moving toward – not gradually, it's actually pretty rapidly – faster, bigger, more boats using new technologies including fishing nets with mesh sizes of a centimeter to collect everything out of the water and it's basically gotten way out of hand. The fishers know that there about ready to watch their fish stocks collapse and they want to do something about it. They want to do something. And we have the social capital now in Ghana to actually make that happen. Here's an example of the centimeter monofilament gill nets. These are just deadly.

The main point about Ghana is simply that we don't have any control over the fishery. It's a pelagic fishery with lots of upwelling; it's totally different from a coral-based fishery, as will look at in the Philippines. It's a highly productive fishery and highly variable and there are just so many people entering, giving up their farmland, giving up their other alternative incomes, to go and join the fishery and very quickly, we need to get a handle on this.

This gives you a real quick snapshot of the ecosystem problems as a result of the high growth rate, economic growth rate, oil, rubber and palm, and mining. We have a number of effects that we ought to be very concerned about. The loss of agricultural lands being primary. And I want to just say a shout out to our program in Ghana and what they've done in a short period of time. They were there right on the spot when these large, multi-year concessions were being negotiated for rubber and oil palm and as a result of their engagement in those

discussions, they actually got the traditional leaders, the chiefs and elder councils, to agree that we're only going to sign these leases if, and only if, we put aside 25 percent of the lands to remain in ag production. Other than that – if they had not done that, if they had not been there for those discussions, they would all be in rubber and oil palm.

So I'm going to move quickly on. I have just a couple more minutes. I think the main point about the Ghana program is that we're really trying to create that vision, those decentralized and co-management structures and the right incentives for people to move forward. We can talk more in a moment about that.

Very briefly, in the Philippines however, we had something called the Fisheries Improve for Sustainable Harvest – and I'll be done in just three minutes. This program, again, took an ecosystem approach for fisheries management and looked at all kinds of threats. The thing is, in the Philippines we have a history of two and a half or three decades of working in coastal management, and natural resources, and building this governance framework both at the national and at the local scale, the local government scale. And here's your fun cartoon about what the fish program is all about.

Its main goal is to increase fish stocks in target areas by ten percent, the fish biomass by ten percent. We had never done this before, we had never tried this as a donor agency before. In fact nobody had. And we do this through the growth, the control, and the maintenance objectives. And what they found, without going into too much detail is we have these target sites in four target sites of the Philippines. Here are your modes of delivery. I'll read them for people who are listening online. Capacity building, constituency building, policy improvement, co-management, ecosystem approach to fisheries. Of course, the NPA networks being the basis of the growth aspect here and what we call fisheries management units and I have two more slides and they're basically showing the results.

Not only was the 10 percent target achieved; it was achieved at 13 percent, so it exceeded that, but they took a very hard look at some of the economic, the cost benefit, of doing this kind of work and so in terms of the volume of catch

increased over the 7-year period; it has increased by a total of 76 percent at this one site, one of the 4 sites. And that's equivalent to 19 percent per year, 19 percent per year of kilograms per fisher. I guess that's worded wrong. If Fisher has increased his own catch or her catch by 19 percent in that 7-year period.

Finally, I wanted to show they did some valuation analysis, too, again at this one of the four target sites, factoring in damages avoided as well as accrued value of the fishery and came up with close to 100 million pesos, which is equivalent of just under 2.4 million US dollars of increased benefits as a result of this work.

I'm going to conclude by just reinforcing a couple of our thoughts. A third of the planet relies on seafood for more than 20 percent of their protein. It's incredibly valued for our nutritional aspects in childhood development. More and more fish is being sourced from the developed world. Stocks are over exploited and in many places have already collapsed. Something we haven't mentioned is that as much – it's estimated – that as much as 30 percent of the global catch is lost, completely wasted, through poor post-harvest practices; handling, onboard handling, landing, processing, marketing, retailing. Obviously, we can make some significant productivity gains but it takes time. It takes years; it takes probably on the order of more than a decade in many places. But we can do it. We can do it through stronger governance; through co-management; through putting in place the right incentives, the market incentives, to make people become stewards of their own resource and I guess really the question is if and how we will do that. So thank you all for your attention. Sorry 'bout that.

[Applause]