

2014 BORLAUG DIALOGUE

October 16, 2014 - 2:00 p.m.

Panel: *Dr. Margaret Catley-Carlson, Moderator*

Introduction:

Ambassador Kenneth M. Quinn

President - World Food Prize Foundation

All right, everybody come on in. We've got all the students from the Global Youth Institute here, so they all arrived promptly on time. Everybody else is networking out there. So this is a continuation of the program from this morning. It was a terrific program, but I know we are going to continue that. And our moderator, Margaret Catley-Carlson, a great friend of the World Food Prize, a longtime member of the World Food Prize Council of Advisors, she has this marvelous panel together. So come on up – the stage is yours.

PANEL:

WATER FOR AGRICULTURE: TRENDLINES AND GAPS

Panel Moderator:

Dr. Margaret Catley-Carlson

UN Secretary General Advisory Board on Water

Panel Members:

Dr. Dilip Kulkarni President, Agri-Food Division, Jain Irrigation

Paul Bakus President, Nestlé Corporate Affairs

Dan Bena Sustainable Development & Operations Outreach, PepsiCo Global Operations

Margaret Catley-Carlson

Before everybody gets involved in deep conversations... and I'm worried that some of you might discover the answers to the world's pressing problems; and if we interrupt you to have a panel, we could be disturbing the solutions to the world's problems, so you better get on with the panel, I think.

Anyway, it's never a joy when somebody phones up and says, "We're going to give you the spot right after lunch," because we all know what happens in that spot. But then it was, "Well,

you can talk about water.” Okay, that makes it good, “And you’ve got three really great panelists.” So this turns something into, instead of being a challenge, really a joy and a delight. So welcome, everybody. This is the panel on water, water in agriculture. We’ve had two days really of looking at the problem of how the world is going to feed itself at nine billion population, and the focus has really been on crops, cereal crops, agricultural methods, a little bit of the sociology of agriculture, not quite enough but the whole, the myriad factors that go into this.

But underneath it all is this assumption that there will be water there for the agricultural needs. And that is one of the things that obviously our panel is going to have to put a bit of a search light on to say that, as we approach nine billion people and as tastes change... we had a marvelous CAST winner who said that over 50% of agricultural water really now goes into the animal chain for the feed and fodder, to food and fodder to feed to the animals and the water productivity, the water needed to produce and process and deliver livestock. I’ve not checked that figure, but it certainly gives the idea how former ideas of what feeding the world was about, i.e., expanding the rice bowl, if more than 50% of some of the factors of product production are going into the food, into the livestock part, the protein part of the food chain, things really have changed an enormous amount. And that adds hugely to the complexity of making sure that there’s enough water.

So are we going to need more land? We hope not. We’ve all discussed why that’s not a good idea. More food, exponential growth to nine billion. And we’ve had them for the last few days—ideas, concepts, science, technology, best practice, are we on the track to improvement? And we’ve been asked to look at the Cassman thesis on whether we’re really on the track to improvement. Ken Cassman in his report talked about rates of grain and crop yields, food prices being on the rise, abrupt changes in land patterns, and increasing atmospheric greenhouse gases. And he said these are pretty good indicators that we’re not very sustainably on track to reach our goal of sustainably feeding nine billion people.

Now, when you turn it to look at the water account, you look at different issues—groundwater being depleted in a number of countries, and a number of major rivers not reaching the sea, and a number of very major lakes being threatened in both quantity and quality. We look at water pollution, hypoxic zones, even municipal reservoirs in this country being threatened by nutrient runoffs. You look at the competition between agriculture, energy and industry, which I’m sure you’re hitting as you go on expanding markets. Because it is a very real and growing competition, and energy producers are big players in this, and they’re powerful players, often certainly compared to smallholder agriculture.

So the balance sheet that you look at—are we winning or losing?—in water is a little bit different than when you’re looking simply or uniquely at crop production. But luckily, we’ve got three really good, experienced, thoughtful men up here this morning or this afternoon to help us look at these questions.

