
Changing Role of Agriculture in Environmental and Consumer Issues

Q&A¹

MODERATOR: MARTY MATLOCK

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Steve Pueppke (Michigan State University, East Lansing): For Jamie Burr—I'm wondering what messages you are getting from your customers about sustainability and water use. And are you seeing trends that they are making decisions about whom they purchase from based on their scores on things such as what you are talking about?

Jamie Burr: Absolutely. Customers are developing an index to score each of their suppliers in all areas of sustainability. One of our representatives is in Chicago because McDonald's is working on their score card right now. And let's take an animal-welfare issue—gestation crates for sows. Many restaurants have said that by a certain date they are not going to source pork from facilities that have gestation crates.

Anna McClung (USDA-ARS, Stuttgart): Having so many plants across the country, do differences in state water policies affect what you look at as your long-range plans in terms of ownership and stewardship of water?

Burr: Yes. Every day, additional restrictions are placed on discharge quality of water, which impinges on the sustainability of the location in question. If it will cost too much money to upgrade a wastewater-treatment plant, then the facility will be on a short list, so to speak.

¹Some of the audiorecording, from which this written record was prepared, was of poor quality, rendering it impossible to accurately represent dialogue. Every effort has been made to provide a faithful transcription.

Hongshun Yang (University of Minnesota, St. Paul): Mr. Burr, you mentioned checking pH and BOD². We know that beef and pork have *E. coli* O57 for example. When you discharge water, do you need to inactivate food-borne pathogens?

Burr: There are standards for discharging *E. coli*, but I don't know what they are. I'm sorry, but that's not my area of expertise.

Marty Matlock: I can throw you a lifeline on that one. We don't have an international set of water-quality standards, but, in the United States, all discharges have bacterial limits. These metrics are based on UN water-quality standards—UNESCO-type standards that are not just an arbitrary definition of a good BOD. It's a very good point and, to progress to a global standard, we would have to define those bacterial limits.

Bill McCutchen (Texas A&M University, College Station): Another question for Jamie Burr on sustainability. What is Tyson's intention for moving outside the United States? With all the added regulations and the expenses, are you going to quote-unquote out-source?

Burr: It's going to be more market-driven more than regulation-driven. China is a big area for us to expand into because of increasing *per-capita* consumption.

Richard Moore (Ohio State University, Wooster): If you expand into the China market, will you engage some aspect of sustainability with their water resources?

Burr: Other countries have different views on compliance and ethics, whereas, as a US company, we have a very strong ethics program.

Anna McClung (USDA-ARS, Stuttgart). Mr. Sullivan, with the different sorts of water-conservation practices that are being implemented on the farm, two questions. One, to what extent are the costs of those changes being incurred by the landowner versus other resources helping to bear those changes? And then the other question: speaking to critical groundwater-use areas, have some been overused to such an extent that not just conservation will be needed but transition to different agricultural systems?

Michael Sullivan: In terms of the cost for the projects that we enter in on, we offer cost share at a rate of 60% to 70%. But some of the practices have caps on them and most of the time the producer ends up paying a higher percentage of that cost. We receive requests for our assistance that far exceed our ability to provide the cost share, so, in some cases, the producers are bearing the entire cost of these projects themselves. Your second question was how bad has the problem gotten? There's recognition that, certainly, we can't continue using groundwater at current rates. We're not making decisions for landowners

²Biochemical oxygen demand.

on what crops they grow. If they are going to continue to grow rice and soybeans, they are recognizing that they are going to have to find additional sources of water, and I think the answer is with surface water. So, there is a sustainable solution, but it will be very different from what we've done in the past.

Ray Vester (E&M Farms, Stuttgart): Michael, I have tail-water recovery systems—how much of a benefit are they to nutrient capture, as far as stopping nutrient run-off, keeping it on the farm, returning it and circulating it?

Sullivan: Very efficient. If you have a tail-water system, you are basically capturing 100% of the nutrients and the sediment. It depends on what you are comparing it to. If you don't have the tail-water system, how efficient are you managing your system and how much run-off water do you have, and how much sediment and nutrients are running off with that? It's the one practice that can ensure us we are going to achieve water-quality benefits.

