

The Great Simplification

Nate Hagens (00:00:02):

You're listening to The Great Simplification with Nate Hagens. That's me. On this show, we try to explore and simplify what's happening with energy, the economy, the environment, and our society. Together with scientists, experts and leaders, this show is about understanding the bird's eye view of how everything fits together, where we go from here, and what we can do about it as a society and as individuals.

Nate Hagens (00:00:34):

Today's guest, Jason Bradford, has been a friend of mine for almost 20 years. Jason is a conservation biologist, turned organic farmer. He's been involved with the Post Carbon Institute from the start, co-founded Farmland LP, and has run various CSAs, including one currently in Corvallis, Oregon. Jason and I dive into the relationship between energy and agriculture and the various trade-offs between monetary efficiency and food yields. We discuss how the future living arrangements are likely much more rural with a higher fraction of our population working on the land. This was a wide ranging and at times emotional discussion. I hope you learn some things about how the future of agriculture will likely be different, perhaps very different than our recent past. Here's my good friend, Jason Bradford.

Nate Hagens (00:01:42):

So Jason, you and I have been doing conversations for a long time. I tried to find online, I was on your podcast 15, 17, 20 years ago when I was starting my PhD.

Jason Bradford (00:01:57):

It wasn't a podcast.

Nate Hagens (00:01:59):

What was it? It was a radio show.

Jason Bradford (00:02:01):

Well, it was actually a live radio show that ended up getting put on MP3, and you could go download it if you wanted to or listen.

Nate Hagens (00:02:08):

Oh, right.

Jason Bradford (00:02:10):

But it was never in a podcast format.

Nate Hagens (00:02:12):

But you were interviewing me. We talked a lot about all these things, about the evolutionary hijacking of our neurotransmitters in a growth economy about oil depletion, about agriculture, about climate change. So here we are. I know you quite well. We've been friends for a long time, but my listeners don't know you. Can you tell a little bit about what you do now and the path that brought you to this point?

Jason Bradford (00:02:40):

Sure. Yeah. Well, as you kind of tell from my introduction, I'm a farmer now, pretty small farmer. I'm managing about seven acres that I kind of rotate around into different crops, a lot of vegetables, and for subscription service, a CSA, and some seed crops for companies that might sell you vegetable seed. So I'm the guy that might grow the seed that gets put in these little packets, organic seeds. But my family has a property that I farm on, but it's a lot bigger than I farm. So I also manage the property,

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and we have other people working on the land. So it's kind of fun because I've got other people out here farming, and we're sharing this larger acreage and we collaborate a lot. I think it's a neat model.

Jason Bradford (00:03:24):

I didn't really think I'd be a farmer. I grew up in the San Francisco Bay Area and got a PhD in evolution and population biology. I was this super into tropical cloud forests and their diversity and their ecology, and got very concerned about conservation of those. I was really fortunate that I had a girlfriend in college, Kristen, I met in zoology class. We end up getting married. She's a physician. And so that's kind of allowed me to not be super ambitious in a career and to sort of follow what I thought needed to happen that was important. And she's sort of gone along with it, very supportive.

Jason Bradford (00:04:06):

I've been really fortunate to be able to spend time like this and not kind of in the rat race consistently. Been to some of the most biodiverse places on earth, just awestruck by our planet. And part of what I then did is, I had this really interesting research group when we were studying tropical forests in Southern South America, so the Amazon basin hits the eastern slopes of the Andes and then the forest goes up along the slopes of the Andes. It goes into these mountain regions that are grasslands and stuff above tree line and then there's glaciers. Just imagine how much richness there is in a short space with time or an area, I mean, the distance you can travel. I could walk from 4,000 meters elevation down to 1,500 meters elevation on these old ink and trails. So we set up these research plots. And the idea was, well, how is these ecosystems that are so diverse going to change as the temperature regime shifts and rainfall patterns may shift?

Jason Bradford (00:05:15):

So I was looking into that and trying to think, "Okay, well let me read the IPCC reports." And that's when I kind of got really discouraged because it seemed that everything was so tied into growth and techno fixes, and we just locked in. Even in these IPCC reports, it felt like, "Here's what we're going to do. We're going to keep going and doing this, and it's going to be bad." So that's how I kind of got into the stuff we talk about, about belief systems and culture and energy. So I decided to kind of drop out of academia and start farming, which is kind of an odd shift, and got connected to Post Carbon Institute back in 2004 and ended up then starting a business. It was doing farming at larger scale and management. So I've had a real mix of academic, nonprofit, business, some local government stuff, and public outreach, such as what we're doing here in writing. And you had me write this report called *The Future Is Rural: Food System Adaptations to the Great Simplification*.

Nate Hagens (00:06:19):

I don't think I had you write the report.

Jason Bradford (00:06:22):

Well, you encouraged me.

Nate Hagens (00:06:23):

Yeah, that might be better.

Jason Bradford (00:06:25):

You encouraged me over and over again. It was a great process.

Nate Hagens (00:06:28):

It's a good report. We'll put it in the show notes, *The Future Is Rural*.

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Jason Bradford (00:06:32):

Yeah. So anyway, that's my story.

Nate Hagens (00:06:34):

Excellent. Well, since you and I have known each other for a long time and you are a particular expert in the field of agriculture, I am going to do a speed round with you on some concepts that I think some of our listeners know, but maybe others don't. What is the term net energy positive?

Jason Bradford (00:06:56):

Okay, well, yeah. So it's probably the biological systems. You can think about it related to, of course, exploration for energy. Right? A lot of the models that you actually have for energy, fossil fuel exploration and discovery and development, actually apply the same math as biologists would with called optimal foraging theory. You can think of this like the low-hanging fruit principle as well. Right? You're going to go after the stuff that you can just sort of reach up and grab. Now let's play it to like an animal system. We're omnivores, like raccoons are omnivores. Right? We can eat a variety of stuff. We can go out and we can grab nuts and fruits. But if we're waking up, shaking off the cobwebs, and we're going to go out and we're going to go harvest something from the environment, we better spend a lot less energy harvesting than we get back in the food calories.

Jason Bradford (00:07:53):

There has to be a positive return on your foraging and consumption. So you can do everything else that is required: reproduce, heal, create social networks, play, whatever. You better not be spending all your time foraging. Some animals spend more time than others. So for example, herbivores, like I've got some cattle and sheep over here, their heads are down eating a lot. And then they're sitting down, they're chewing their cud. They spend more time. They don't have this dense of food as omnivores do, like us. They're eating cellulose that makes more time to process, but they still have to be net positive.

Nate Hagens (00:08:35):

Going to inject this question on the fly. What exactly is chewing the cud?

Jason Bradford (00:08:40):

So you'll see the animals sitting down and they're still chewing, and they're not grazing directly at the moment. What's happening is that these livestock will swallow grass and clovers and chicory or whatever the mix is that they're grazing. And it will go into one of their stomach chambers. They have four stomachs ruminants, and it will start to get digested a bit, but then they'll regurgitate that. And it's just wad of masticated, semi-digested material that they then chew some more and then re-swallow.

Nate Hagens (00:09:15):

That was selected for, somehow.