And my question—where are the good, new ideas to make water go further, better, cleaner, more times per drop, and more crop per drop? Where are those great ideas? And is the world moving in these directions sufficiently so that we are on course to really try to achieve what needs to be achieved if we really are going to sustainably feed 9.5 billion people. So it’s not just a land and crops issue; it’s very much a water availability issue.

So who are our three today? You've got your book, the book which very nicely puts us all together and gives you a bit of background and puts in pictures to make us all look very nice indeed. So you will be able to look at the longer version of who we are.

Dan Bena to my immediate left heads Sustainable Development in Pepsi, and he looks particularly, but he has pretty broad knowledge, but he looks particularly at water safety, i.e., the pollution issues and public health issues.

Paul Bakus, further down, is Nestlé Corporate Affairs, and he's got a long experience looking at nutrition, health and wellness issues; and he's now looking at the Roundtable in Obesity, which is of course the growing nutritional issue.

And Dilip Kulkarni to my immediate right is the president of Agri-Foods within Jain. And anybody who doesn't know Jain is synonymous with really great new developments in irrigation, everybody must know that. But he's also got an interest in food technology and in food processing; and, as you're going to discover, that's part of the key to what it is we have to find out.

So we're going to have more or less of a conversation with a few longer interventions, but we're not going to have set speeches, because we have to keep you awake after that very nice soya lunch.

Catley-Carlson Let's talk first of all – what really is the water in agriculture issue for the next 20 years. Dan, lead us off. What big issue are we facing as we try and feed nine billion people?

Bena Thanks very much, Maggie. You know, my mother was a big fan of the KISS principle. If you don't know that, it's "keep it simple, stupid." And she would say that to me quite frequently. I'm not sure if I should be happy or sad about that. But in some ways there's a lot of wisdom in that. And I think it comes down to, too much water or in the wrong places, too little water, not enough quality.

And certainly the not enough water – if we look out to the year 2050, 4.8 billion people, 45% or so of the global GDP, which would be \$63 trillion, will be at some risk of water scarcity. If you look at the 2030 Water Resources Group, they estimate a 40% gap between water supply and demand out to the year 2030. Certainly a major portion of that gap can be filled through interventions in agriculture, since we all know the factoids about 70 to 90% water use in agriculture globally.

The good news is, Maggie, I think there has been a remarkable focus in the past five years on water scarcity. There has been new technology to better map water scarcity and predict water scarcity. Hasn't been a whole lot of focus on the other end of the spectrum – the flooding, the water overabundance. Admittedly, it may be a little bit more difficult to predict within any sort of long-term certainty; but that is something that I think is critical, because, when you look at flooding events that happen quickly and that happen catastrophically, we all know all too well the impacts that that can have on agriculture and food insecurity, not to mention pollution. I mean, you hinted at it. U.N. Water, in one of their infographics just a couple of years ago

pointed the finger very clearly at nitrate from agriculture, the most prevalent chemical contaminant in global groundwater.

So obviously we're starting to see all of these bits and pieces that are forming a pretty compelling picture. I think what's needed is something that brings it all together.

Catley-Carlson Okay. Dilip, has he got it right? Has he got the major elements in there?

Kulkarni Thank you very much. When the earth was created, the water was created, and we have still the same water. We don't have a single drop extra. But there's a lot of exploitation, particularly groundwater exploitation. And 60% farmers are still deprived of water there's the soil moisture insecurity. And from that point of view, I think reaching water to those fields which are not seeing water, irrigation water, I think that is the future for the future for security. And this is possible.

Catley-Carlson So if it's possible, why don't we do it?

Kulkarni The efforts are required from the recharging ground aquifer through rainwater harvesting and using whatever water is available very efficiently, like what we say, more crop per drop.

Catley-Carlson India is probably the poster child of water scarcity, and yet India is full of very intelligent, dedicated people who know the water situation very well. Tell us a little bit about why it's so tough to make the kind of progress that you're talking about. What do you run up against, or what does a government run up against in India when they're trying to make the changes that are needed?

Kulkarni See, the recent government, which is there now in position, has announced every farmer will have water. Now, how is going...

Catley-Carlson That's helpful but doesn't...

Kulkarni How is going to happen?

Catley-Carlson Yeah.

