



FARMER TO FARMER

podcast



EPISODE 161

Elizabeth and Paul Kaiser of Singing Frogs Farm on No-Till Ecological Farming in Northern California

March 8, 2018



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Chris: It's the Farmer to Farmer Podcast, episode 161. This is your host, Chris Blanchard.

Chris: Elizabeth and Paul Kaiser raise a little under three acres of vegetables at Singing Frogs Farm in Sebastopol California, where they've been farming since 2007. Their ecological farming model rests on a foundation of no till production, but incorporates many more elements to build soil organic matter and soil biology to support an economically viable operation.

Chris: Elizabeth and Paul dig deep into the ecological and production principles that undergird their success from soil management, transplant production, and crop planting strategies. We take a look at their use of hedge rolls for soil building, climate management, and insect management, including their tips for installing and maintaining these important ecological tools. And, we discuss employee management within their complex nonlinear production system, as well as the economics of their production system.

Chris: And perhaps, most importantly, Paul and Elizabeth emphasize the ways that observation and their responses to their observations, provided the foundation for building what they consider to be an example, and not a model, of their ecological production system.



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- Chris: The Farmer to Farmer Podcast is generously supported by Farmers Web, Software for Your Farm. Farmers Web makes it easier to work with your buyer, saving time, reducing errors, and increasing your capacity to work with more buyers overall. FarmersWeb.com. And, by Vermont Compost company, founded by organic crop growing professionals, committed to meeting the need for high-quality compost and compost space. Living soil mixes for certified organic plant production. VermontCompost.com. And by BSC America, BSC two wheel tractors are versatile, maneuverable in tight spaces, lightweight for less compaction, and easy to maintain and repair on the farm. Their driven and built to last for decades of service. BSCAmerica.com. Paul and Elizabeth Kaiser, welcome to the Farmer to Farmer Podcast.
- Paul: Thank you very much.
- Elizabeth: Fantastic. Glad to be here.
- Chris: Really glad that we could finally connect. I think I've been after you guys for well over a year to get you on the show.
- Chris: I know, farmers are busy people, and sometimes you just have to be persistent. I'd like to start off by having you tell us about Singing Frogs Farm. Where are you guys located? How many acres of vegetables you growing? How are you guys selling it? What are you guys doing that makes the farm special?
- Elizabeth: Fantastic. I'll just dive in and give you some of the basics. We're in Sebastopol California, which is in Sonoma County, which is wine country. We're about an hour and a half north of the Golden Gate Bridge of San Francisco.
- Elizabeth: Our property is eight acres, but it's got a lot of little nooks and crannies, plus we live here. So, our actual production is under three acres. We've been here for almost 12 years, two weeks from now will be our anniversary of moving onto the property, so that's really exciting. We've been farming, bit by bit, that whole time.
- Elizabeth: We're a small farm, but we're very productive, and we're year round. About 35% of our food goes out to our CSA. We do a year round CSA that's got 40 harvests a year. We do weekly harvests from May through Thanksgiving, and then every other week from Thanksgiving through the end of April.
- Elizabeth: We also do farmers' markets. That's about 50% of our income. We have two year round farmers' markets. Then we have one or two others that we will add in the high season. We just love that community.
- Elizabeth: The last little bit of our produce does go out to some restaurants that we have a good relationship with, as well as, we have a really fantastic food hub in our community called Feed Sonoma. About 95 to 99% of our produce stays within 15 miles of our farm, which is really important to us.
- Chris: Now, there's a reason that I've been trying to get after you for a whole year. There's a reason that you guys are really busy. That's because you're not just doing the farm thing. You're doing a lot of teaching and education work. I'd like you tell us about the production systems there at Singing Frogs Farm, that has so many ... I've had more



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requests to have you on the show than I've had for anybody else. I'd like you to tell us about what it is that makes Singing Frogs Farm different.