Jason Bradford (00:09:17):

Yeah. The idea is that, walk around and look around the environment, most of what you see that's plant matter is not digestible by our gut. We need starches, sugars, proteins fats. If we eat the stuff that the cows and sheep are eating, it basically flows through us like fiber. That's what fiber is. It's the celluloses. We do not have the suite of enzymes or the digestive system that can handle it. But what it means is, we can eat a lot less and still be very active and do other things. So we only need to eat two or three pounds of food a day, and we can flow through our system quickly. We also cook it a lot, we use tools for chopping, so we're kind of predigesting. But try going out and just chewing on grass and see how far you get and how long you can maintain yourself.

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Nate Hagens (00:10:11):

Okay. Moving on, what is NPK? Why is it important and where does it come from?

Jason Bradford (00:10:18):

NPK, it stands for nitrogen, phosphorous, potassium. It's used on fertilizers. They're often sold with a rating for that. So you'll see 10, 10, 10, or 16, 16, 16, or whatever. Where does it come from? Well, nitrogen now in fertilizer is usually from the Haber-Bosch process or basically pulling it out of the atmosphere, which is 78% nitrogen gas. And they're converting it to a form that can become biologically available, ammonia or urea, and then phosphorus and potassium are basically mined.

Nate Hagens (00:10:55):

Haber-Bosch isn't pulling it out from the air. Is it?

Jason Bradford (00:10:58):

Well, it's providing both the energy from the natural gas. So you take natural gas, and through the Haber-Bosch process, natural gas is used as an energy source for heat. And there's some sort of catalyst, I don't know the exact thing. And then also the hydrogens of the natural gas, some of them are then moved on to the nitrogen, it's cracking this nitrogen, this N_2 . So you can imagine, methane is CH_4 , so some of the hydrogen has to move into the nitrogen. And that will make it soluble, either it's a liquid or you can actually change it a little more and make it to urea, which could be a solid, that's how you can spread solid fertilizer on. The little grains of urea, that's the energy source for nitrogen and a lot of synthetic fertilizers. In nature, there's biological processes that do that, that convert the atmospheric nitrogen, it's called fixation, into available form for life. And there's process that will reverse that as well.

Nate Hagens (00:12:02):

And phosphorous and potassium?

Jason Bradford (00:12:05):

Well, they tend to be like mineral deposits. So they're certain parts of the planet that just happen to have higher density of rock rich in phosphate and potassium. And just like anything in geology, history, and what was going on, might be old sea beds or particular volcanic substrates that are getting mined. Sometimes there's craters.

Nate Hagens (00:12:29):

We're using nitrogen naturally from plants that fixate it, but additionally from a Haber-Bosch process adding ammonia fertilizer to our fields. And we're also mining phosphorus and potassium.

Jason Bradford (00:12:44):

Yeah. They're important because they tend to be, what's called the macronutrients. If you were to take any organism and combust it, just like cremation or whatever, what's left over is ash. And you add up what's in that Ash. Well, a big part of it is going to be P and K. So you just look at the constituents of life on the planet. P and K are some of the major macronutrients. There's a lot. There's a couple dozen minerals actually in any organism, but those are the big ones. Nitrogen actually volatilizes, so it will go back. When you combust things, it goes back to the gaseous state. That's why our atmosphere is dominated by nitrogen. But those other two are part of ash, so that's why it's called potash. Potassium is also called potash because they used to get it from ashes and fires and stuff.

Nate Hagens (00:13:37):

But why are NPK are important? And why are we talking about them?

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Jason Bradford (00:13:41):

Well, they're important because if you add these things to crops, then you're tending to supplement what the plants need, and they end up usually having higher yields, let's say. So we rely on these fertilizers right now on our farm soils in order to reach the yield potential of them. So that's what people believe right now, is very limiting for crop yields is fertilizer. There's often a relationship between fertilizer addition and crop harvest yields. Right? The idea being that if you don't have these, then yields will decline. And I think it's complex. It's more complex than that. But in the short term, that's probably true.

Nate Hagens (00:14:25):

Okay. So what is the law of return?

Jason Bradford (00:14:28):

Oh, that's the idea that... And this is really kind of fun. Remember I said, anything, if you were to burn it, has ash in it. So the law of return is basically saying that what you remove from a farm field needs to go back if you want to maintain the mineral wealth of that field. It's very basic. It's just a mass balance. You can go onto USDA websites and say, "I harvested this many tons of corn or this much alfalfa. What was my loss? What was the removal from my soil of all these elements?" And people use that to then say, "Okay, I'm going to plan when I do fertilizer next year to replace those."

Nate Hagens (00:15:04):

Okay, well, what is soil? And what's the difference between soil and dirt?

Jason Bradford (00:15:09):

Oh yeah, very closely related, and in common conversation, maybe doesn't make a difference to what you say. But typically, the aficionados, the soil aficionados will tell you that soils are live, that soil has all these, what they call the microbiome or the soil food web. It's the minerals that is dirt plus organic matter and the life that's in there. And we're talking in the size of my thumb, like teaspoon or whatever. There's just billions of organisms of bacteria and fungi, et cetera. It's microscopic, so we ignore it. But there's a tremendous difference between a live healthy soil and something that is sterile, which might be the dirt, or somewhere in between, because you're farming it a lot, and a lot of our practices disturb the soil and end up making dirt.

Nate Hagens (00:16:06):

So presumably, if you had all the minerals that you wanted, plenty of NPK, but you didn't have the life, you didn't have those billions of little organisms in there, your yields would be much lower.

Jason Bradford (00:16:21):

Well, that's the tricky thing. You can have, what's called hydroponics. Have you ever heard of that?

Nate Hagens (00:16:27):

Mm-hmm.

Jason Bradford (00:16:27):

Where plants are rooted into their own water, there's roots hanging in water, and they're given this solution that's the perfect mineral balance. It's like, I'm in the hospital and my digestive system shut down because I'm having some surgery or whatever, but they put me on an IV. All right, I'm okay, I'm still alive. But just like the human gut-

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Nate Hagens (00:16:49):

Right. You're alive, but it's a temporary thing.

Jason Bradford (00:16:51):

Right. So we are basically doing that. That's our farming system. That's the short answer.

Nate Hagens (00:16:56):

Okay. I have a lot more questions. So let's, for now, stick to the short answers. What is soil health? Or what is healthy soil?

Jason Bradford (00:17:05):

All right. So this is a really important kind of a new concept that's taken off in the last 10 years, so I'm really glad you're bringing this up because it kind of relates to what I've been hinting at, is that... Let me tell you a story. I've got a field out here that has got this one type of soil. It's called Malabon, it's a local soil type, good soil, really high-class soil. But there's a road and then my neighbor has the same soil type. There's a line of it on the soil maps. You can look, you can stand and see it's about the same level in the landscape, et cetera. I tested the two different fields, and my field had a really excellent soil health and the neighbor field didn't. And this has to do with very simple tests like infiltration.

Jason Bradford (00:17:52):

So I put water in a disc, in like a tube, and it went right into my soil. Within about 20 seconds, this water went in. The neighbor soil, a hundred feet away, sat, pooled. Okay. So one of the important things about soil health that is incredible is, the structure is different. And I kind of make the analogy as like, you ever see scaffolding against a building, where it says high rise, where they're redoing something, and they've put these giant scaffolding up?