McCutchen: Are there feasibility studies on facilitating recharge of aquifers here in Arkansas? Is it technically feasible? Would it ever be economically feasible?

Sullivan: I'm aware of some studies. I'm not aware of any that show it to be economically feasible. Recharge occurs naturally, but withdrawals far exceed the rates of recharge.

McCutchen: Are there any "Manhattan projects?" Water is the natural resource for all of us, so economics may not be the problem 20 years down the road. It may be a necessity to recharge. Are any of those types of studies going on?

Sullivan: We do have excess surface water available, which has been recognized by the state. Several projects in the state are at various levels of implementation, in terms of importing surface waters from rivers to get them to crop lands. That's probably the most economical means of transporting water from one location to another.

McCutchen: I have read articles about pipelines from Canada to United States, not carrying petroleum but water. Any validity to that?

Sullivan: Most of what I've heard was more in terms of states like Texas taking water from Arkansas. That's been part of the impetus for Arkansas's water-planning efforts.

Matlock: Jamie represented the processors' perspective and he mentioned the issue of consumption. Mike, can you address the hydrologic process of using water—the difference between putting water on the field and consumption? What is it we consume in agriculture when we use water?

Sullivan: When we think of consumptive use, that's just what it is. It's the amount of water that is actually used. Other water may be lost in the system and not actually used that could be recaptured. And so, from an agricultural standpoint—I don't know what the exact numbers are, but if you look at where we show that we can improve our efficiencies from 55% to 75%, in a lot of cases historically those may be where we had a lot of tail water running down the ditches, and not efficiently utilized, which either could be captured and reused or more efficiently used to begin with. Here in Arkansas, especially compared to some of the states in the west, we have a long way to go in terms of improving our efficiencies by reducing losses of nonconsumptive portions.

Ken Korth (University of Arkansas, Fayetteville): Sarah, you mentioned Walmart's surveys of their suppliers. Are they using them to make decisions about whom to buy from? Must suppliers have a minimum score?

Sarah Lewis: Probably they will, but they have not said that they will choose one supplier over another based on sustainability. Price and quality and all the regular things that always have been in play—consumer demand is a huge component of this—and sustainability will be part of the conversation. It's about how to make improvements in the life cycle around these key issues. And that is across the board, not just Walmart. It's Marks and Spencer, Tesco and others; that's the message that we are hearing.

Hank Venema (International Institute for Sustainable Development, Winnipeg): What's the strategy to elicit consumer awareness? Are you going to have a logo? Can you elaborate on the strategy for rolling out to consumers?

Lewis: The mission of the Sustainability Consortium is not linked directly with consumers. Companies in the electronics sector—Dell, HP, Best Buy and some others—have collectively said that they will display a label. Companies in the Food, Beverage and Agriculture sector are not interested in a label, which would be inappropriate for such a complex value chain. We are providing information, and, in this life cycle, water is an issue.

Venema: An editorial comment—a consumer logo for your sector will come, but it is probably 10 years away.

Lewis: Well, some companies tried that, Tesco for example, but couldn't find a method applicable across the board. They couldn't communicate consistently and so they saw the value of TSC in harmonizing content, facilitating the education of their consumers using their own strategies outside of TSC.

Matlock: A question for the panel as a whole. From your perspective on the water-supply chain, if you can measure only two metrics, two bits of data, what would they be and why?

Sullivan: One would be related to water quantity and the other would be associated with water quality. We have not done a good job in monitoring our effectiveness in conservation practices that have been applied, and so, on the water-quantity side, we need good data on actual water use and water savings. On the water-quality side, the same thing—one example would be the Discovery Farms approach here in Arkansas looking at edge-of-field monitoring data on what's happening with sediment and nutrients. So, my two metrics would be good water-quantity and water-quality monitored data showing the effects of conservation practices.

Burr: The first one would be the cost of wastewater treatment to go from, for instance, a 3 milligram per liter phosphorus discharge to a 1 and then to an 0.1 and then the second one—which we already do—is gallons of water per pound of product.