Kulkarni And I think the solution lies in what I said – the water use efficiency. The soil moisture security is the most important parameter for the productivity of the crop. Right amount of the water at right stages of the growth of the plant. And I think making it available as and when it is required is the key to the growth of the plant and productivity of the crop. So from that point of view, ponding water during monsoon period, particularly for India, because if you see the number of rainy days, there are hardly 22, 25 rainy days in a year during monsoon, actual rainy days. And whatever water is available during that time has to be conserved in situ conservation in the field itself, what we call it as "green water." Then increasing the blue water by storing it, on-farm storage. Like I was saying, there's more than 60% land which has

not seen irrigation water until today. The possibility of developing farm ponds during monsoon season, giving critical irrigation to the crop when it is – just three to four critical irrigations during the growth of the crop, like during flowering, during or fruit setting or pod setting, grain setting. The productivity increase almost 50 to 60%, alone by water.

Catley-Carlson Okay. Sounds good. Paul, what have we missed in terms of the major factors that are part of the water for agriculture conundrum?

Bakus I think the panelists have done a nice job of framing the issue, and I think all of us, what keeps us up at night is the fact that we really do believe there's a serious issue. And you ask the question – why isn't there more action being done. And I think water and water scarcity needs to be higher on the agenda, particularly of the local governments. And everyone needs to recognize that this is a significant issue, and it really is going to threaten food security in much greater detail in the future. This issue isn't going to go away, and you can't wish it away. And there isn't a silver bullet; there's not a single solve. It's a multitude of constituents that need to come together to really address this issue at a local watershed level.

From our standpoint, we can manage our water more efficiently and effectively in our factories, but the reality is, we rely on so much agricultural inputs; and we're very concerned that we're not going to have enough to keep our operations running if we don't address this water situation. So it's high on our radar screen, but it needs to be higher at the level around our facilities, around the growing areas that we source our commodities. And it starts with having the local governments really help to be a part of the solution and convene.

And the good news is we've seen that it works. There are signs that we as a collective group can make a difference. And so I'm very encouraged by what we've seen as an industry and as a company if we get the right people together. But it starts by getting the awareness level up.

Catley-Carlson I want to come back to this at the very end, what we can all do to help governments try and set the better policy framework for this. Because I think, and you're going to find out this afternoon, how much the private sector can do – initiative, innovative impact – but ultimately you run into the need for good public policy, so we're going to circle back and end there.

But let's move on right now to food waste. The common [inaudible], just as Dan says, 70%+ of the water that humans use goes into agriculture. And the other cliché is that we probably waste 40% of the food that is produced. It's a different 40%. In the global South a lot of it gets lost between the stage of being in the field, up to the point where it can be sold. In the global North, a lot of it starts at the point where it goes into your own refrigerator or into the refrigerated units of the supermarket. So it is a different loss pattern. But with... I was going to say "simple," but it's in fact simplistic mathematics. If you could remove the 40% waste from the 70% use, you'd have 30% more water to use on agriculture, and we could make it to nine billion very

easily. Now, you can tell I did not major in advanced mathematics, but the point is that we would have a great deal more water.

How are we doing on that one? Because food waste is intimately connected with the actual amount of water that's available for us to use. Have you got any good ideas up your sleeve?

Kulkarni 25 to 30% of the food never reaches consumer, particularly in developing countries. And this is mostly because of lack of infrastructure. The roads are not good, there are no cold storage areas, no cold chains are available particularly for perishable commodities like fruits, vegetables. And the grading and packing facilities and transportation – it's a big issue in most of the developing countries. And that causes most of the food waste.

And the solution itself is in part of what I have said we have to develop the infrastructure. And infrastructure, particularly, cold storages, warehouses; I think these are very important and particularly at farm level. The farmer has to be educated. Many times the harvesting is not done at a proper stage. So if we do even simple harvesting at proper stage and grading, we can prevent about 10 to 12% of the losses which can happen during transportation.

There are new varieties which are coming, like, say, tomatoes. We have now new varieties which can withstand the rough road transportation, and they can stay for longer. So the solution also lies into the varieties which can be useful for long-distance transportation. So there are several kinds of solutions available. But the only thing is, there has to be a program at the national level and implementation at the ground level.