Nate Hagens (00:18:23):

Mm-hmm.

Jason Bradford (00:18:24):

So scaffolding is structure that you can climb on. It's got tensile strength and compression strength, and air and water can move through it. Now imagine, you basically take sledgehammers, you just start knocking everything, and that scaffolding collapses. So what happens when you lose soil structure is, you have organic matter, its stuff is still there, but the structure got lost. And that happens often with the chemicals that are applied, in the tillage programs, and these sort of things that end up turning these microscopic scaffolding, this is on scales you can't see with the naked eye, and destroying those structures. And it has important properties like water infiltration, air movement. So healthy soil has aggregate stability as well. It doesn't blow away in the wind because it's being held together at a scaffold.

Nate Hagens (00:19:15):

So we have minerals, we have the microbiome of the living organisms, and we have the structure. Those three things are required.

Jason Bradford (00:19:24):

Yes. And it's the microbiome that creates that structure. So the reason there is, the scaffolding is that these little organisms, these little bacteria are interacting with the plant roots and creating a scaffolding system that allows air and water movement and allows for a rapid cycling of minerals and nutrients.

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Nate Hagens (00:19:43):

So do we have any idea what percentage of the farmland in the United States has the erect scaffolding versus the sledgehammer-smashed scaffolding in the soil?

Jason Bradford (00:19:56):

I don't know if we have a really good idea. I would estimate, it's less than 5% is in good shape.

Nate Hagens (00:20:02):

And how does that relate to the stories we hear about, at the current rate, our top soil will be gone in 50 years or something like that? Well, what do they mean when they say that?

Jason Bradford (00:20:14):

Well, what's happening is that, because of soil's not healthy, there isn't the microbiome in plant roots that are creating this structure that holds everything in place. So it easily washes away and blows away. And then there's a lock-in to keeping going with the same program. It's like being on a drug and being weaned. There's a painful process to transition. So that's why, I mean, we know enough to change completely, but we're locked in.

Nate Hagens (00:20:41):

Okay. What percent of the United States population works in producing food?

Jason Bradford (00:20:48):

Yeah. What percent works in producing food? If you look at these charts about percent of labor force that are farmers, it's around 1%. I think if you start adding things of the people in food processing and farm services, it goes up. But let's just say it's low, it's like under 5%.

Nate Hagens (00:21:11):

Right. And how does that compare to other countries and to historical norms?

Jason Bradford (00:21:17):

The US has a highly industrialized, highly recognized food system and farming system, and so that has removed most of the labor. If you were to go back and look at earlier agrarian societies, pre-industrial revolution, even early after the industrial revolution got going, labor was still on the farm for the most part. Most people lived on farms and if they were agrarian societies. So, 90% would be typical if you go pretty far back. And early mechanization, it shifted that, so that maybe it was 70%. There's plenty of places today where it's still pretty high, but it's tending to go down almost around the world right now because of mechanization.

Nate Hagens (00:22:04):

But it's still kind of 80 percent-ish in India, which has a billion people.

Jason Bradford (00:22:09):

Yeah, right, exactly. There are places still like that. I've got an interesting chart in my Future Is Rural report showing kind of that difference between nations.

Nate Hagens (00:22:18):

Yeah. So the past was also rural.

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Jason Bradford (00:22:22):

Yeah.

Nate Hagens (00:22:23):

Okay. Is modern agriculture an energy sink or an energy source? And how does this compare to pre-industrial revolution?

Jason Bradford (00:22:35):

Yeah. If you look at agriculture on the farm, when you start using all this equipment in the embedded energy and fertilizers, irrigation pumping, all the tractors that move around, et cetera, you look at that energy and then you say, "Okay, how many calories did I harvest in terms of corn?" You can convert everything into BTUs or whatever you want. It ends up that on the farm, it's slightly negative. In other words, you harvest less calories than you put into it. And then to get to the food system itself, once you go off the farm, it just gets way worse. Of course, in the past, I mentioned net energy positive, optimal foraging theory, all food systems in the past were very energy positive, of course. So it's kind of weird right now.

Nate Hagens (00:23:27):

I'll get to that in a second. Just a story that I recall, I wrote an essay on the oil drum that you were with me as a contributor back in the day, where I calculated the energy return of my own labor and the caloric output of my potato crop.

Jason Bradford (00:23:45):

Yeah.

Nate Hagens (00:23:45):

And I counted the hours and did some metabolic, how many kilowatt hours I worked, and the math was that my potatoes were a 20:1 energy return. That didn't include the shipping of the potato seeds here from Maine or things like that. So it was kind of a medium boundary analysis, but it struck me at the time that my energy return from planting, weeding, hilling, harvesting, drying, storing potatoes for the amount of calories they gave me was a higher energy return than modern oil extraction.

Jason Bradford (00:24:26):

Wow.

Nate Hagens (00:24:27):

Of course we can't fly a plane on baked potatoes. But if you do a lot of human labor like that and you have good soil and amendments, the energy return can be quite high.

Jason Bradford (00:24:39):

Yeah. I mean, typically, it was 10:1 or 5:1, something like that. And it depended usually on how productive the system was and how much animal labor was being used.

Nate Hagens (00:24:49):

Well, it also depends on I had added-

Jason Bradford (00:24:51):

And potatoes are especially good return.

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Nate Hagens (00:24:53):

Right. Right. And I had really good soil, which kind of had energy additions from years past that I was mining down. So how many fossil calories does it take to deliver a calorie of food to our tables, roughly?

Jason Bradford (00:25:08):

Yeah, it's about an order magnitude, about an order of magnitude more. Right? It's like 10:1, 14:1, something like that.

Nate Hagens (00:25:15):

Mm-hmm.

Jason Bradford (00:25:15):

No one's going to be really precise, but I just sort of think of that level.

Nate Hagens (00:25:20):

When people talk about the fact that our current agriculture system is incredibly sensitive to fossil inputs, that's the punchline, is that we're using 10 to 14 calories of natural gas, oil derivatives. We're using two calories to produce one calorie, but we're using 10 to 14 to deliver after the packaging and the drying and the delivery and the cooking and all that.

Jason Bradford (00:25:52):

Cooking.

Nate Hagens (00:25:53):

It's 10 to 14:1, whereas in our past, it was an energy source, not a sink like that.

Jason Bradford (00:26:03):

Yes, that's right.

Nate Hagens (00:26:04):

Yeah.

Jason Bradford (00:26:06):

Yeah. This is why it's kind of crazy-making to be in this world right now, how weird it is.

Nate Hagens (00:26:12):

Well, it's weird being in the world being energy blind because people go to the supermarkets and they have these beautiful little styrofoam plastic, clean packaged food that cost not too much money, though it's going up partially because of Ukraine, but we're disconnected from the massive energy inputs that go into our food.

Jason Bradford (00:26:37):

Yeah.

Nate Hagens (00:26:38):

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And the fact that energy, since you and I have been on the planet, we've had pretty much more energy available to humanity globally every year. And that will probably not be the case the rest of our lives. And so what does that portend for our food system?