Paul: Thank you for that. I think what often catches people's attention is the sales figures. But, there are many farms out there that we've met who are doing better than us, or the same as us, for sale per acre. But, the reason sales per acre figures are important for Singing Frogs Farm is because we are also focusing heavily, and exclusively, on doing a really ecological farming model, with no tillage of any kind. Entirely hand labor, ecologically based farming model, that happens to also produce revenue for us to live on, and our crew.

Elizabeth: And I think that there's a lot of information out there, especially right now, about tillage and carbon. It is really rocking the box that farming has been in. I mean, you think of farming, and what do most people think of? They think of a tractor and a plow. Here we are, these little Northern California farmers on less than three acres, saying, "We're doing it. We're not doing tillage." I think that rocks a lot of boats.

Elizabeth: What we're doing is very specific. There's a lot of ways to do it. We have gotten into sharing it, because ... Oh, gosh. I don't even know why, but, we got into talking ecology. Our background is really in ecology. We love that. People kept asking, and so we kept telling about it. That's how we got into telling about it.

Paul: I think it's really critical for farmers to remember our job, our role in this world. It isn't just raising food, and making ends meet, which is critical, 'cause you can't be a farmer the next year if you didn't make your ends meet the prior year. But, part of that growing food process, obviously involves soil. We can get into a whole debate on hydroponics and organics and all that, but soil is foundation for a farmer.

Paul: We have to remember that, what makes planet earth distinct is not the chemistry, it's the biology. Biology's what's makes it distinct here. Soil biology is critical to all life on earth. All things that die get transformed, through soil biology, back into nutrients for the next round of life.

Paul: In addition to that ecological condition, more importantly, is photosynthesis. Photosynthesis taking all the atmospheric carbon that we have too much of, and free and abundant sunlight, is drawn in by the plants and made into all kinds of nutrient and energy packets of which, yes, the plant grows using those nutrients, but at least a third, and up to two thirds or three quarters of the nutrients a plant makes through photosynthesis is exuded through the roots to feed soil biology.

Paul: It's critical, as farmers and land managers, to remember that photosynthesis is what makes planet earth unique and special. We need to constantly be feeding soil biology through the act of photosynthesis, therefore maintaining a full and complete cover of green living plants on the soil, at all times of the year, as best as we can, is critical. A diversity of plants, so you have a diversity of root exudates, is critical. And of course, you never want to disturb that soil with any means of mechanization or metal tools going into the soil, because all that disturbance is gonna wipe out the biology that's there and destroy the habitat, destroy the inner relationships, destroy the fungal colonies, and networks, destroy the root exudate pathways. It's gonna wipe out that which, as farmers, we need to care about most.



- Elizabeth: I think, he said that very much from the ecologist side. But, what you're also doing is, you're also growing food that you are feeding to your community, that you are making a livelihood off of, and so forth. We can do these two things together.
- Elizabeth: And, we want people to understand that, the way that we've gotten it to work on our under three acres here in Sebastopol California is not the way it needs to be done. There's all sorts of really innovative things that are happening. It's just that the box of tillage that a lot of people are in, we want to have people think about how might there be other ways to do that.
- Chris: When you say, "No tillage," on your farm ... and I've talked to a lot of people who say, "We don't do tillage." Or, "I've got a no-till farming operation." But it seems to mean something different to everybody. When you say, "No-till," does that mean that you guys aren't stirring the soil at all? Aren't going in there with a broad fork? Or are there some intermediate technologies that you're applying, that aren't going in there with a BSC, or a rototiller, or a plow?
- Paul: Sure. Great question. There are many versions of no-till. In fact, the common mechanized no-till on soy and corn farms across the Midwest, that is actually only no-till for two or three years, and then they do a full round of tillage to wipe the slate clean and start over. That's still called no-till.
- Paul: For us, we have beds that we have not destroyed the soil in for seven straight years. Those beds have had probably on the order of about 30 or 35 crops, maybe even 45 crops, over those seven years, without any broad fork, without any keyline plow, or a hoe, or a rototiller, or anything else, but simply managing the soil, fluids, through keeping it covered all times, with green living plants, that are maximizing photosynthesis, and having a zero disturbance.
- Elizabeth: Now, where might some ... You be able to say, "Oh, there's something that might be tillage." Let me answer your question on that. On the initial field creation, we did do tillage. But that was actually because we were doing tillage initially. A lot of people who are transitioning their farms over, yeah, you're already doing tillage. Do one more pass of tillage. Or, do an initial pass of tillage, put it in no-till beds, and then never do it again, as a way of getting started off. But there are completely no-till ways to get started as well. That's one ... there was tillage at that point.
- Elizabeth: Another one is the broadfork that you brought up. We are on primarily a sandy loam, about two thirds of our fields are a sandy loam. About one third is a clay loam. Our sandy loam fields, we did use a broad fork at first. We do see a broadfork as a really good transition, or initiation tool. We don't see it fully as tillage, because you're not inverting the soil. You're not really breaking up aggregates. Yes, you are bringing in some aeration-
- Paul: In fact, with a broadfork, you could even use a broadfork during a cropping cycle so that you can do it while you have full green cover and photosynthesis on the soil. There's no reason a broadfork has to be done in a bare and empty bed. It's really just to lift the soil and de-compact it. As she said, it's a transition tool, 'cause the active tillage, when we began our farm, we were tilling for one or two years in the beginning. That turned a lot of that sandy loam into concrete. Then we had to work with a broadfork, for the next