Lewis: I'll be a little bit broader. Big initiatives already are taking place in water and energy, so I would say what benchmarking tool are you using and what multi-stakeholder process are you involved in that's facilitating progress towards addressing these issues? We are all looking at doing these important things already, so getting together on these issues is what I would be looking for.

McLung: Following up on that, what would be some scientific knowledge gaps that you feel would help the community to address sustainability in the future?

Lewis: One example is the work I mentioned with GIS. There's a need to link key issues and strategies to geographic region. Are we talking about a watershed at the eight digit hydrologic unit code? Are we talking about the country level? Region? Ecoregion? Global ecoregion? What are the issues at the regional or watershed level and how can they be communicated to stakeholders?

Burr: I'm going to stick with the cost side again and say the cost-benefit of either a water-quality standard TMDL³ or a more stringent permit limit.

Sullivan: There is still a lot that we don't know about the effects of conservation practices beyond the edge of field. We are getting to the point we have some good information on what is happening at the edge of field, but less so when there is interest in what is happening downstream at the bottom of a small watershed or down into a river basin or river scale with long-time delays and responses. A lot could be gained with additional information there.

Lewis: There's a very strong need for improved traceability for the supply chain and water. Someone mentioned it—water is a necessary, across-the-board, resource. Everyone needs it. And if there is anything that could help us have improved traceability across the supply

³Total maximum daily load.

chain, it's water. From the time the seed goes into the ground to when the package arrives at the recycling center, what's the water-use efficiency? We don't have that information.

Tom Riley (University of Arkansas, Little Rock): Sarah, I want to put you on the spot a little bit. I want you to put on your other hat, your community participant hat. What's the role that community has in this issue as it relates to both industry and the other perspectives that are represented here?

Lewis: I encourage everyone to get involved with their local watershed partners and communicate with their locally elected officials about ways to provide incentives that then can be communicated up through the life cycle.

Venema: I agree with you on water foot-printing in products. Carbon foot-printing on products is done in Europe. Phosphorus is a conservative substance that can be tracked in principle through the value chain as well, and it's non substitutable. It's actually really crucial to world food security. Any thoughts about the logic of a phosphorus trace in value chains?

Burr: I'm not real sure how to address that. Dr. Sharpley talked about the broken chain, so to speak, of taking the phosphorus out of Florida and taking it to the Midwest and then taking it to the livestock-growing regions. How do we complete that loop and take that phosphorus back out of the regions that have livestock and put it back up in the grain-growing belt?

Lewis: That is an important question and, right now, what we have captured is energy use at fertilizer production. I would say that is an information gap in the research. We have looked at fertilizer production and fertilizer application, which are key life-cycle issues, but we have few references to the nonrenewable aspects of phosphorus. That's a good point and I'm going to take it back to the researchers.

Venema: I noticed that you are collaborating with the Arizona State University who, in addition to their sustainability initiative, have a sustainable phosphorus initiative. You might want to talk to colleagues at Arizona State.

Lewis: We will get those folks connected.

Vester: What do I tell the farmers who ask me what will it cost me and what will I gain from it?

Lewis: I'll start. Economics is an important part of sustainability. The Sustainability Consortium communicates environmental and social impacts for a life cycle. Our members then take that information and decide what improvement opportunities are feasible, which may provide economic returns.

Burr: Sustainability is more than just water, like I mentioned earlier. I had a graph that showed feed efficiency over time with broilers. One of the biggest things with sustainability is increasing production, doing more with less. That's one of the things that the farmer should realize. If we can do more with less fuel or whatever, that is where we need to go.

Sullivan: At the NRCS, if you ask "What will it cost me?" we would ask you some questions back. We have a conservation planning process where we work with you one-on-one. You will tell us your objectives which will begin to tie into natural resource concerns, sustainability issues. We will help you inventory your resources, look at alternatives, put a plan together that will include cost and options, then you will make decisions on how you want to invest your resources.

Vester: But the next question they will then ask is, "What benefit do I get?"

Sullivan: From our standpoint, if we have done a good job of conservation planning, that will be included in there. It will have benefit to you from a production standpoint. It will also show environmental benefits. It will then show opportunity for additional federal assistance for implementing those practices that you would like to put into operation and avenues then for applying for cost-share assistance to help you install the practices.