Jason Bradford (00:26:56):

Right.

Nate Hagens (00:26:57):

Couple more short questions and then we're going to get to the long questions. What is a trophic pyramid and how do human economies fit into that concept?

Jason Bradford (00:27:07):

Yeah. Okay, so trophic pyramid is an idea, any basic ecology course will teach you this, that there's the level that's called the primary producer level, and that's going to be the plants. Right? They call it a pyramid because that's going to be the widest base. And then above that, you have things that eat plants, herbivores. It's going to be a little narrower. Then you're going to have things that eat the herbivores, omnivores, carnivores, et cetera. That's going to be smaller. So it's a pyramid shape because at each trophic level, as you go up from primary to secondary to tertiary, there's a reduction in the population of those different levels. And that's just because of laws of entropy. You have to have more producers at a lower level to support what's at the higher level.

Jason Bradford (00:27:57):

And so human economies are sort of weird in a sense that if you look at labor force, it's upside down. Like I said earlier, 1% of people farm. Well, that's at the primary level. Right? But a lot of people are in this sort of service economy side of things, their management, et cetera. If you think of an ecosystem, that would be pretty rare, because most of the time, what you need is the primary production level to be big as a base for everything above it.

Nate Hagens (00:28:30):

And so what is the tertiary sector of human economies?

Jason Bradford (00:28:34):

Yeah. I kind of mentioned that was the top. Well, those would be the people that aren't in the primary and secondary. Let's say the primary being food, agriculture sort of sectors, where, let's say, you're harvesting raw materials from the earth. You're mining energy, food production. Secondary would be turning those products into materials that are more useful. Okay, so maybe I raise cattle, but I'm not going to make leather. Somebody else is going to do that, and then turn that into shoes. And then the tertiary level will be basically people that are retailing, designing, buying shoes as status symbols because they want to have the latest, greatest fashion. They want to look awesome because they have some high status job, but they're not doing any of those productive tasks dealing directly with materials. Maybe they're musicians, maybe they're bankers, maybe they're life coaches, maybe they're therapists. I'm not saying none of this is useful, it's just that-

Nate Hagens (00:29:40):

Or podcast hosts.

Jason Bradford (00:29:44):

Yeah. It's not to denigrate those; it's just to say that our society has so many more at the tertiary level than is normal, and that's because of the fossil fuel supplement.

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Nate Hagens (00:29:55):

Right. So compared to the rest of biological nature, the human trophic pyramid is engorged and misshapen in that-

Jason Bradford (00:30:07):

Top heavy.

Nate Hagens (00:30:08):

... we've used 1/2 to 2/3 of our fossil and mineral endowment to have an enormous goods and services sector in the middle.

Jason Bradford (00:30:18):

Yeah.

Nate Hagens (00:30:19):

And on top of the pyramid is all these financial claims that are enormous, that are trying to be supported by the stuff on the bottom. We did the speed round, JB.

Jason Bradford (00:30:33):

All right.

Nate Hagens (00:30:33):

So let's move into the main course of our agricultural discussion. I think we've kind of alluded to this already, but what is our fundamental problem with agriculture and modern food systems in coming decades in your opinion?

Jason Bradford (00:30:51):

Well, I think the short term, if you look at what's going on now with rising energy prices and supply chain disruptions, it's just the rising cost of energy is then leading to a lot of inflation and shortages of some critical things in the food system. And it's that complexity itself where you've been relying on this particular set of suppliers for so long and they disappear. What do you do? It's hard to turn somewhere and figure out how to manage this, especially in this globalized system. So I figure that now for the next decade, we're probably going to see a lot of problems related to this energy and complexity leading to these episodic kind of breakdowns and this or that. So you have empty shelves of certain things now and then, and rising prices in general. That's the first thing I'd say.

Nate Hagens (00:31:41):

And longer term?

Jason Bradford (00:31:43):

Well, I kind of hinted at the lock in. Right? So longer term, you start to have to wean off of fossil fuels.

Nate Hagens (00:31:50):

Let me pause you there. We have to wean ourselves off of fossil fuels not for climate reasons per se, but because we will be forced to because there will be fewer available fossil fuels.

Jason Bradford (00:32:01):

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Yeah. I don't know if we're going to do anything about this really at the climate. It doesn't sound we're doing anything.

Nate Hagens (00:32:06):

Mm-hmm.

Jason Bradford (00:32:07):

It'd be nice that we did. I'm really worried about that. But in reality, these are fossilized hydrocarbons that we've taken the low-hanging fruits, and now we're going off to the dirtiest, most difficult to access things.

Nate Hagens (00:32:20):

Because we have to.

Jason Bradford (00:32:21):

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Nate Hagens (00:32:23):

Yeah.

Jason Bradford (00:32:23):

So how do you respond to this? My worry is that we're not going to do anything sensibly. We've got this lock and this cultural momentum about our previous investments in our equipment and technologies, all which rely on the high density energy of fossil fuels at the right price, with the right repair systems and parts and all that. So we have a biophysical reality shift that's going to happen, that is completely mismatched with our culture, our workforce, our infrastructure, and then a lack of understanding of those involved. I have not seen a lot of comprehension. It's more like a doubling down of the madness really of, we're going to use more technology, drones are going to farm for us, and we can completely get out of humans that get involved. Farms are getting bigger. Right?

Nate Hagens (00:33:16):

So can technology offset fossil fuel depletion insofar as its effect on agriculture? Can we use technology to improve reductions in NPK or energy used in industrial agriculture?

Jason Bradford (00:33:35):

Yes, I agree. There's a lot of technological things we could do, but we're mostly doing the wrong ones. We're doubling down. Here's a really important example, I think. So it was discovered, as the organic food industry started getting bigger, there started to be more demand for seeds in the organic seeds. But there weren't enough so organic farmers had to go buy conventional seeds. It turned out there was trouble, because the crops have been grown in such a way for so long that they no longer have the genomes that do a proper job interacting with the soil microbiome. And so you have to now start using breeding techniques to breed a whole new set of crops that are really good at partnering with the soil microbiome to create the soil health you need, to wean yourself off of the external synthetic NPK.

Jason Bradford (00:34:39):

Now, there's a whole set of technology there, but it's not the kind of technology that people tend to think of. They think of vertical farms and precision agriculture with GPS and drones and microsensors everywhere as opposed to, "Oh, we need to breed for weaning ourselves off of synthetic fertilizers." So that kind of stuff where there's technologies being really good at making compost.

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Nate Hagens (00:35:03):

Right. Well, that's a technology.

Jason Bradford (00:35:04):

Yeah.

Nate Hagens (00:35:05):

So our system, Jason, has optimized not for agricultural output or for health or for soil health, our agricultural system has optimized for monetary profit per input of time. So we have become more efficient at producing monetary output.

Jason Bradford (00:35:30):

Yes.

Nate Hagens (00:35:31):

Could that be different if we optimized agricultural output? What are the trade-offs? Can you unpack that for me?