year or two, to help break up that concrete and turn it back into even healthier soil than it was before we began tilling.

Paul: The lower fields-

Elizabeth: The lower fields that are a clay loam, as I just mentioned, we actually get flooded almost every winter. We didn't this winter. Last winter, we had seven floods. With that clay, we get quite a bit of compaction. It was far worse when we were doing tillage. Last year we did broad fork in all of those lower beds that were a clay loam, that were compacted with seven floods. But, we aren't at all this year, because we haven't had any floods. It's really ... depends on the situation, and I don't know that I'd even consider a tillage.

Chris: What else are you doing, then? In the absence of tillage, there must be some sort of action that you're taking, to favor the growth of the annual plants that you wanna have growing in those growing beds, over everything else that might be trying to grow in those growing beds.

Paul: Well said. We're both laughing. Yes, of course, 'cause that's what the farmer's job is. In order to describe what we do, it is incredibly easy. In the morning, we harvest cauliflower. We come back through, and we cut the plant out, at or below ground level, leaving the root structure intact in the soil. All the top growth, above ground growth, goes to the compost pile. Then we come back in, and we prepare the bed, which we can talk about briefly, soon, either with compost, or with organic fertilizer, or neither, or both.

Paul: Then we transplant the next round of crops in that bed, so that the time from one standing crop that was just harvested to the next crop that is now transplanted in, hopefully is on the order of a few hours. That way we have maximum, consistent photosynthesis. That act of clearing the bed allows us also to clear out weeds, in addition to clearing out all of the left over nutrients from the crops. Because you left that cauliflower root intact, let's say, all the rhizosphere, all the biology associated with and surrounding that rhizosphere of roots of cauliflower, they're never harmed. In fact, the roots won't even begin to die for a couple days. They're still being fed exudates. They're still having that relationship. Meanwhile, you've already put a brand new root structure of the next crop in the ground, right next door to that cauliflower in the bed. So you have this rhizosphere that is never deprived of nutrients, and immediately is offered a whole new source of nutrients coming in right next door. You're maximizing health the whole way through.

Chris: When you're talking about the rhizosphere, what you're talking about is this web of mycelium that is down there in the soil, that's inhabiting the roots of the plant that you've just cut the top of off, that cauliflower plant that's no longer in your field. But the mycelium are still there, and in those roots, and spreading out into the soil. What you're saying is, now you can go from that into the next crop.

Paul: Correct. It's not just mycelium, it's also the nematodes and the bacteria, and all of the other beneficials. There are just billions, and billions, and billions, and billions of species of beneficial soil microbes that, mostly, we know very little about, except that, the more of them we have, the healthier our plants are. The healthier the soil is, and the higher the nutrient density of the crops coming out of the soil is, as well.