Catley-Carlson Well, you're the President of something called Agriculture and Food Processing, so what is your company specifically doing? I mean, what's your product? Because you have to turn this into a product that has buyers and...

Kulkarni Yeah, we work with complete value chain in agriculture, right from irrigation solutions like drip and sprinkler; we are also in greenhouses, tissue culture and food processing. Actually, food processing started like this when we started giving this high-tech agri inputs to the farmers. The productivity enhances, and when the productivity enhances and there's lack of infrastructure, there is a problem of access to market by the farmers. And in order to help farmers, actually we started processing buyback from the farmers.

Catley-Carlson Oh, really.

Kulkarni Yeah, and particularly mango, bananas and guavas and papayas and tomatoes and onions. So we did a lot of contract farming. We buy from the farmers who buy our inputs, as a buyback. We settle their advances against the raw materials which we purchase from them. And we process fruits and vegetables for pulps, for concentrates and dehydrated onions. And a lot of waste is generated during the processing. In fruits, particularly, almost 50% waste is generated in the farmer fields

and seeds and roughages which comes out after extracting all the juices. And we have done with that is we recycled that in order to maintain and produce electricity. Like, we have 300,000 tons of fruits and vegetables processing in our company, and we generate almost 150,000 tons of waste; and all that is converted to methane gas, and we produce electricity. We produce something like 1.76 megawatts electricity from that and use it in the company. And also that process generates a biowaste, which is a very good fertilizer.

Catley-Carlson Good story, yeah.

Kulkarni Yeah, so it's a complete recycling of the food.

Catley-Carlson And it does save water.

Kulkarni Yeah, it saves water because it's recycled into the system.

Catley-Carlson Very good, yeah. I'm going to go with Paul first because he wants to talk about supply chains.

Bakus Getting our arms around waste has multiple benefits, but one that's really not so visible is all the water that's consumed with this waste. And I'll give you one example that may be a little bit nontraditional. But Nestlé sources a significant amount of milk across the globe, and we've set up milk markets or districts to source milk from farmers. And what we've seen is that, in these markets where we source milk, without any intervention, there's anywhere from 16 to 30% waste of the milk.

And so what we do is we bring in infrastructure that, first of all, we accept all milk that the farmers want to sell us, and so there's no waste from that farmer. They can have a place to bring and sell their milk. But then it talks about the infrastructure, about how we cool the milk, how we put it on refrigerated trucks, how you get it to market. And what we've seen is, when you have the infrastructure in place – and keep in mind, this isn't just Nestlé doing this, it's working in partnership with the local communities, because everyone will benefit from this – we've seen a significant reduction of the waste, under 1%. So if you think about...

Catley-Carlson You've got waste down to 1%?

Bakus Down to 1%, from roughly 20% to 1%.

Catley-Carlson That's a lot.

Bakus So you think about the immediate increase in capacity, milk, but then also you're making that much more milk or having that much milk come to market with the same amount of water. So this is just another way of thinking about water usage in the whole agricultural supply chain. If we can eliminate this waste, you can really produce a lot more with the same amount of water.

Catley-Carlson That's good, excellent. Dan, you know one or two things about supply chains, too.

Bena Want to offer a point of calibration for this waste – and your math is actually pretty good.

Catley-Carlson Oh, really?

Bena Because there was study by the Institute of Mechanical Engineers – I think it was just last year – that suggests an estimate of one-quadrillionth liters every year of water wasted in food waste, one-quadrillionth

Catley-Carlson How many zeros is that?

Bena Fifteen zeros.

Catley-Carlson Fifteen zeros.

Bena I mean, that's unbelievable, and that's every year. So you think about the magnitude if even a portion of that is able to be saved? And the one thing I wanted to bring us back to was the Cassman report, because one of the focus areas in that as I read it was the importance of people and the importance of leveraging people and capability.

And one very, very small but I think innovative solution is PepsiCo has decided to work with the World Food Programme, I think five years or so ago. And we figure if PepsiCo, or if Nestlé or if any of these consumer products companies have enough consumers that want our products anywhere in the world, we figure out a way to get it to them – right? We call that "the final mile." If we can leverage that same final mile capability for food waste, for warehousing, for logistics and distribution... So we're using our retirees that were in global operations, working with the World Food Programme, to design better distribution systems – and it's been a partnership made in heaven. It's been really, really very positive.