Jason Bradford (00:35:38):

Yeah. That's a really good question. I think about this all the time, Nate. Living in a place where labor is cheap and energy and machines are relatively inexpensive, the incentive is to just remove people from the farms and find a way that you just let a machine do the job. That's because the highest factor of production right now is human labor. And it's always been the drive, cheapen the cost of production. So yeah, we have big machines that can cover a lot of territory.

Nate Hagens (00:36:09):

So the same thing we're doing at a coffee shop in San Francisco to fire the barista and have a automated robot serving coffees, we've been doing the same thing over time in our agricultural fields and producing food.

Jason Bradford (00:36:25):

Yeah. I mean, to even the most extreme manner possible, these machines of 500 horsepower tractors is better than a 300 horsepower tractor, because one is only 3,000 human workers at a time and the other is 5,000 human workers at a time. Yeah, it's pretty remarkable. It's fascinating. We can cover so much territory so fast with these big machines with so few people, and this drive for specialization in economies of scale. It's also then led to this conundrum where farms have now, if you've got these big machines and you've got fewer people, management complexity needs to be reduced. So farms also now specialized in fewer crops. So these big machines, they can cover tons of territory, but because they're so expensive and there's so few people, then management has to simplify and so they want to do fewer things.

Jason Bradford (00:37:20):

They would rather farm a thousand acres of one crop than a hundred acres of 10 crops. So whatever gets common in the region then, also becomes what you can start doing. So if there's not enough people doing asparagus anymore, then the asparagus packing facilities go away. And then the buyers aren't showing up to even buy your asparagus. I saw this happen in California, and that was because Mexico got into asparagus big time.

Nate Hagens (00:37:48):

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So it's the Amazonification of agriculture.

Jason Bradford (00:37:52):

In other words, big retail driving out small retail kind of thing.

Nate Hagens (00:37:57):

Mm-hmm.

Jason Bradford (00:37:57):

Or getting it from somewhere else in the world drives out the local producer.

Nate Hagens (00:38:02):

Mm-hmm.

Jason Bradford (00:38:02):

Yeah. And that fewer people in farming means simplify management, simplify cropping programs when what we need is the opposite, diversified.

Nate Hagens (00:38:15):

Well, not only are we pushing small farms and farmers and their expertise out of work, but over time, we're putting the soil in the intensive care unit that requires an IV, and the soil doesn't have that scaffolding because of this process where it's large mechanized machines that are sledgehammering the scaffolding of the soil down every year.

Jason Bradford (00:38:43):

No, that's really true. It's the machines, it's then the dependence on these synthetic inputs, which are quick fixes, that also allow you to do the same crop over and over again because you've got the pesticides and the fertilizers, and you're not relying on the diversity of life that helps maintain healthy soil in the absence of these. The smaller farmers ironically, of course, are most energy efficient. Like we said, with you and your potatoes, you have positive energy return. They also have been shown to outyield these larger farms, and that's because they can tailor what they're doing to the specifics of that soil and not grow stuff that really doesn't work. But if you have a big machine, you just run across the landscape and it's heterogeneous, but you're going to fit the same thing into every acre you can. Well, the modern farms are then turning soil into dirt.

Nate Hagens (00:39:40):

So what about, I hear a lot, especially in our networks, that organic agriculture can outproduce conventional industrial agriculture? What are the caveats and the truth to that?

Jason Bradford (00:39:53):

That's a good question. I think organic agriculture, but especially the smaller farm agriculture, can, as long as their people are experienced, knowledgeable, have the proper equipment sets to do what they need to do, have the proper seeds. The problem is not, can it be done theoretically? The problem is, how do you go from situation where that's a small part of the ag system to then a dominant part in a way that can maintain or improve yields? That's what I think is the challenge, is not that, can it do it? Well, it's going to have to, in some ways. But can we get the right people with the right support, that no place is wealth to make smart decisions?

Nate Hagens (00:40:40):

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Well, the other challenge is, if you had an industrial system that had, I don't know, 10,000 acres and you had 10 people that were using industrial machines to farm it all and you had a certain yield, and now we want to have 5,000 people work the land, we could then have a higher yield. But 4,990 people had to come out of other jobs in the tertiary sector, which would largely... We would boost our yield and we would boost our soil, but we would reduce our standards of living at least the way we describe them today, because those people would be making, on average, substantially less money. Correct?

Jason Bradford (00:41:31):

Yeah. I think that's problem, where it's like, is modernism a one-way trip?

Nate Hagens (00:41:41):

Right.

Jason Bradford (00:41:42):

Yeah. I think you're right. We could get more yield per area and have higher food security in many respects if we get more people farming. They can turn dirt into soil. They can diversify what's going on in the land. So there's a diverse diet coming off the land. How many industrial farmers actually feed themselves? None that I've seen.

Nate Hagens (00:42:05):

Right.

Jason Bradford (00:42:05):

They're doing a few commodities and then they're going to the grocery store. But this is a trade-off we have to deal with. Right?

Nate Hagens (00:42:10):

So let's expand that then. If we only were able to focus on best practices and we had as many people in the world as possible working in the fields, meaning a lot of our Amazon delivery trucks and junkets to Vegas and safaris to Africa and NASCAR races and all these other things, would probably recede somewhat or a lot. But if we had all the people going to the fields, how much food could we grow without any fossil fuels or without most fossil fuels? Because a lot of people say without fossil fuels, we only have a billion or at most two billion - food for one or two billion people. So can you unpack that a little bit? I know there's lots of speculation involved, but help me understand the boundaries there.

Jason Bradford (00:43:03):

Yeah. This is a tough one, and so we can break it into parts and take our time and work around it. I gave you a story. I did the math for Benton County, where I live, Benton County, Oregon. I sort of thought of, what would a food system look like at the level of the farm? What would the farms in Benton County have to grow to provide a complete healthy diet that's regionally appropriate for our place? And then how much area would it take up and how many acres do we have? You have to deal with so many things when you're thinking about this. I have this in the Future Is Rural report, and the spreadsheets for you to download, and you could adapt it to anywhere. And other places have done this. Other academics have done this much more detailed than I have of complex models, but they all assume the industrial ag system is in place.

Jason Bradford (00:43:52):

It's like, we will make New York food self-reliant, but it's all the same food system in many ways in terms of all the inputs. But how do you grow healthy soil first? How do you get a diversity into the diet? How do you integrate animals? These kind of things. And then how do you also account for fiber and energy,

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if you're going to grow the energy to run the food system itself which is what had to be done? So I did that, and I came up with about four tenths of an acre. If you had extract that to the world-

Nate Hagens (00:44:29):

Per person?

Jason Bradford (00:44:29):

Yeah. There's plenty of land. Often what people say is that, you need about half a hectare, which is, about an acre per person is sort of the minimum. But like I said, it varies because as you know, different places have richer soils and better climate. So it can vary from two tenths of a hectare, which is kind of like what my result was, up to an entire hectare per person. But if you use a global average of about half a hectare-

Nate Hagens (00:45:00):

Half a hectare or half an acre?

Jason Bradford (00:45:01):

I'm going back to hectares because that's what the stats are globally, which is about half a hectare is about an acre.

Nate Hagens (00:45:08):

Okay.