- Elizabeth: And also, I'd like to add in there, we are not mechanically moving the soil around. But, everybody else is. The plants are. The earthworms are. All of the other little organisms, they're moving the soil around quite a lot. That's how it should be. We don't wanna disturb that ecosystem and that process that they have going on. We wanna work along with it, rather than against it.
- Paul: As a result of our managing our soil in a no-till system over the years, certainly we apply compost between most crops, especially if we go from a heavy feeder to a heavy feeder, but not always. We've actually done soil tests going down three feet in our fields, in our beds. We've find that the organic matter levels down at two and a half to three feet of depth, are the same as what our organic matter levels used to be in the top six inches, before we began tilling the property.
- Elizabeth: Which just-
- Paul: Which was about two and a half percent organic matter.
- Chris: Wow.
- Paul: Since then, we have no increased our soil organic matter in the top three foot horizon so that the bottom of those three feet is two and a half percent, the top of the three feet is anywhere between eight and 11%, depending on what we feel is appropriate for that field in terms of its exposure to sun and wind, and soil type, clay or salt, or sand, et cetera. We can actually modify the organic matters to go higher or lower, according to what kind of benefit or detriment we see for that field and what it needs.
- Elizabeth: One of the things that we found is, I mean, they say that our fertile land used to be between six and 10% soil organic matter-
- Paul: Not ours, but, the USDA says that, nationally speaking, much of the good Ag land in the US was between six and 10% organic matter, before humans intervened.
- Elizabeth: Thank you for the clarification. Ours in the greater sense, was between six and 10%. Through our recent soil management practices, that's come down to one to 2%. In California, even further, the CDFA, the California Department of Food and Ag, 18 months ago, said that California has a 1% soil organic matter.
- Paul: Average.
- Elizabeth: Average.
- Paul: Now, we didn't used to. Right? We depleted it, destroyed it.
- Elizabeth: Exactly. We've found that sort of, eight to 11, 12% soil organic matter is really where our plants are doing well. I don't think it's a surprise. Where it used to be, where mother nature had it, is a really good place to be.
- Chris: Right.



- Elizabeth: We do hear of some farms that have gotten their soil organic matter much, much higher. We just didn't find much benefit to that. And don't know anything about it. Maybe they've got some amazing thing going on there.
- Chris: Now, for building soil organic matter, what have you been doing to make that happen? You mentioned the compost. Is that your primary source of soil organic matter?
- Paul: Great. I'm glad you asked. That's often what's promoted in literature written about us. But, it's not at all, necessarily, the truth of what is happening here. As I mentioned, we've had this amazing increase in organic matter in the top three feet of our soil. Some background napkin calculations with a few other soil scientists, friends of ours. We all sort of agree that, honestly, if you calculate how much compost has been put down over the years in the fields, that the organic matter level increase we've had, can only be accounted for, only about a third, or a quarter of the organic matter levels increase can be accounted for by the compost additions. Which means, more than half of the organic matter increase we've had on the farm has nothing to do with the compost, and everything to do with the other hundred tools in our toolbox, for better soil management. Compost is simply one tool in our toolbox. There are many, many hundreds of others.
- Paul: I started a few minutes ago by mentioning that, it's so simple. We cut out the plant. Prep the bed, and transplant the next one. Like anything that's successful and healthy, and really deeply comprehensive like this? It is never as simple as three little things, right? There are actual a thousand little nuanced techniques to make it function really well. That's where all those gains come in, not just mere organic level gains, and soil biology gains, but also the crop harvesting gains, and the amount of revenue that we're generating from our fields.
- Chris: Okay. Let's just start a list. What are all of those thousand little things that you're doing?
- Elizabeth: How much time do you have, Chris?
- Paul: This is one of those things where we have workshops for a reason. We gotta get out there and get your hands dirty. It's all of the little manner of techniques that all work together in a system. I guess one, easy way to start with would be having large transplants. If you direct seeded crops out in the fields, well, that direct seed goes in the soil, and takes a week of staying constantly moist and wet as you water it. But, while you're watering the seed, you're also watering weed seeds. Then they germinate. Then you still have another three or four weeks until they really grow and begin to cover and shade the soil.
- Paul: That means you have at least a four-week time, in which you had nothing covering the soil, nothing feeding the soil, and yet you were watering it. If your organic matter's low to begin with, and you're just watering it for four weeks, with no roots, then you're mostly leaching out the nutrients that you had put in ahead of time. Hence, you need to top dress and side dress a month or two after germination.
- Paul: We prefer to do transplants. We also use very large, healthy transplants. They tend to be five or six inches tall. They've been in the open nursery for four weeks. We use the large six packs that you would find at any standard nursery. Not the jumbo six packs that are deep, but just the standard six packs. We do one seed per cell. No thinning, 'cause



