

Food for Thought and Thoughts on Food: A Discussion on Scaling in Food and Other Industries

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Food & Drug

On this episode, Wiley's Amaru Sánchez is joined by Ryan Hawkins from Next Rung Technologies to discuss scaling across multiple industries and sectors and the difficulties startups are facing in the current investment landscape. Ryan describes his recommendations in using a Techno-Economic Analysis (TEA) to analyze their processes and implement improved practices. Following the discussion, Senior Counsel Bob Hibbert and Associate Amaru Sánchez break down the hurdles of scaling the food industry, including both economic challenges and consumer acceptance issues.

Transcript

Amaru Sánchez

Hello, everyone. This is Amaru Sánchez, associate in Wiley Rein's Food & Drug practice. Welcome to today's episode of Food For Thought and Thoughts On Food, where we discuss everything about food and food technology. I'm here with my colleague, Bob Hibbert. Bob.

Bob Hibbert

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Good morning, Amaru, and hello to everyone out there listening. Good to be with you again in the new year, and I understand to start the new year with a bang, you've got an interesting interview that we're going to pivot to in a second. What's, who are you talking to, and what are you talking about?

Amaru Sánchez

Yeah, in today's episode we had a really great discussion with Ryan Hawkins from Next Rung Technology, talking about something that always comes up when we talk about a growing industry, and that is scaling. So, without any spoilers, we can jump right to it, but before we do that, Bob, anything else?

Bob Hibbert

No, I mean, I think scaling is the new magic word you hear in this space all the time and, you know, I tend to think of the metaphor of clearing hurdles. So the hurdles that have been cleared for this universal product, I mean, we start with proof of concept, the fact that it's been demonstrated, as a matter of science and technology, that you can generate wholesome, edible protein from animal cells versus live animals themselves. And then the next hurdle that our listeners are probably familiar with is that, for companies that are able to do their homework and the companies that have been successful have done a lot of work, can get a green light from regulators, it's that there's no inherent regulatory barrier to producing and selling these products under existing regulatory oversight. So, what that then leads to is, okay, can this now be done? Can you get product into commerce, into the supermarket, and so on, at an acceptable quality and affordable price, and that's the hurdle that everyone's going to see if, when, and how it gets met. So, I'll be real interested in what your friend here has to say on that subject.

Amaru Sánchez

Awesome, and on that note, let's take a listen.

Hello, everyone. This is Amaru Sánchez, associate in Wiley Rein's Food and Drug Practice. Welcome to today's episode of Food For Thought and Thoughts On Food. On today's episode we're going to focus on a topic that has been getting more and more attention lately, scaling. And this is scaling in the context of a company's growth and transition from a startup to a full-fledged commercial entity. Now helping us on this journey is our friend and colleague Ryan Hawkins from Next Rung Technology. Briefly, Next Rung is a company based out of Greentown Labs in Somerville, Massachusetts. Their mission is to accelerate the commercialization of sustainable technologies by helping companies effectively scale their engineering and business processes. They have already assisted over a hundred clients in scaling their sustainable technology across multiple industries and sectors.

Ryan, welcome to the podcast.

Ryan Hawkins

Yeah, thanks Amaru. Thanks for having me. I'm glad to come in and talk about a discussion that is believe it or not, like near and dear to my heart and my career. So, I'll give a little bit of background on myself and the company I work for, Next Rung Technology. So, my background is in chemical and biological engineering. For the last thirteen years, I've been working on technology development, scale up, and commercialization for different sustainable technologies in a bunch of different industries – so biotech, renewable energy, and wastewater. My backbone is a process engineer, so I'm familiar with how to design the processes that create some of these products and for the last three years I've been working with Next Rung Technology as a Senior Process Engineer and a Technology and Project Development Specialist.

So Next Rung was founded in 2017. Our mission is to accelerate the commercialization of sustainable technologies. We've provided engineering, execution, and operational services, and we've helped over 100 clients scale their sustainable technologies. And we work with a bunch of different products, so I think the focus of this one is on alternative proteins and cultivated meat, but we also work with companies that are doing biochemicals and materials, water and waste treatment, renewables, and health nutrition. And we work with folks at all different stages, so most of the folks we work with are early stage emerging startups, either coming out of the lab or in their pilot process, but we've also worked with mature companies who have already commercialized technology. One thing I'll say about Next Rung in the context of this is that, and I think you had just mentioned this Amaru, is that if you go to any alternative protein conference and just walk into a panel, more than likely you'll hear somebody talk about scale up being a significant challenge or barrier for their company or for their technology, and that's really what Next Rung likes to do. That's I think where we found the sweet spot, and so we'd love to hear from folks who are going through those challenges and hopefully help people kind of figure out how to get to the next stage.