Catley-Carlson You have also... I mean, I've been very few places in the world where there isn't Frito Lays hanging up in the corner of the little roadside stand or whatever. And if you want a good cocktail party question, ask somebody who the largest potato buyer is in the whole world, and people will say McDonald's, McCain's, things like that. It's Pepsi. And you've also done some things about water use in the production, in the growing, in the agriculture. Do you want to talk a little bit about that?

Bena Sure. There's a couple of things I think are notable. One is kind of on the community side of things. So it's one in agriculture, which actually does not feed our supply chain, and that was in India – you mentioned the poster child, unfortunately. But it is the production of low-cost tensiometers. So in India you can get a tensiometer probe that tells you when to water your crops, for about \$150 U.S. It's a lot of money when you consider the annual income is about \$400 or \$500 U.S. So we worked with the

Columbia Institute, the Columbia Water Center at the Earth Institute and got the fabrication cost of those tensiometers down to about \$7 U.S. Over 5,000 farmers are now using those tensiometers, and they're saving between 20 and 30% of the water over traditional flood irrigation.

That's one. The other one, not so inexpensive but equally as effective. It's something that we did in partnership. And again partnerships are key over and over again with this finding solutions. It was with the University of Cambridge in the UK, where we developed something called i-crop, and it uses a bunch of different climatic sensors on-farm. It takes readings about every 15 minutes or so, and it uses a software. But it tells us exactly when to water the crop, and it delivers the water to the root zones of those crops. There again we're seeing 20 to 30% reduction.

Catley-Carlson You're talking about getting it to the... getting the amount that you need, no less, no more. You're each in the private sector. You're competitive, you have to be competitive. There are a couple of other beverage companies running around, I hear. So we want your really good solutions to grow. We want them to spread, we want them to move beyond the boundaries of your very large companies. Talk a little bit about that, because you do very innovative solutions, like I know the tensiometers you don't want to keep within the Pepsi family – you want that to grow. But how do you reconcile this in the sense of becoming advocates, missionaries for an improved approach to water, with the fact that this is one of the things that puts you into a competitive position. Paul?

Bakus It's clear you can't create competitive advantage around this area. A sustainable source of supply of raw materials is something that has to be looked as – you're not going to get competitive advantage in that. You really need to be partnering with your competitors and others to be able to quickly come to the solution. So I appreciate the tensiometer approach. How can we take that learning and build it into some of the things that we're using or implementing that aren't relying on technology? They're just basically relying on education and best practices. Because what we find is the farmers aren't doing anything knowingly wrong. It's they just don't know that they're overwatering. They don't realize that they're not using good water practices on their farm, and there's so much water that actually gets wasted on their farm; and they just don't know it. So how do we build off of one another's knowledge, and how can we leverage the tools and build these tools so that they can be additive and it's not exclusive – the solution is not going to be one simple solution – it's going to be multiple solutions?

So it's a whole new world. You have to be collaborative. You can't expect competitive advantage in this area, because we'll all benefit if we crack this code.

Catley-Carlson Do you go out and advocate? I mean, when I said India was a poster child, that's also got really good examples. It's got the good, the bad and everything. But does Jain spend good time trying to become advocates for better water practice?

Kulkarni We are the second-largest employer of extension workers after the government, more than a thousand workers, they are called agricultural helpers. And extension is the key, and from that point I'll just give you an example.

Like in Maharashtra State, 60% of the available water is used by 3% of crop that is sugar cane, which is a criminal waste.

Catley-Carlson Yes. You'd have to go to Florida...

Kulkarni Yeah, and if you use drip irrigation in sugar cane, you can save almost 50 to 60% water, and there is increase in productivity by 30 to 40%. There is a club of farmers who have formed what they call it a hundred-ton farmers club. Those farmers who produce more than a hundred tons per acre, they're from the club, and all of them use water-saving devices. This is one example. Like in the onion dehydration, we buy a lot of onion from farmers. And if the flooding irrigation is used, the water requirement is something like 443 liters per keg of onion produced. Whereas if we use drip irrigation, it requires only 220 liters of water to produce one keg.