Jason Bradford (00:45:08):

It's almost two to one. Yes, there's about eight billion people. There's about four billion hectares of supposedly heir of a land. So you could do it theoretically, but there's so many factors.

Nate Hagens (00:45:18):

For how long?

Jason Bradford (00:45:20):

Well, maybe indefinitely, but what I worry about is all the other stuff. I worry about resilience in the face of climate change. These hectares that are present today that we call farmland or arable land, are they going to be in the same place in 50 years? I don't know.

Nate Hagens (00:45:40):

Well, not to mention that if there were eight billion people perpetually just sitting around on a half acre each and doing nothing else other than farming to grow their food without any entertainment or education or hospitals or whatever, I don't find that altogether plausible, but we still have a lot of fossil fuels left.

Jason Bradford (00:46:06):

Well, no, and this is the thing, is you have to think about this from a food system perspective and how many professionals and workers are there, relative to people who are doing other things. I don't think we're studying this at all. We're just assuming we're going to have robots eventually do it all for us. But what does society look like when a higher percentage, I don't know how many, are engaged in this? And what kind of social structures are there in terms of habitation relative to where the productive landscapes are, ownership of land? How is that capital allocated in your society? These are all just really complex questions. We have models for what things were like before or other countries now that

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are different than ours, that are more like that. But I care enough about the world we have today and the knowledge we have and the education levels. I'm a product of this culture too. I don't want us to see it tossed out in some sort of Pol Pot, crazy insanity of shoving people onto the land and with no understanding. It'd be nice to be done well.

Nate Hagens (00:47:22):

Let me ask you a hard question, Jason. You can guess because no one knows the answer to this. But what do you think the odds are of a giga famine this century, a billion plus people starving?

Jason Bradford (00:47:35):

Oh, that's a good question. It's horrible. I think it's pretty high odds. I mean, I don't know if it happens all at once or it's just intermittent. I mean you had Dennis Meadows on your show, seeing the population curves. How does that happen? It's war, disease, famine, all kinds of ways. So I think all these things happen in combination, don't they, usually.

Nate Hagens (00:47:59):

Yeah. My own view, which is of course speculative, is we're likely to have more people on the planet in the next 20 or 30 years, but they're going to be a lot poorer. And that the giga famine truly, from a reduction in our fossil inputs to the system, is in the back half of the century, not in the near term.

Jason Bradford (00:48:20):

Yeah.

Nate Hagens (00:48:20):

The near term is going to be wider poverty and environmental chaos. First, financial then more societal. But I don't know. That's why I'm asking you this question, because I think a lot of people in our tribe, in our choir, which is energy and ecologically literate, they naturally assume that the population maximum on the planet sustainable is a billion people. And I think that's realistic because people think, "Oh, 500 million to a billion people living at the standards of a Western industrialized nation." But I think if you draw the boundaries of the analysis, it is possible that a human doing labor and regenerating the soil and processing and recycling the waste, like you said, an acre or a half an acre, there wouldn't be much else complexity in the world, but you could feed eight billion people that way or at least five billion anyways. We wouldn't be living like we are today.

Jason Bradford (00:49:27):

Yeah.

Nate Hagens (00:49:27):

To me, the population argument is really two axis. There's the population, a number of people, and then there's how do they live? What sort of a footprint do they have? And we can have a lot of people if we have a low footprint.

Jason Bradford (00:49:45):

Yeah. And the irony of course is, the longer we keep doing what we're doing, the way we're doing it, the harder it is for the more benign scenario, where people have the ability to go back to more self-provisioning or community-level provisioning in working landscapes, where biodiversity is protected, the water is cherished, and the soil health is rebuilt. It's nicer if you can start from an environment that is less degraded. It makes the odds that more people make it in less difficult and risky path. If eight billion people have the energy rug pulled out of us over, say, 30-year period, could do it. It's a bottleneck, but boy, it's on the margin. Right? Let's say you had to grow potatoes and other stuff for

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your family, you would not do some math and say, "Oh, I need exactly this many potatoes. And this is a million calories per person." You'd say, "I'm going to try to double that," because you don't know what's going to happen.

Nate Hagens (00:51:04):

Right.

Jason Bradford (00:51:05):

I had a potato harvests half last year than the year before.

Nate Hagens (00:51:08):

Yeah.

Jason Bradford (00:51:08):

So there's all this variability that happens.

Nate Hagens (00:51:11):

It's not just the return you want. It's the risk adjusted return. It's the amount of return you have adjusted for the standard deviation because you never know when there's going to be a bad year.

Jason Bradford (00:51:23):

Yeah.

Nate Hagens (00:51:24):

I'm going real off tangent here, JB.

Jason Bradford (00:51:26):

Do it.

Nate Hagens (00:51:26):

But what happened in the potato famine in Ireland back in the day? My understanding is, people got by, by eating potatoes, kale or collards or something, and milk. That was it, those three things. And still, there were a lot of people that starved. Do you know anything about that?

Jason Bradford (00:51:45):

Oh, a little bit. I mean, there was a blight that hit the potatoes. So you had a society that had a very simple diet, like you're saying, and the potatoes had a blight. Now also, there's a lot of weird stuff that went on because they were also a big wheat exporter to England. So part of the problem was, they were not a very monetarily wealthy economy. And in order to service debts, et cetera, they kept having to sell wheat. So they actually starved while wheat was being exported because the peasants didn't have money. So it is tied up with a lot of colonial nastiness as well.

Nate Hagens (00:52:27):

My god. Yeah.

Jason Bradford (00:52:30):

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But the vulgarities you're talking about of the environment and the buffers, I just want to point out that that's a lot of what happened in food systems in the past, is they would deal with this by integrating livestock. I think this is an important point that people don't understand, because a lot of what you hear is talk about veganism, vegetarianism. And I understand why. Because the current system of CAFO meats, poultry and hogs, and feedlot cattle is pretty horrific and I think should be outlawed. Okay? But if you look at why those animals exist, from a historic perspective, they were to handle stuff like what we're talking about. You always grow more grains than you think you're going to need. You worry about mold. You worry about rats. You're worried about a poor harvest. You're worried about all kinds of things you can't predict and the animals are the feed buffer. And so if suddenly you have half the harvest but you've been feeding animals, now you can cull animals, you can cull your herd down, but you've also maybe grown enough at least to take care of people.

Jason Bradford (00:53:43):

And so that's why I think if you look at where people lived, some people have lived in places that are dominated by animals and some dominated by plants. In fact, where I live now was dominated by a plant culture, the Kalapuya, and they ate these camas bulbs. It's a prairie lily. They burned the landscape to keep it open so that these lilies, these camas would flourish, and they didn't want the trees to encroach too much. You go north towards, nowadays, Portland, you hit the Columbia River. Those were salmon people. The salmon didn't get up the Willamette River to where I am. So just going a hundred miles away, you have a meat-based diet and here it was a plant-based diet. And so I just think that people need to understand that these food systems evolved to deal with what was present or not and what the environment was throwing at people. And there was trade, the Kalapuya would trade their flour from their camas. They trade camas flour for salmon.

Nate Hagens (00:54:46):

So in a more rural future with less fossil inputs and maybe some more human labor, will it be efficient from an input standpoint to have more animals or less, or less vegetarian or more?