Amaru Sánchez

Yeah, I mean, you're right. You and I have attended sort of several kind of conferences and scaling has been sort of a common theme through, there's always some scaling panel or discussion. I think in the last conference we went to there were actually two sessions on it, and I think that kind of reflects the current tough investment landscape that a lot of food companies are facing. That's not the landscape that it was a couple of years ago where the whole industry was pretty much flush with cash, and we've seen several investors be very explicit saying they're kind of scrutinizing a startup's technology, milestones, and process. So I think having you on today's podcast is great because I think a lot of folks want to, you know, know and understand how you and your colleagues help companies really position themselves the best that they can, or even start thinking how to best position themselves cause it's, as you mentioned, you work both with startups as well as more mature companies and I guess my first question is like, how do you help companies navigate this investment landscape given your specialty?

Ryan Hawkins

Yeah, I would totally agree the investment landscape has changed. Folks are much more risk adverse to investing in projects and companies that are trying to build facilities, and I think there's a number of ways to attack that. The main way, and it's something that we do with most lab based or pilot companies, either way,

even if funding is ripe, is we'll go through and do a techno-economic analysis, which is a TEA, and many people who are providing funding are, they're pretty much going to demand to see one of these, and that's usually the starting point for getting funding.

So, let's say you're some entrepreneur in a lab. You've come up with this perfect fermentation process to make alternative protein and you've got like killer yields and this world-changing protein product, and you're saying like, how do I do this at commercial scale, and usually the first question that people are going to ask is like, well how much is it going to cost, and so that's what the TEA is. We go in there and we say, what's your process? What are the steps of the process? What is the material balance in the process? So like, how much sugar are you putting into your process, and how much water are you using? What's the amount of product that you're making? We define all these things, and we define every single material stream going in and out of your process, which defines the equipment that you need for that process, and we say, okay, what does this look like at commercial scale? Like, how much product are you making a commercial scale? And basically we can back out how much it's going to cost for you to buy the equipment to do that process at scale, how much it's going to cost you to install that equipment, and how much it's going to cost you to operate that equipment. So, like, how much steam are you using to heat different material streams? How much wastewater are you generating? All these different variables that play into the economics of a commercial plant, and coming out of that, it's an extremely powerful tool we end up with a CapEx, OpEx breakdown for a commercial facility, along with the cost of goods for how much it costs per kilogram of product to make whatever you're making, and it doesn't stop there. So the backbone of that model is kind of what I described, but it's not like a one and done model. You can go in and do sensitivity analysis on any of the features that you process. So, like maybe your operating temperature or your tighter or whatever it might be, and you can look at how that impacts the end-all economics of your product at different levels.

Amaru Sánchez

Yeah, and I'm glad you raised, you know, the sensitivity because my sort of one question as you were presenting that was this TEA, once you deliver this, is not static. There's ways that you can improve it. As we know, things on paper or on a screen is one thing, and then the reality hits, and then there's always the unknown variables. So it sounds like a TEA can be updated as you get real time feedback or as you start implementing it. Is that correct?

Ryan Hawkins

Exactly, and I think where you're maybe going with this is more of like a roadmap. So if you're at the lab, like you've got this great process and you're trying to figure out what it looks like at commercial scale, like I think you'd be lucky if you found somebody who would go in and just give you money right away to build a commercial plant. And so, usually there's these other stages of developing a technology and a company, which is lab, pilot, demonstration, and commercial, or like the, you'll hear that people talk about those scales all the time. And there are different scales of manufacturing. So, if you've done your TEA at your lab or pilot scale, you're doing it at the commercial scale. So how does this process translate at a commercial scale facility? And you look at what that looks like, and you look at what targets you need to hit at that commercial

scale versus where you're at now in the lab, and you then define your technology roadmap for what you need to achieve at the pilot scale, the demonstration scale, when you need to achieve it, and how you're going to achieve it. And that's something we also will typically do with an early stage company, along with the TEA, is just develop that roadmap, because like you said, it's really easy to have a TEA and plug in numbers that are favorable to the economics, but if you don't have a plan to get to those favorable numbers, then what are you really doing? So that's I think one thing we try and focus on is making sure that the TEA is really solid, and that we're building out multiple cases, not just optimistic cases, but cases that take into account like development paths of different technology or innovations in certain areas.