Vester: For the person who raises rice and sells it, what will be their benefit? They will have a cost and will it increase their return?

Sullivan: That's part of the equation, looking at your returns and everything else.

Vester: I agree, and that's what frightens them. They know it will cost and they are at the bottom of the chain. That's the fear of the farmer: "Yes, we know we have to do this. We know it is good for the environment. We know we will spend more." But, typically in an agricultural situation, you spend more and the only thing that happens is the margin shrinks a little more. We farmers are price takers, not price setters.

Matlock: Jamie could you respond to that? I know you feel the same pinch.

Burr: Without profit you are not sustainable, and that's all there is to it. One of the four pillars of Tyson's sustainability program is profit. I'm sorry to answer a question with another question, but a greater concern for me is, "When it comes to third-party verification, who is going to pay for that?" Going back to your question—if it doesn't make a profit I don't know how it can be done. Again, sustainability is more with less.

Lewis: One thing I am hearing from our members is the need for sustainable supply. Maybe the major reason they care about sustainability is sustaining the supply chain. If we are growing things in areas where there is a groundwater-scarcity risk, then that is a supply issue. How do we sustain the supply? That's an economic issue.

Korth: Earlier someone talked about growers who are near the White River and have plenty of water, with the Alluvial Aquifer being replenished. I'm guessing it's hard to convince them to go the extra mile to make the capital expense to do these things that you are suggesting. Is that what you see? How do you convince that person that it is worthwhile and, likewise, the person further away for whom the cost is more again: how do you convince her/him that it is worth the significant investment?

Sullivan: That's a tremendous challenge for us because, primarily, the way we work is landowner by landowner, and there is a lot of variation. If you are in the area of the most significant cone of depression, producers are looking to conserve water any way they can. If you have producers who have easy access to either groundwater or surface water, they are not going to be nearly as interested. I'm not sure what the answer is other than offering opportunities to adopt conservation plans to address their resource concerns and needs to help them ensure they are sustainable from an environmental standpoint as well as financially. That may be as good as we can hope for.

Ernest Girouard (Louisiana State University, Rayne). The topic here is water and 70% of the water is used to produce food. We all eat, so sustainability of water is everyone's problem. We've finally gotten around to saying that sustainability without profitability at the producer level will not work. We are going to have to involve more technology, more interest, more participation at the farm level, to solve the problem. Producers can't solve the problem on their own and federal money keeps going down. How are we going to raise additional money? One of the most important issues is to overcome the bad taste at the producer level, when sustainability, in recent history, did not have a profitability component to it. NRCS has been very successful with obtaining additional industry support by partnerships. I was a recipient of one of those partnerships in my program. How do we raise additional money with additional partnerships? Sustainability is really important at the producer level. But it is even more important to the companies that buy the products. And it's even more important to the consumer.

Sullivan: I will add that Dr. Girouard in Louisiana has been very effective working with conservation districts and working with groups of producers in small watersheds to address problems. Something I failed to mention—we have the opportunity to focus on small or micro watersheds where we can make a great difference. In Arkansas we recognize that we need more partners. Our funding opportunities from the federal side are certainly dwindling, however we have seen more interest from NGOs in working with us, even beyond some of our traditional groups like the Nature Conservancy and Ducks Unlimited. Recently, here in Arkansas, we embarked on a project with Heifer International looking at sustainable food systems in East Arkansas, in economically depressed areas of the delta, and how we can help producers be viable in producing crops in a sustainable manner and also providing locally available food, vegetables and those kinds of things. We are seeing some interest from other organizations. Certainly we have a long way to go though.

Burr: I'm going to take a different approach and say that our producer groups need to do a better job of telling the story of agriculture. There is a bumper sticker, I see it all over, *Farmers Were the Original Conservationist*. And that is very true. Our commodity groups, especially those that get paid check-off dollars, need to be doing a better job of telling the story. The Pork Board has been doing probably one of the better jobs; a carbon footprint is out and they are working with Dr. Matlock and his team on a water footprint. Next will be land and then air. The other commodity groups need to do the same thing.