thinning is just maintenance. It's management, it's not production. We put transplants out so that we can have large, healthy plants going into the fields the same day that we just had a standing crop that we harvested out.

Paul: Some of the benefits of a large, healthy transplant going into the field at four weeks of age is, if it's spent the first four weeks of its life in a nursery, then it has less time in the field. Less time in the field translates to more crops per year, and also translates to less availability for pests. If we do have pests that show up, if it tends to be, maybe aphids. The aphids might just finally discover that topsoil or that broccoli, at the very, very end of its harvest cycle, because it had less time in the field and more of its life was in the nursery.

Paul: If you're just having aphids arrive on the last 5% of the broccoli harvest, guess what? You harvest the last 5%. You wash off the aphids. You cut and clear the plants. Put them in the compost pile. Cover the compost pile with a blanket. Cook the aphids. All of a sudden, the aphids that began to appear are wiped out and killed before they can even make the next generation of life.

Elizabeth: So, intensity is really, really important. Making sure that you're constantly keeping big, young and healthy, and active plants in the ground, so that they're at the height of photosynthesizing and feeding the soil.

Elizabeth: Also, I'd like to say ... You asked, "What are the thousand different things that you are doing there?" And of course, we can't go into them. But, honestly, they are going to be different on our farm than they are on yours, than they are on so-and-so's. I'd really love to emphasize the importance of observation, being out there and trialing things. Watching, "Wow. This feels a little bit dry. Wow. I think I could cover things. Let's try this." Just observing, and observing, and observing.

Elizabeth: Honestly, that is how we've developed our system, is doing tillage. Doing what we thought was the right thing in organic agriculture, what we were being taught. Observing that, that wasn't working. Observing the soil. Observing the pest problems. Blending in ...

Elizabeth: Paul and I, our background, actually, is very different than other people. The two of us met in West Africa. We helped people farm in West Africa.

Paul: In the Sahara Desert.

Elizabeth: Yes.

Paul: I was gonna say, she's heading towards an ecological description of our farm. But, one of the other main tools in our toolbox would be focusing, first and foremost, on the ecology. I mentioned the below ground ecology of soil. But the above ground ecology is equally as important. That's one of the main reasons we have had such success with managing our soil.

Paul: Back to ... we were farming in Saharan West Africa-

Elizabeth: I'm just saying, we saw a very different way of farming. When we were observing that things weren't working well on the farm, "Hey, let's try something completely different here. We had seen people do hand labor, permanent beds. Let's get rid of the tractor.



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It's not working for us. Let's use a rototiller instead. Let's build permanent beds. Oh, let's also see if we can go year round, because we need to pay for our property taxes and we're not making enough money. Oh, and we have this fantastic employee. If we, for the third winter, till everything under and put in a cover crop, we're not gonna have work for him for three months. He's gonna move to Santa Cruz and probably not come back again in February or March. Let's see if we can make some permanent beds that we can keep the tractor out of. Farm in the winter, and see what happens here."