Amaru Sánchez

And it sounds like the TEA is something good to have as early as possible. Is that correct? It sounds like as soon as, essentially, as soon as a company starts, hey, you know, I want to be a company, and start going down that pathway, it's never too early to start thinking about doing something like this as it sounds like this, especially in this environment, would you say like having a company knowing that they need a TEA early on and being able to devote resources, grant money, whatever it is, early on to really get this TEA going can really open up sort of the door or really provide the insight needed to know like what direction they're going in the future, how much money they may need. And it sounds like it may also be useful and actually demanded by investors. Is that something, what are your thoughts on that?

Ryan Hawkins

Yeah, I mean, in one sense it definitely is needed. It's a need just to get to progress the company and get funding like we just talked about. But on the other hand, a lot of times we'll work with companies that are coming out of the lab that do have amazing technologies, but as we start going through the process of building out a TEA or building out a material balance, you start to uncover some areas that maybe weren't as developed or haven't been thought through or haven't been developed, and so from a technology development, it can be extremely helpful just to go through the exercise so that you can list out your unknowns, and then incorporate those into your workstreams as you work towards commercial scale. So early as possible is definitely the recommendation, and I think not knowing, like you're at a lab scale, maybe you don't know what your process looks like. That's okay. That's part of the creating a technology roadmap is like, if you don't know then you've got all these different options of ways that you could do your technology and you can do a TEA for each one of those options, and then understand which one is the most worthwhile to pursue and how you might pursue it.

Amaru Sánchez

Ryan, if a company has certain topics or areas that they want to add as a variable in the TEA, is that possible? For instance, if for a company having low GHG emissions is important. Is that sort of a variable that they can plug in, and I have a follow up question based on your response from a panel you and I attended, but I'll let you answer that first part.

Ryan Hawkins

Sure, yeah, our, so Next Rung's TEA is customizable. All processes are unique I should say. There's some commonalities between them. But we work with different technologies that aren't just like alternative protein or fermentation. So our TEA can capture a bunch of different processes, and if there's a certain variable that was going to be important, whether it's for your economics or for your consumer market or whatever it might be, it's built into the model. And yeah, one other thing I'll say is the way we do TEAs it's actually, they call it an FEL01, and it's a bit more detailed than some folks do TEAs, but the backbone of our TEA is almost the same process that we would be going through if we were going to design a pilot facility, the first steps of designing it. So, yeah, you can build in whatever variables are important to your technology, and then if you end up getting funding for whatever your facility is, you've already got a model that allows you to track your progress against whatever that variable is when you're operating your facility.

Amaru Sánchez

Yeah, that's great. And I raised that because I know sort of the last conference that for instance you and I attended, there was this one presenter that had a very unique sort of an investment instrument that really had a big factor in whether or not this one instrument is available to certain companies is on their sustainability scores, their GHG emissions, et cetera, and from what I recall, that instrument provided capital financing. So it was, I think, their example they used that someone, one of the companies that qualified it, they gave them \$100 million, which is an appreciable amount. So that's great that your TEA is customizable to reflect that level of sort of detail that may be like, to your point, that may be important in that example for financing, but also consumers, you know, are looking more and more for a climate-friendly, sustainable, however that is defined, but that's great.

Ryan Hawkins

Yeah, and the TEA is an extremely powerful tool. It's only one part of what we would consider a roadmap, that is a very important part of it, but in a full roadmap where you're staging out all these different scales, and when they're going to happen, and what needs to happen between them, you would also be staging out factors about like, when do we need to hit certain carbon emission targets if that's important for your technology. And you can use the TEA to model that, but from a roadmapping standpoint, you would also be saying like, when do I need to get regulatory approved? When do I need to start thinking about regulatory? Is it something I need to do at the lab scale, or maybe I do it at the demo scale? What kind of staffing do I need? Like, who do I need to have on my team to become successful at each stage, and how many people do I need? And yeah, just overall technology goals, which come out of the TEA, but the roadmap will have much more than a TEA. It's got the evolution of each of your work streams across time to ultimately lay out what it means to be commercially successful, and how to do it.