Lewis: That's what I observe too. It's about getting together with your stakeholders and communicating your stories in a harmonized way so you are focused on the key issues. A lot of progress can be made on water with across-the-board impacts if that communication can increase. Right now there are silos and people aren't communicating across them. If you do nothing else, try to improve communication across the supply chains.

Matlock: We are the 24th meeting of the National Agricultural Biotechnology Council. Starting with Mike, then Jamie and then Sarah, give me your best optimistic view of the role of biotechnology and your worst fear about the role of biotechnology in addressing the challenge of sustainable water and agriculture.

Sullivan: I'm an optimist by nature and, in my presentation, I said that we can be sustainable from a water-use perspective. We use a lot of water here in Arkansas. We get a lot of publicity because of that. But I am optimistic. We can be sustainable in our agricultural water use with the crops that are being grown currently. My concern or fear is that we may not be moving as far or as fast as we need in the proper direction. We are directionally correct and we are moving toward the correct solutions. Looking at some of the problems that have developed, we need to accelerate the pace at which we are moving forward.

Burr: I'll start with my concern and my concern is how we feed 9 billion people in the next 40 years with the same amount of land and the same amount of water.

Matlock: What about biotechnology Jamie? The first transgenic meat animal was approved by FDA this year. How does that affect your industry?

Burr: Good thing you come up with easy questions, Marty. I'm not sure how to answer it.

Matlock: Do you see a role for biotechnology in water efficiency in the animal?

Burr: Oh absolutely, especially in terms of water use in the processing side, because there is a cost to buy that water and there is a cost to treat that water.

Lewis: As a multi-stakeholder organization, we present key issues and biotechnology is one of a variety of ways to address them. If you want water-use efficiency, if you want

to fertilizer-use efficiency, biotechnology is a way to get there. But there are also other ways. We say: work on addressing these issues and if biotechnology makes a difference in water-quality issues, efficiency and yield, then it is an important tool.

Venema: It strikes me that the biotechnology discourse is around crop agriculture primarily. I haven't seen much discussion around biotechnology for bioremediation. That would be a practical way to deal with some of the externalities from agriculture. I proposed a biomass-based approach to deal with our bioremediation issues. We are using a volunteer invasive, but all kinds of work could be done around optimizing species for bioremediation.

Moore: Back to the talk on Lake Erie and the timing of 1994, when we saw a reactive soluble phosphorus increase, which corresponded with the adoption of Roundup Ready soybean in that area. The connection with glyphosate in the water is another issue. We don't know much about it yet, but that's an issue that connects with biotech.

Lewis: Biotechnology and GMOs are being used to address multiple hotspots, as we call them, across life cycles, including water. Are you asking about transporting those across different regions?

Moore: No, in the case Roundup Ready soybeans, the herbicide is being transported in the water.

Lewis: That's the tradeoff, and it's something that has to be communicated. If you're not using GMOs and you are spraying herbicides heavily then there are water-quality implications: eutrofication, acidification and so on. So what is important is how you are addressing the impacts of the practices you are using.

Kristen Gibson (University of Arkansas, Fayetteville): Those who grow fresh-produce crops that are minimally processed and ready to eat, are getting mixed messages about conservation efforts. Buffer zones can become breeding grounds for food-borne pathogens coming from the wildlife. Now they are actually ripping out buffer zones because of the food-safety issue. How do you manage the risk of implementing conservation efforts—for water sustainability—where food safety is a concern?

Matlock: Are you referring to the baby leaf spinach *E. coli* contamination from feral pigs?

Gibson: That's one of them. Recently with the new Farm Bill, the discussion has come up in the leafy green produce marketing agreement in California—the Center for Produce Safety. These are questions that stakeholders have. We are asked to adopt conservation measures but, on the other hand, we are trying to protect our crops and allay food-safety concerns.

Matlock: The story goes that *E. coli* contamination in leafy green baby spinach came from feral pigs that were getting access to the field through the conservation reserve riparian zone that was put in. And so they they had to destroy the riparian zone area. That's the conflict on landscape, and a good question for Mike.