Jason Bradford (00:55:05):

Yeah, it's interesting. We probably have way more animals of certain kinds and we have way less animals of other kinds. So that's what's kind of interesting. Remember I talked about how the organic industry couldn't get the seeds it needed? Well, the same thing is kind of true probably for livestock. Livestock have been bred for these CAFO systems, hogs without much fat.

Nate Hagens (00:55:30):

What is CAFO?

Jason Bradford (00:55:31):

Confined animal feeding operation. So you think of a hog barn with a half a million animals or whatever, chickens like that, whereas we would probably need different breeds and probably fewer of certain things. But do we have any more draft animals? There used to be a lot more horses around, but the horses nowadays aren't as useful as the horses would've been in the past for doing certain kinds of work. But overall, there's way more human livestock than there should be. Yeah.

Nate Hagens (00:56:04):

Human livestock or livestock for humans?

Jason Bradford (00:56:06):

Yeah, the latter.

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Nate Hagens (00:56:10):

Yeah. Well, in Minnesota here, there are more pigs than people, a lot more, as one example.

Jason Bradford (00:56:17):

Yeah, right.

Nate Hagens (00:56:18):

There's 1,100,000,000 cows, over a billion goats, over a billion pigs. We eat 75 billion chickens and turkeys every year, et cetera.

Jason Bradford (00:56:33):

Yeah.

Nate Hagens (00:56:33):

So I realized in talking to you, Jason, that we probably could cover four hours and not get to everything I wanted to get to. But let me ask you a few more questions here before we get to the closing questions, which I ask everyone. So your report is called the Future Is Rural, laying out the path that some of us, many of us would be wise to start forging that path for ourselves and our communities. What do you think is most likely? Is there a hybrid path between industrial large scale agriculture and a rural low-tech future? Or is it kind of all or none?

Jason Bradford (00:57:14):

I think the hybrid path is what makes sense. Because if you look at the transition, it takes time, it takes the ability to fail gracefully. Training people in all the stuff that needs to happen and building this sort of parallel way of life, that is the opposite of high-energy modernity. But maybe it still has one toe in it in a sense that there is still this system in place that is cheaply and abundantly and reliably supplementing the transition, just like we supplement all kinds of enterprises early on with capital and government and community support. As a human being, I was taken care of by my family for a long time before I could stand on my own. So I think doing this hard work that's very fascinating and very complex and a lot of people would really be into, but knowing you have the backing of the industrial food system, modern medicine, the support there so that you can push, push, push the envelope, learn, learn, fail gracefully, and build something new would be really nice. And that system, maybe over time, can grow and grow and grow as the other one draws down.

Jason Bradford (00:58:36):

I think a lot of what we need to be thinking about is such difficult questions, Nate. I wish there was so much more work into this. But what are the elements of the sort of high tech modern world that we want to bring through this bottleneck and The Great Simplification? What kind of energy systems that can be more advanced in the 1800s? D.C. Motors connected to versions of portable voltaics that aren't so complex, right? Wind systems and all these things can be longer lasting and repairable. Can you still do some 3D printing for parts and repurposing of all the waste steel that's going to be lying around, using wood again for fuel, but not in ways that are so detrimental to health and lead to deforestation ?

Jason Bradford (00:59:25):

What kind of culture forms around these questions of a civilization that can persist for thousands of years in a place with the knowledge, and carrying through most of the knowledge we still have? This just fascinates me, but almost nobody is doing anything about this. If we were being wise, we would be incubating these centers where that could grow and develop and become beacons for the future. You know?

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Nate Hagens (00:59:56):

I mean, this is self-referential opinion, but I do think it's because of our energy blindness as a culture. We think technology is what produces the yields in the seeds and the engineered crops that continue to feed the world because we conquered that. But Norman Borlaug told Paul Ehrlich that technology bought him a generation to use it wisely.

Jason Bradford (01:00:22):

Yeah.

Nate Hagens (01:00:23):

And once oil starts to deplete in earnest, the agricultural system is going to have to play catch up or the yields are going to drop or the magnitude of crops are going to drop. So I think we need, like you say, these models and pilots, and especially getting young people involved, learning the things that you know, instead of going and being a mid-level programmer to create video games as one example.

Jason Bradford (01:00:52):

Right.

Nate Hagens (01:00:53):

So a lot of people in our network talk about permaculture being the answer to our current overshoot energy situation. What is something that permaculture can do that paves the way to a better future that our current society does not? And what does permaculture lack as a global solution to the upcoming great simplification?

Jason Bradford (01:01:16):

Yeah, I'm a big fan of permaculture. It's a design system. Right? It really focuses on just learning about the place you live in and inhabit and designing around it. It's the idea of the permanent culture, a civilization that can have this permanence. So it gets that right in terms of its philosophy, I think. What it really encourages is people to be engaged in self-provisioning while supporting biodiversity and soil health and community. Okay, they talk about a culture. So it's there. I mean, a lot of what you see, examples are households, homesteads, but ideally, you bring a lot of these permaculture principles into building a lot of this new community, new civilization. Right?

Jason Bradford (01:02:06):

What it doesn't really deal with, I don't know how it would, is the legacy of the complex civilization we have. We've got nuclear power plants all over the place. We've got missile silos. We've got toxic wastes that we have to be able to have enough capacity to deal with those, so we don't burden the next generations with this. There's probably a lot of stuff like that where it doesn't know what to do about that and isn't talking about it. There's still a lot that has to happen outside of permaculture. Right? What do you think?

Nate Hagens (01:02:42):

Bend, not break, is my philosophy.

Jason Bradford (01:02:45):

Yeah, right.

Nate Hagens (01:02:48):

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Yeah, no, I agree. We can't just throw the baby out with the bath water because then we have all these complex problems that need addressing. So I think we need lots of pilots of people going towards a future in rural direction, but we still have to keep the system stable in the meantime.

Nate Hagens (01:03:11):

Okay. So we are kind of running out of time, my friend. I will definitely have you back because I want to take a deeper dive on the Future Is Rural report and recommendations that you have. Here's some questions that I ask all my guests, kind of personal closing thoughts. What kind of advice would you give to young people who today discover and understand that they're alive during the peak in complexity and energy availability and with climate risk to nature, energy depletion, et cetera? What advice do you give to young people?

Jason Bradford (01:03:49):

Yeah, it's tough because it's kind of anxiety provoking. It creates a lot of fear. But how that's mitigated and how people find purpose, find a tribe of like-minded friends, that's really huge, of a social network that also gets this stuff. Hang out with the right people. Be a helpful person that has skills and passion for things that are useful with or without this world we're in, what works now and what would work during The Great Simplification. And I do this all the time, this is what helps me and maybe helps others, but connect with nature. Find ways of supporting the restoration and preservation of biodiversity. Those are the main things I would say.

Nate Hagens (01:04:34):

And you have young people working on your farm. Right? What is their motivation and how do they come away from the learning experience of working in the soil every day?

Jason Bradford (01:04:44):

I'm so lucky. God, that's so hard because there's so many wonderful kids out there. I think they're 20 or whatever. I'm 53, and I think about myself when I was their age, they have so much they're going to have to deal with. But gosh, they're just wonderful people.