Amaru Sánchez

Yeah, I think the word roadmap is a really great sort of term for that because it is, on my end, on the legal regulatory front, you know, when we talk about roadmapping, we talk about regulatory pathway. What's your regulatory pathway to pinning your technology and your product? If you're clearly, if you're a cell-cultivated meat and poultry, there's the FDA and USDA, and then if you're just a cell-cultivated seafood, then it's just FDA. And we think about a pathway like that, but it's great that folks can now understand that there's, you are able to provide a roadmap from even before they even get to someone like me, you know. And, because by the time they need a product that they can be able to commercialize, by the time they reach a legal regulatory fork in the road, they need to have a lot of work has to have been done before then and a lot of capital has to have been raised and spent. So, it's good to know that this roadmap and this TEA report can provide that pathway for them to know how, what to do when, and how much money they need when, and that way they can be very strategic. Okay, I'll need X amount in year one through three, let's kill it then, and then know that, okay, we're approaching our milestone for us to start raising, you know, et cetera. So, I think that's, having that, it's always nice to sort of see the process, at least for me, see what's my ideal situation, and then breaking it down to milestones to know what am I working at now, because you can't boil the ocean, but having it in chunks, it's good to have.

Well, my next question is, I know we talked about how it's never too early to sort of get this TEA report, but is there a point that it's maybe too late, or can someone that, say someone never got, a company didn't do one initially, they're halfway through their initial funding and are just freaking out. Can they essentially go to you at a certain point in time, they're three or four years in, even though they spent a lot of money and have done a lot of work, can they go back to the drawing board, essentially?

Ryan Hawkins

Yeah, absolutely. Even if you do have a TEA, it's not a one and done thing, it's something that's evolving over time and you should be revisiting anyways as your technology develops and you scale, but if you haven't done one and you've somehow managed to get funding and you're already operating a pilot plan or whatever, it is never too late to do it. It's the process is exactly the same as it would be if you started at an earlier stage. The added benefit is that maybe you have some real data at a larger scale that you can use to incorporate into the TEA, but yeah, it is never too late to do a TEA or to revisit a TEA that maybe it's been a few years since you've looked at it and your whole process has changed, or you're looking at different commercial situations.

One thing that I think folks look at later stages, which they don't look at necessarily at like a pilot stage, is where in the world do they want to build their plant commercially, and even if they do look at it at a pilot stage, the world changes over the course of four or five years, and so the economics of different regions change constantly, cost of materials change in different regions, et cetera, and so that's, I think we often are like looking at other factors for later on TEAs. Basically the TEA is being used for different purposes, but it's still the same TEA.

Amaru Sánchez

You raised a nice sort of one of those things that people should think about early on, where they're going to be building, where they're going to be manufacturing. Are there other kind of, in your experience working with all these companies, other areas that folks should be thinking about or pitfalls to avoid early on so they can really start understanding, okay, what are the things I need to consider as my company grows?

Ryan Hawkins

Yeah, good question. I think a big part of the scale-up challenge that folks talk about, or one big piece of it, has to do with funding, but also has to do with lack of infrastructure for people to perform scale-up runs. So like, if it's hard to get funding, that means it's hard for you to build a scale-up facility, and if there's no scaleup facilities that are multipurpose facilities to use, then that's, therein lies the challenge. Luckily, I think in the last year and in the near future, there's folks that are developing and rolling out scale-up facilities for overall biomanufacturing in the U.S., and they are being built specifically as scale-up platforms with a big focus on alternative proteins, but also for the other like bioeconomy sectors, like chemicals and renewables. So this infrastructure didn't previously exist. It's a place where if you're a startup company, you can go and scale up your process and use their equipment and use their facilities, so that you don't have to deal with getting funding to build your own pilot plant, which may have a limited lifetime anyways. So that's a roundabout way to say that's a solution to one of the scale-up challenges, but the other pitfall that I think we see often is developing the right relationships and partners to help you succeed. So, once you get to like a demonstration or a commercial scale, it's really important that you've got really good equipment suppliers that understand what your needs are and get you a good pricing and lead time on equipment. It's good that you have the right engineering partners to help you build these facilities, and if you're doing a smaller scale facility, sometimes those things don't matter as much as they will later on when you're doing stuff, ten, twenty, a hundred times scale.