Sullivan: In Arkansas I'm not aware where that has become a significant issue, probably because we don't grow many vegetable crops. However, I'm aware that it has been an issue in other states and could be an issue here. I would hope that, as we work with producers, those would be the types of things we would consider when putting conservation plans together and, where needed, we would have opportunities to address concerns. Feral pigs have become a big issue here. Currently, we don't have a national policy for how we can provide support and assistance for those types of invasives. I know APHIS and others are working on that and have worked on some pilot projects in the southeast part of the state. One of the things that we will be looking at in the coming months—in fact we have a team assembled—is what are the natural resource problems associated with such an invasive species and what we can do from a conservation perspective to help deal with them. Should we be providing financial assistance to help producers trap such invasives?

Matlock: Clearly that illustrates the interconnected nature of the complex system we call agricultural production. Decisions aren't easy and that has been a common theme through all of the presentations.

Burr: We deal with a similar issue, not in your particular produce example but in poultry as it relates to ABD influenza and using surface water as the drinking water source for poultry. You have to eliminate whatever is causing it or you have to eliminate the habitat. Or you have to treat the water. You have to take a multidisciplinary approach to solving that issue.

Ralph Hardy (National Agricultural Biotechnology Council, Ithaca): Let's take another crack at the biotech area and impacts. Bovine growth hormone: my understanding is that it increases the amount of productivity per unit input. Presumably you are reducing the amount of water input, for example, into an animal. You may be reducing the amount of phosphate going through and the phosphate in the manure. There was a porcine growth hormone in the pork industry that was supposed to provide leaner pork. Now that got somehow rejected along the way. You know, there are other things like that in biotech that we should be looking at that would be beneficial to the broad area we are talking about.

Matlock: Sarah, do you want to tell the story of the Dairy Innovation Center meeting during the week that Walmart pulled rBST milk off the shelf?

Lewis: I'm sorry I'm not familiar with the details of that particular story. I'm going to focus on tradeoffs. One thing that is important to recognize is that sometimes we don't

have all the information. If you are using growth hormone you may be saving water. You may be reducing the amount of phosphorus reaching surface waters, and so on, because the yield is increased per unit of input. But the trade-off that we are hearing from our stakeholders is that there may be health issues and animal-welfare issues. Sometimes it's a value judgment on what is more important. And science has a hard time addressing that. As scientists, we can provide all this information, but, in the end, at some point there is a value judgment: "What is more important to me? What do I care more about?" Maybe someday science will tackle that, but right now I don't know that we want to.

Matlock: I see rBST as an example of where we, as scientists, weren't measuring things that would have informed public opinion and retail policy in a way that would have been valuable for the industry and for our producers. We hadn't measured the fact that it reduces greenhouse gas by 13% per gallon of milk and the other metrics of sustainability that would have improved by the use of that particular product for liquid milk. Since those measurements hadn't been collated in a way that was scientifically vetted and reported, there was no counter argument to the fear. In a cost-benefit analysis, you have to have the benefits and the costs, and all the consumers saw were costs. They didn't see benefits. And that is an area of sustainability science where we can do a better job of making sure we understand objectively where the benefits are and where the risks are and then, as Sarah said, people can make their decisions.

McCutchen: Jamie, we are going to keep shooting at you on the biotech issue. Hopefully, this is an easier question. Maybe you don't want to speak about genetically modified animals and Tyson's stance, but what about the reality of marker-assisted selection or breeding, especially with poultry. A number of land-grant universities are using marker-assisted breeding in crops—in addition to transgenic traits—for increased productivity. Land-grant universities are using those for let's call them specialty crops or orphan crops. I could see marker-assisted breeding, understanding the traits—you talked about feed efficiency—in cattle for example. Is Tyson investing in that type of research?

Burr: Yes, Tyson owns Cobb-Vantress, a poultry-genetics, chicken-only, company. That research is done in-house. Cobb is based out of Siloam Springs. Their geneticists select for qualities just like what you are talking about. Over the past 20 years through genetic selection, about a point of feed conversion improvement per year has been their target.

McCutchen: Would you have any interest in working with land-grant universities to develop these types of approaches?

Burr: Cobb collaborates with the Center of Poultry Excellence at the University of Arkansas.