But when we sell dehydrated onions, most of international buyers, they buy from us, but nobody pays premium for the onion which has the small water footprint. We have done water footprinting of all our products, but there's no premium in the market. There has to be some concept, some buying premium for the producer which has used water-saving devices.

Catley-Carlson We're circling back again to the role, the necessary public role, yeah. Yes, do, yes.

Bena It was an interesting lesson when we started to talk about pre-competitive topics, and water is certainly one of them. And in all candor, when we go to our frontline sales people and we tell them that we're working with our competitors and we're working with Nestlé and we're working with Coca-Cola, they look at us sort of out of their corner of their eyes and wonder – where does our loyalty lie. Because that's frontline, that's sales, that's very different.

Water – a great example of pre-competitive. The chair of Nestlé, the chair of PepsiCo, the chair of Coca-Cola, all serve together on a governing council of something called the 2030 Water Resources Group. And that is specifically formed to engage with governments at their request to help collectively close that 40% gap that I started off my comments with. What's really cool about 2030 WRG is transparency. So we issued a compendium of good practices. We never want to say "best practices," at least good practices. The tensiometer is one of them that's in that compendium. It's all available in the public domain, and the idea is to keep making that compendium richer and richer and grow more and more.

Catley-Carlson Want to add anything, Paul?

Bakus Well, I think that's a great point, and it speaks to the fact that we're all in this together, and we're all going to benefit from a solution, regardless of what the

situation of the crop is. And it's going to take a village to tackle this problem, and you just have to be open to working in new and different ways with a variety of stakeholders, including your competitors.

Catley-Carlson Good enough. Well, I want to get to public policy, but I want to make sure that we've really talked about some of the things that your companies are doing. So I give you a chance to say, is there anything you want to add about what your company is doing. Tell us a little bit about what drip irrigation does in terms of water saving.

Kulkarni Yeah, drip irrigation or whether it is sprinkler irrigation, we can save almost 50 to 60% water, and there is crop productivity increased by almost 300% in some of the crops.

Catley-Carlson 300%?

Kulkarni Yes, in some of the crops. And it's not just only water saving. It is the productivity increase, which is very important. We also save on fertilizer, almost 30% fertilizer is saved.

Catley-Carlson Good.

Kulkarni Also we can save on the labor cost—the weeds are less. Recently we used standardized methodology for drip irrigation in paddy, which is... You know, you can't imagine a paddy without a water field. And on this paddy we are launching this big program at Bangkok International Rice conference where we are seeing that almost 55% water saving by drip irrigation in paddy, which is unimaginable.

Catley-Carlson Yes.

Kulkarni And it's not only that. There is also prevention of greenhouse gases in paddy because we don't have stagnated water there. Our company did a program which we do every year on 1st of May. We identify a thousand villages, they are wells which are dried up which have no water during summer. We do recharging well program on 1st of May. The physical infrastructure which is required for recharging is done on the 1st of May on that day. All the villagers, they come together, bring their own carts, their equipment which are required for excavation and building up. And they do at least ten wells in a village, and they join community program, developing, recharging of wells. This type of mass movement is required. And I think this will be very revolutionary if we do that rainwater harvesting, recharge aquifer, accumulate water in farm ponds, achieve soil-moisture security, and I think that will cause a lot of impact on food security in the future.

Catley-Carlson I hope so, I do, I do. What haven't we touched on that you are proud of that...

Bena One thing in particular that's actually very recent. It's something we announced at the World Water Week in Stockholm just last month or so. PepsiCo Foundation

obviously played a very small role in something this potentially big, but I urge every one of you to Google hydrobid, H-Y-D-R-O-B-I-D, because it is a brand-new tool, a suite of tools, that the Inter-American Development Bank has developed and are piloting, which will give you as close to real-time insight into being able to do a water budget as any tool that I think is out there. We have a lot of expectations for this tool. It's being piloted in five countries now. It's completely open-sourced, it's in the public domain, it's only going to get better if more and more people use it and build on it. But we think it can be a global tool.