Amaru Sánchez

Yeah, that's some great advice because I think, yeah, more and more, we're seeing more partnerships forming as the market gets a little bit more competitive or the money is drying up. You're seeing sort of these creative partnerships between the supply chain of the cellular agricultural industry, and it sounds like you guys in that TEA report, or just your company in general, has relationships with other companies, as well as suppliers, that can help build these facilities or kind of introduce these companies to folks that they need to work with. I recall from our discussion that you all do the TEA report, but you also build it. Like your company is not just churning out reports. You guys do everything, essentially, but to do that you need to have a solid network of vendors, of suppliers to do that. Is that, and just wondering, is it, can you talk a little bit more about how your company makes those connections if a company needs them because a lot of the startups don't know where to even start.

Ryan Hawkins

Sure. Yeah, you're totally right. The TEA itself is just a model. I mentioned earlier that the way that we do TEAs is actually very similar to how we would enter the design phase of a pilot plan in FEL0, but to actually, if you've got a TEA, you still have to build something, and so there's a process design and other detailed engineering that has to go into actually building a facility, which a lot of times matches the TEA, the whatever design you're showing in the TEA, let's go build this thing, and there's a lot more detailed engineering to defining what that looks like and having the right partners.

So, what Next Rung would do, if you say you've got a TEA and then you want to build something, we would help you get the process design lined up called FELO 1 and 02. e'd help you identify the right equipment suppliers, folks that we've worked with at whatever scale that you're trying to enter into, and then a lot of what we do is we just help folks get good deals on equipment. So we'll competitively bid equipment so that you've got the right equipment suppliers lined up for the scale you're at, and then the other piece of it is there's other partners who are involved in building a facility, right? You need an architectural and engineering firm to build a building and there's other contractors, electrical and plumbing contractors, who have to go in there and do it. That's not what Next Rung does, but we help you find and vet out partners who can build a facility for you.

Amaru Sánchez

Great. Yeah, I know, again, I'm an attorney and my colleagues, you know, and I work at a law firm. We can really, we're great at providing you that legal advice, but it's always the part that I enjoy about practicing law is being that trusted advisor that they ask you, Hey, I need, I need a consultant to help me with X, Y, and Z. Do you know anyone? I think more and more we're seeing type of that as part of the practice of law is being able to connect your client to trusted vendors, trusted folks that can help them with another aspect or just implementing something that you have recommended. So it's great that your company has those connections because a lot of folks don't even know where to start.

Ryan Hawkins

Yeah, and I'll just add that it totally matters on what scale, like there's some equipment or engineering partners that will just hit a home run if you're at a large enough scale, but if you were to try and plug them in to a much smaller project, they, not that they would fumble, but they probably wouldn't be the most cost effective option. So it's like knowing not only who's good, but what they're good at and where they can really provide value for what you're trying to do.

Amaru Sánchez

Okay, and I'm sure that saves a lot of time, effort, and resources knowing that ahead of time and then finding it out in real time. Yeah, Ryan, I can sit here and talk to you all day, but I think we're closing in on our time, but before I let you go, I've asked my past few guests on the podcast to play a little fortune teller role and predict what trends they see in this space, in your industry, you know, in the short term, one to two years, in the medium term, three to five years, and then the long term five plus years. So we'll go short term first. What's

your predictions?

Ryan Hawkins

Alright, I got my crystal ball here. So short term, I think on one hand there's going to be a consistent theme of folks trying to scale up and running into the same obstacles and challenges with scale up and consumer preferences and acceptance and regulatory, although it's a little bit of wait and see on how things shake out with the consumer launch of the Upside Foods, which has been FDA approved. I think that's going to create a little bit of traction. On the other hand, in short term, I mentioned that there's development and rollout of all these multipurpose scale-up facilities, which I think is going to create this really healthy platform for people that deal with the scale-up challenges that we've been talking about, and those are happening on multiple, multiple ways, like private companies, government, and universities are building out these facilities.