Paul: So there was a definite demand from the economic side of servicing the mortgage. And, definite demand from the social side of keeping an amazing employee. There's also an ecological demand in that, we were actually invited ... Deborah Koons Garcia was coming out to film for Symphony of Soil, a very good movie if you wanna watch a movie about soil, even though she doesn't talk about no-till in it, but she does talk about soil and soil health.

Paul: One of the checklist items that she wanted to film on our farm was earthworms in a vegetable bed. We went out there early in the morning, to make sure that we had the earthworms in the vegetable beds, 'cause you don't wanna not have something when the film crew shows up. We're looking around, and the first bed we dig into, tons of earthworms, but the vegetables are kind of ugly. We go to the next bed, and dig in that one, couldn't find an earthworm. Go to the third bed, dig in that, not a single earthworm. Go to the fourth bed and dig in that, tons of earthworms, vegetables look beautiful. Good. Phew. We can have a nice filming for the crew. The day went on.

Paul: Meanwhile, we're sitting here scratching our heads going, "Why did the first and fourth bed have earthworms, and the second and third didn't?" That was quite a conundrum for most of the morning, until we realized, that second and third bed, had had a walk behind rototiller in the past six to 12 months, those two beds. The first and fourth bed, that had the earthworms, hadn't seen a walk behind rototiller in 18 months or longer.

Paul: All of a sudden it dawned on us, even the walk behind rototiller was wiping out the earthworm populations for at least a year in our beds. Earthworms are just a macroscopic life. What about the microscopic life? What about all of the things we can't see? What's happening to them?

Paul: This huge ecological impetus was behind our transition to no-till, in addition to the social and economic impetuses of keeping an awesome employee year round, and giving them job security, and being able to afford to farm vegetables on newly purchased land in Sonoma County.

Elizabeth: I took you a little bit down a wormhole, talking about observation. Sorry about that.

Chris: No, I think it's good. I actually ... It's something that I come back to again and again in my own thinking about farming, is the importance of management. One of the key steps in management is, I call it monitoring, because I stole that from the holistic management people, but that is really what observation is. It's looking and going, "Am I getting what I want out of the thing that I'm doing? Is this moving me towards the objective that I'm trying to achieve?"

Paul: That's why I think it's so critical for farmers to remember the process of biology and photosynthesis, and the underlying foundation of our livelihoods, which is soil. So often, that's out of sight, out of mind. We assume the soil tests will tell us what minerals and



nutrients need to be put back in. But that biology is so often forgotten about, in part because we just don't know enough about it, except that we see when biology is healthier, everything else is easier, and healthier.

Paul: We're at the point now where, we pretty much don't have tests. We pretty much don't have weeds. We've gotten rid of most of all the viruses and diseases and pathogens that were out there. We've been able to farm tomatoes in the same beds for 12 years. The first couple of years of doing that, when we were tillage based, those tomatoes had viruses and diseases. But we've still had tomatoes in the same beds, and as the soil gets healthier and healthier, those viruses and diseases have faded away.

Chris: Talk to me about the kinds of things that you're observing and paying attention to, when it comes to measuring and evaluating your soil health, if you're not relying on the soil test.

Paul: There actually is a myriad of soil tests. I think a really fun one was a total microbiology test for the soil. We didn't need to do it, but we wanted to, because it was actually a confirmation of all our other management techniques, and other observations that we can go to, as well. But this one observation was doing a PLFA test. There are many types of biologist tests of course. PLFA is just one, of many. But one of the results we had from that was, we did a control test in one of our green grass, permanent roadways, and we did another test 30 feet away, in a vegetable bed, in one of our no-till fields.

Paul: These two tests were 30 feet apart. Both had basically permanent crops, but one of them was a permanent grass cover, and no harvest from it. The other one's permanent vegetable rotation, and constant harvest. What we found is, is that the grassy roadway had slightly above average for total microbiology. Thirty feet away, in the production economic vegetable beds, we had about four times as much biology in the soil, three and a half to four times as much biology in a production area, over the permanently grassed roadway, which should have been a very healthy ecosystem to begin with, and it was.