Catley-Carlson It can. And I mean the whole big data thing is enormous, is going to change water, because it often comes as a surprise to people in North America that water quantity is a closely guarded secret in many countries. And even the amount of river flow from one country to the other is a very, very closely guarded secret. And so therefore it becomes extremely difficult to do any kind of reasonable transboundary work. I sit on the ICIMOD board, which has the seven countries of the Hindu Kush and the Kailash group. And even trying to do flood prevention and flood protection is very difficult because you simply cannot get the flow data that you need.

So if we start combining all of the publicly available data on water flow, water quantity, water quality and turning that, using the skills of big data, we can actually start getting much better ideas as well as to be used at the macro as well as at the micro level. Again, at the micro level, one of the very real ways to make sure that we don't have municipal – which isn't our subject today, but municipal problems, is water metering. The whole island of Malta is completely metered, and the meters measure electricity use, water, unforeseen water rises, unforeseen water drops, so that you've got immediate electronic forecasting flooding, shortage, too much electricity and leakage.

So a lot of the very good, new possibilities really do come through using 21st century technology. And I'm glad you brought that up, because it links into a lot of really good things.

Okay, let's circle back and talk about public policy. And it's very clear that each of your three companies takes their citizens as international citizens very seriously to do the right thing about water. It's very difficult to try and get governments to do the right thing about water. And people often say to me – “Okay, you've been working in this field for a long time.” (I see my friend Mark over there smiling.) “Why is it so difficult to get positive and good change about water policy?” And I say – “Well, just imagine you're the water minister and somebody comes up and says, ‘We really need a new water plan because there's people over here that don't have enough, and there's people here that have too much. So the first thing you've got to do, Miss Madam Minister, is to take the water away from those folk over there and to give it to others over here.’” She's going to look at you and say, “I would like to get elected again at some point.” And so then you say, “Well, then we'd like to meter it and monitor it.” And then you'll find out that that has tremendous, tremendous obstacles and very real problem areas for governments.

And then you say, “Well, and then we really need \$60 trillion dollars worth of new water infrastructure. And, by the way, none of it will show. Nobody will be able to see it, and so therefore you’re simply taking the money and burying it under the ground.” So by this time, the water minister is convinced that this is a losing game in terms of trying to do the right thing in water and yet maintain some kind of political popularity.

I had an Indian friend who used to run for parliament, and he said it was very easy – he just waited until one of his opponents said something about a possible need for water price increase sometime in the future, and then he would quote it and put it in big posters, and he’d get elected and the other one wouldn’t.

So, okay. How are we going to get out of what is really a difficult situation when you combine the democratic process and the need to do good things about water? Who wants to start on that? You? Good.

Kulkarni See, up ‘til now most of the governments, they describe water as a social good, and never as an economic good – I think the problem lies there. And it cannot be solved by sociological or democratic way. The solution lies in technology. That is what I feel – like saving water – I think that is the key.

Now, if you see the cases of large dams, distribution of water through open canal systems, reaching that water to the field – what is the water use efficiency there? Hardly 25%. Most of the water is evaporated, leached out, stolen many times. And if you see actual water use for the crop is hardly 25% water efficiency. But if you have in situ water conservation, small dams, big dams, farm ponds, recharging wells, you don’t have that problem of water distribution. The water will be available at the sites. So water you are doing presently is you are collecting water from different places, bringing it one place and again redistributing. I think that is economically not a good thing to do. Even if you have that pipe distribution of water, pipe, which is now being done in Brazil and some other places where irrigation is not done by open channel; it’s done by pipe distribution. And simply by converting open channel system and conveying water by pipes and using drip irrigation system, you can have water efficiency of something like 85%.

Catley-Carlson You’re saying, make it easy for governments ...

Kulkarni Make it easy, yeah, and then it becomes... And also there are agronomic solutions. Agronomic solutions – I’ll give you just two small examples. Like, say, banana – it requires a lot of water. But if you have a technology of using tissue culture, you can have three crops in two and a half years and increase productivity against traditionally two crops in three years, which is an agronomic solution. You increase productivity of two to three times. Or like we now recently launched a program with Coca-Cola in South India for ultra high-density mango plantation. Now here against 40 trees per hectare traditionally we’re planting something like 650 trees per hectare. They’re pruned, they’re kept dwarf, the productivity increases 3 to 4 times and is a very successful program. We are targeting 50,000 farmers in the next five years with a productivity increase of four times, so a agronomic solution.