Nate Hagens (01:05:01):

I know I've taught hundreds of them myself.

Jason Bradford (01:05:04):

Yeah. We're out there in the farm and it's beautiful out and we're talking and working together, and this is what they want to do. But gee, how do you do this as a kid? How do you do this as a young person? You don't have money. You can't buy a farm. Nothing pays you well enough. How do you get healthcare? How do you get housing? So I get kind of upset because we have a whole generation that actually knows this stuff in many ways and is ready to do something about it. But this society doesn't support any of that. So I'm a little amped up about it now. You just triggered me. But I care so much about them.

Nate Hagens (01:05:36):

Yeah. I hear you, my friend. I have hundreds of former students. They understand this. They care. Their hearts and minds are in the right place, but yet they're still part of the vortex, which is our consumer growth culture. And it's really tough to make the right decisions.

Jason Bradford (01:05:55):

So I try my best. I don't have enough for them. I really feel I don't have enough for them.

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Nate Hagens (01:06:01):

Well, you have an opportunity to educate them about ecology and soil and farming. We need thousands of you around the country scaling this. Maybe podcasts and conversations like this will alert more people to the centrality of agriculture, soil, community in a world of soon-to-be depleting fossil inputs to the system, and maybe change some choices and change some priorities and changed some systems and incentives from the government.

Jason Bradford (01:06:34):

Yeah.

Nate Hagens (01:06:35):

Well, why couldn't we have a mandatory year off between high school and college where people went to do ecological and community restoration around the country as a young person?

Jason Bradford (01:06:46):

Mm-hmm.

Nate Hagens (01:06:47):

They would love it. They would learn a ton.

Jason Bradford (01:06:48):

Oh my God.

Nate Hagens (01:06:48):

They would build social capital and skills and help the soil and the ecosystems.

Jason Bradford (01:06:56):

Yeah.

Nate Hagens (01:06:57):

Why couldn't we do something like that?

Jason Bradford (01:06:59):

Yeah, we totally could.

Nate Hagens (01:07:00):

Okay. So a couple more questions, Jason. I'm curious to see what your answer to this will be. What do you care most about in the world?

Jason Bradford (01:07:08):

Oh God, I travel around the world, studying biodiversity when I was in my 20s. And God, it's still a big passion. It's just stunning what's out there. So what the hell are we doing?

Nate Hagens (01:07:21):

Yeah. Even in a diminished state, this world is stunningly beautiful and diverse.

Jason Bradford (01:07:30):

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Yeah. That's kind of what I got into this for, was like, you travel around, you see these places, you see lemurs hopping around on trees in Madagascar. You see most ridiculous birds flirting around in these forests covered in mosses and orchids. You're on the reef in Fiji, to giant groupers and just colorful corals. Just absolutely ridiculous. So I kind of want to keep that around. And of course, I love my family, my friends, my dog. It's endlessly curious and inspiring.

Nate Hagens (01:08:05):

Well, that's why we've been friends for 20 years because you know that's exactly how I view the world. And that is what is sacred beyond religion or economic growth. That is truly what is sacred, is the natural world we share this planet with. We will miss these creatures when they are gone one day in the future. And I really hope that when your kids are my age, our age, that the largest animal in the world is not a cow and that we don't exclaim with joy when we saw a squirrel this week because that was all we saw.

Jason Bradford (01:08:43):

Yeah.

Nate Hagens (01:08:44):

And I think the first step is, we have to care about these things and recognize them. It's a tall odds, JP, but I mean, that's what we're trying to do.

Jason Bradford (01:08:53):

Yeah, totally.

Nate Hagens (01:08:55):

So couple more questions, my friend.

Jason Bradford (01:08:57):

Mm-hmm.

Nate Hagens (01:08:57):

What are you most worried about in the next decade or so?

Jason Bradford (01:09:01):

You had Chuck on the show.

Nate Hagens (01:09:04):

Yeah.

Jason Bradford (01:09:04):

Yeah, war, authoritarianism.

Nate Hagens (01:09:07):

That stuff.

Jason Bradford (01:09:07):

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Yeah, the absurd doubling down on our non-negotiable "way of life," the stuff you were talking about, like just create another \$6 trillion and just do nothing useful with it. So that's the stuff I worry about.

Nate Hagens (01:09:23):

And what, in contrast, are you most hopeful about in the coming decade or so?

Jason Bradford (01:09:27):

Well, the students I interact with are fantastic. Like I said, they're pretty savvy and sophisticated. And like you said, this is what is amazing, is their care, it's so present. A lot of them aren't into the heavy materialism of our culture and find their kicks in these healthy ways. There's a lot of amazing information available now. Some of it is junk, of course. But it's also easier than ever to get out there, the ideas that we have, for example. So could it be with the crisis and another crisis comes and maybe we don't miss that opportunity? Maybe real reforms become possible. And then I think back on, nature is incredibly resilient and just respond and bounces back pretty quickly. I've seen that. So we give it a chance. I've seen it with the soil. I've seen it with forests.

Nate Hagens (01:10:29):

Well, your soil, compared to a hundred feet away, has got the scaffolding so it's resilient.

Jason Bradford (01:10:35):

Yeah. It's five years, takes five years or so to do that.

Nate Hagens (01:10:38):

Yeah. So if you were benevolent dictator Jason Bradford, or could make one wish for humanity without any personal recourse in our present circumstances, what would it be?

Jason Bradford (01:10:52):

All right. Well, it kind of run in circles, but the sort of investments now we're making in the military and space colonization, building more skyscrapers, more roads, if just some decent chunk of these could be turned towards developing this civilization that can last thousands of years, one that preserves our knowledge that are incredible. I mean, I love that we understand our place in the universe for example. How do you put front and center a care for this thin veneer of life, this complex life, maybe the only in the universe? And then gives all these people an opportunity to build that, to be part of that. So God, funding all the potential out there, the trials, the research. At the level, we fund cancer research or whatever, or professional sports. I guess allocating capital towards the challenge which is, are we going to have some kind of long-term survival on earth?

Nate Hagens (01:11:59):

Thank you, my friend, for sharing your wisdom and reflections here. Do you have any other thoughts, advice, or closing comments for our listeners?

Jason Bradford (01:12:10):

Well, I guess, don't give up on things. I know it feels like we're kind of in for it, and that's kind of too bad. Sorry. A lot of us are trying. But nobody really knows for sure what's going to happen.

Nate Hagens (01:12:29):

Mm-hmm.

Jason Bradford (01:12:30):

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I'd say, avoid people who are too certain, and spend your time trying to be helpful because much of what does need to be done is pretty awesome anyway so just get at that.

Nate Hagens (01:12:45):

Excellent. Thank you, my friend. We will talk soon. I really appreciate it.

Jason Bradford (01:12:49):

Well, thanks for the opportunity. I love listening to this podcast and I appreciate the ability to be on it because it's been really interesting so far. Keep it up, Nate.

Nate Hagens (01:13:00):

Thank you, Jason, to be continued, my friend.

Jason Bradford (01:13:03):

All right. Thanks, Nate.

Nate Hagens (01:13:05):

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