Paul: That kind of laboratory observation was really critical to giving some numbers to what's happening in the microscopic range. But, macroscopically, some observations are simply, "What is soil tilth naturally doing? How much moisture is it holding? How much plant cover's on it? What kind of diversity of plants are in the soil? Are we making sure to rotate enough beneficials through? Are we inter-cropping and multi-cropping vegetables together to create diversity? Are we maintaining edible weeds along the perimeters and throughout the beds to add even more diversity and more plant cover?"

Elizabeth: I would say a lot of it, actually comes from just sticking our hands in. From transplanting. "Is it dry? Is it wet? Is it chunky? Am I encountering life in there? Oh, there's an earthworm here. Or there's too many Roly Polys over here. The soil is really cold here."

Paul: She mentioned soil being cold. That's actually an interesting offshoot that we could go into. One of the ways to cover your soil, if you can't do it with green living plants, is to cover it with mulches. They can be dead plants. It can be straw, wood chips, or get into plastics, and landscape fabrics and stuff like that.

Paul: It's interesting to remember that not all mulch is necessarily good. Some mulch can reflect a lot of light, like a straw, and keep your soil very cold, which, in the summer, for brassica is great. But, in the summer for corn or tomatoes would be horrible. It's



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interesting for us, being in a very cold valley bottom, that we need to be aware of the temperature of the soil, and temperature of the climate, and really help to accelerate the warming of our soil in the springtime, and lengthen the warming of the soil into the fall as far as we can, but yet, protect it from summer's furious UV exposure and wind, as well as protect it from winter's deep freezes that we have, constantly and repeatedly.

Elizabeth: Another major observation is the crop that we are just harvesting and taking out of there. How did it do? How quick was it? How did the leaves look? Is there a lot of leaf growth? Is there a lot of the fruit ... what else?

Paul: What season did it just grow in?

Elizabeth: Yes.

Paul: What does the soil look like, right now, as the crop comes out. What season are we heading into? What's the next crop we wanna put in, et cetera.

Elizabeth: Then also, not necessarily our observation, but what has the weather been? What is the weather projected to be? Those are really, really important. We just had a very strange two weeks, where it was almost 80 degrees-

Paul: I think it was 80, in early February. Now, we're hitting low and mid 20s in the mornings right now.

Elizabeth: Yes. The high for today is 55, and the low was 20 this morning. Taking all of that into account as well.

Chris: Paul, you mentioned above ground biology leading to soil improvement. That doesn't feel, to me, like an obvious straight line sort of a thing.

Paul: Oh, conservation. Yes, and actually thank you for asking about the above ground macro biology, again, because that is really our foundation, and our beginnings, and our origins. My master's degrees were really looking at how to help farmers in the hot, dry tropics to regenerate their soil, and regenerate their livelihoods. I worked very much with agroforestry, trees and bushes, and how those interacted with soil and crops to help bring back vitality to heavily degraded lands, the tropics.

Paul: Now, we are here in a cold tempered zone, in a low valley bottom, in inland California, slightly inland California. It's intriguing the location we have. We focused, first and foremost, on building back that ecology. We planted a couple thousands Sonoma County native, pollen air friendly perennial hedge row plants, so bushes, mainly, that were natives here. We also put in trees and fruit trees, and fruiting bushes, blueberries, and elderberries, stuff like that. But the main focus was really on pollen air friendly perennial and native bushes. What a bush is doing is, in part, drawing up nutrients and moisture from deeper levels than vegetables will go. Then they drop leaf litter on the soil's surface, adding more nutrients. Taking deep nutrients and depositing it on the surface, where it's more available to our soil, and our plants. But honestly, one of the huge benefits that a low bush hedge row can provide to the farm, we're talking about three foot to six foot, or three foot to eight foot bushes. It isn't necessarily the beneficial insects and pollinators that I'll get into, but it really comes from the overall management of the climate on the farm.