Medium term, three to five years, I think we're going to see hopefully multiple commercial products which have launched and give people, folks who are entering the space more of a roadmap, not only for regulatory approval, but also for scale up. I think the, specific to alternative proteins and cultivated meat, the focus is going to shift a bit to the consumer. So like taste, texture, nutrition, all the things that people are developing in the background, and I think we're going to start to see the fruits of all of the infrastructure being built in the U.S. for scale-up facilities, and hopefully have multiple commercial ready companies that are ready to go to market behind the first wave that are coming out in the next year or two. And, long term, so hopefully five plus years from now, alternative protein products are established in the market. Consumer acceptance is less of a concern at this point. Alternate protein and cultivated meat are a major source of protein for humans on the globe ,and I think then the shift will be towards sustainability. Alternative proteins are typically considered more sustainable than traditional meat, but they still use a lot of water and they still have a carbon footprint. So I think five years from now people are really going to be focusing on how to make those products even more sustainable.

Amaru Sánchez

Awesome. Great predictions. That's awesome. Thanks Ryan. Thank you again for taking time from your schedule to be on our podcast.

Ryan Hawkins

Yeah, thank you Amaru. It was great. Great to chat with you.

Amaru Sánchez

All right, Bob, a lot of good info there. Where do you think we should start?

Bob Hibbert

Yeah, a couple of thoughts. To go back to what I was saying earlier about hurdles, I mean, what he's suggesting is that there's a systematic process that he can help with that can get over those hurdles. If you play that out, it seems to me, let's say you're the startup and I'm the friendly investor with \$100 million in my pocket ready to spend it – it's fantasy, but bear with the hypothetical – it seems to me, let's just say it's ground beef, that you're able to tell me with the kind of assistance he's offering, that you can, over a reasonable period of time, get, let's say, a pound of ground beef in the supermarket that can compete in terms of taste, texture, appearance, nutrition value, and not least price with traditional product. That's a big hurdle to be cleared, but then I think what gets interesting is I think the last hurdle that he touched upon at the end, and I'd be interested what you think about this, is this broader concept of consumer acceptance, because on the economic side it may be difficult, but that problem is going to solve itself. I'm not going to make that investment unless you've got a good story to tell, but then what a consumer is going to do. What kind of resistance is there going to be? What kind of acceptance is there going to be? Are people going to try it once and then go back to the regular product? That's a challenge, not just for an individual company, I think, but for the broader industry and really for the broader culture to see how it's going to accept or not accept these products.

Amaru Sánchez

I agree, and I thought it was, what I found very interesting with these sort of TEA reports is how customizable they can be to capture those qualitative metrics that are important to the end user. I think in the interview, I mentioned there's a new era, a new generation of consumers that are really focused a product's, not only the taste and functionality of a product, but also the climate impact of a product, and these reports can capture that level of analysis and see what's that going to cost the company as they scale up, what do they need to do, and also breaks it down, and I was impressed with how detailed it can be even looking at the upstream ingredients, you know, which I think factors into some of also the taste and functionality component but also, once we started looking at the supply chain and all the greenhouse gas emissions with the scope 1, 2, and 3, that's another factor. So I was really impressed with that. I thought it was just focused on just more of the economics of it, but it was interesting how there's other variables you can throw in and monitor and then adjust as needed.

Bob Hibbert

Yeah, and I think on that consumer, I have to think on some level, it's a generational thing. I think the ship may have sailed in terms of my own generation, but I certainly think there's an opportunity over time for younger generations to embrace some of these products. You know, for some of the sustainability, environmental type reasons that you talk about, but that's, time will tell as they say.

Amaru Sánchez

Yeah, absolutely, and I think it's also not only generational, but it seems also with Ryan's comment about, you can really, a big question a company should think about is like, where are they going to manufacture? So there's a generational, but also a cultural thing. If they're going to manufacture and sell in the E.U. versus the

U.S., there's very different, no pun intended, appetite for some of these more novel products here in the U.S. than they are in some E.U. countries. So I think that was also a really good sort of takeaway that I got.

Bob Hibbert

Yeah, well, thanks for putting that together. I mean, as the saying goes, there's lots of food for thought in that interview, and I hope it's helpful to our listeners.

Amaru Sánchez

Agreed. And on that note, stay tuned for the next episode of Wiley's Food for Thought and Thoughts on Food. Thank you all for joining us and a Happy New Year to everyone again.

Bob Hibbert

Amen. Buh-bye.