Catley-Carlson Put your faith in technology, not in governments. Paul, your company has been a pioneer in trying to actually engage in government dialogues and in promoting the idea that, particularly large countries, whether national or international, on the ground should be engaged in dialogues with governments to point, to talk about what the water agenda is, what the water problems are. Can you talk a little bit about that?

Bakus Yeah, I think it goes back to what was said earlier. You've got to talk about water in terms of economics. If you talk to the government about jobs – how many jobs are at stake? If we can't have access to water in our factory, it means X number of employees are going to not come to work because we can't run our factories without water. But it's much broader than that because, again, the commodities that we source and bring into our factories are so dependent on pond water, if we don't have the water to grow the crops, we're not going to have the ability to keep these factories running.

And so it comes back to what I said earlier, which is – the local watershed is key, and the government has to be engaged. We have to talk about the entire use of water – now, how do we treat our water after we use it in our facilities? How can we treat it in a better way, in a different way so it can get repurposed? There are many different sectors that can play a part of the solution, and it really comes down to the government has got to be the convening agent. But they've got to do this with the right motivation, which is, we've got to look at the economics of this. And once you get them to look at the economics, it changes the whole dialogue, and I think it opens up their minds to be able and willing to talk to a much larger group of constituents.

Catley-Carlson So improved methods. You're both saying, hold out a carrot and say to the government – follow the carrot to maybe avoid having to use the stick.

Bena I think there's a place for a little bit of a stick too.

Catley-Carlson Oh, yes.

Bena So valuation is absolutely key, and valuation is not synonymous with price and cost, which too many people do kind of think of as the same. And if you truly value water, it gets back to what Paul started with, which was awareness raising. If we can get the general populace to actually value water conceptually, then they'll understand the pricing and costs that go along with it.

If you want to get an elected official to act, what do you do? You have their constituents tell them that something's important. PepsiCo has about a billion consumer engagement opportunities every single day through our brands. If we're able to start leveraging that kind of engagement with messaging and with awareness building and then imagine if Nestlé does it with their billions?

Catley-Carlson Imagine what you could do.

Bena Exactly.

Catley-Carlson We have a whole one minute and 50 seconds left, so we shouldn't feel under any time constraint, but let me end with Ken Cassman's question: Are we on track? Is the water lined up to be supporting the agricultural sector so we really can feed 9.5 billion people? Are we on track?

Bakus We're making progress, but I am still not sleeping well at night, knowing that the water scarcity issue isn't going away, and the climate changes are showing that it's potentially going to get worse. So we're making good progress, but we need to accelerate as a group our efforts at using water more efficiently and effectively.

Catley-Carlson So I hear you saying, not quite. Dan.

Bena I would agree with Paul. I am much more optimistic specifically in the water context than I am with the broader food insecurity context. I will say, though, Maggie, you absolutely need a systems holistic approach. The worst thing is to disincentivize a user for saving 40% of water, only to have rates increase by 40% the next year. So that brings so many different stakeholders into the mix.

Catley-Carlson And we have to invite the finance minister in, and he has to answer the invitation. Are we on track?

Kulkarni I will again say I agree with these two gentlemen. But every stakeholder has to play a role here, and I think private sector also can be change agents. And I think we are playing that role, at least recently, if not in the past. But collaborations and partnerships are really important. I think public-private partnership, NGOs, they should come together and implement this program for the good cause. I think we are to forget about what has happened in the past but have a right path. Solutions are available. The only thing there has to be willpower to implement them.

Catley-Carlson Well, we finished right at the 000 mark. I think our report card to global civilization is, maybe we're verging towards to being on track but not quite, that there are change agents around. A great number of them are in the private sector, and I want you to join me in thanking our three private sector representatives today, who I think have done a superb job.

Ambassador Quinn

You have the toughest job in the symposium, after lunch – and you were extremely engaging, so well done. Thank you.