- Paul: Your vegetables are primarily all one to two feet tall. They have quick little lives. They're down there against the soil. These bushes that are taller provide windbreaks and climatic stability for all the fields. We're talking windbreaks of these hedgerows every hundred feet, every 150 feet, fairly close together. That reduces the amount of wind stress on the plants, and wind stress on the soil. It reduces the amount of evapotranspiration, and transportation, therefore water loss, in the overall system, including soil. It overall protects the soil and keeps it a little bit healthier, a little bit more most.
- Paul: We've also found that these hedge rows, because they are drawing up deep water, and exuding that water through their leaves, they're creating a little bit more atmospheric moisture and humidity in the air, which means that on super hot days, it's a little bit cooler near the hedge row. On super cold nights, it's a little bit warmer in a hedge row. The overall climatic benefits of the hedge row are significant, really hard to quantify, but very significant for both the vegetable plants and the soil nearby, and making a much healthier system.
- Paul: You can know this yourself, as a human, because your plants, and your soil biology need the same thing as you need. If you walk out into a field and it's a big, expansive, barren area that's dry and dirty, you're gonna feel exposed. You're gonna feel, basically, naked out there, and exposed to the elements. What are you gonna do? You're gonna go find a fence to lean against. You're gonna go find a tree to stand under. You're gonna find bushes or cars to be near. You're gonna want some other structure that's bigger than you next to you, to help to provide that feeling of protection.
- Paul: Your vegetables? They want the same thing. But they're out there 24 hours a day, seven days a week. They can't move, 'cause they're rooted. So we need to bring that protection to them as close as we can, and create this hedge row atmosphere throughout the fields to help create some climatic stability.
- Chris: Are you using cover crops in your fields? You mentioned that in the old days, you would've tilled everything in in the fall, planted a cover crop, and then come back in the spring, and that you're not doing that anymore. But, do cover crops figure into your crop rotation and your soil building strategy?
- Elizabeth: The cover crops, in the way that most people think about them, do not. Every crop we have out there, whether it's a Napa Cabbage, or pepper, or a broccoli, or whatever it is, radicchio, fennel, I don't care what. All of them are covering the soil. All of them are feeding the soil. All of them are part of this system. No, we do not do a noneconomic cover crop. We do some favus and so forth, but we will harvest those as well. Every crop on our farm is a cover crop and is an economic cover crop. That's all I can say about it.
- Elizabeth: I do know some people ... Part of our system is being year round, and being very intensive. That's a lot of work. We have a really fantastic crew that we work with. I would love to shout about that at some point. But, there are some people who are in different climates, or who don't wanna be that intensive, and wanna, for instance, take off their winters, or take off their summers. For them, it has worked well to put in a noneconomic cover crop, and then do something like chop it and occultate over it, or something like that. It can work as part of the system. We do not on our farm.



- Paul: An important equation to add onto that, is that if you do a cover crop, and you either chop and drop, or till under, then, between two thirds and three quarters of the carbon and nitrogen content of the cover crop is often lost in the atmosphere. Only a quarter to a third is maintained in the soil. But, if we look at every single economic crop, as a cover crop, and we're cutting and removing the plant growth and putting it in the compost pile, when you compost the green biology, green organic matter, and put it back in the field as finished compost, you've actually maintained two thirds to three quarters of the carbon nitrogen in that compost, and only lost a quarter to a third of it to the atmosphere.
- Paul: Through the act of growing these all as economic cover crops, and then removing them and putting it back in the field as finished compost, we're doubling the amount of nutrient retention, versus if we had grown a noneconomic cover crop, and then plowed it under.
- Chris: Paul, can you explain why that is? I understand what you're saying. If I have a crop in the field, and I just chop it and leave it lay, why wouldn't that be getting me as much organic matter ... 'cause the same amount of organic matter's there, as if I put it in the compost pile?
- Paul: Right. Chop and drop or tillage, either way, you're ... Chop and drop, you're losing a lot of the C and N to exposure. The wind and sun is gonna draw out a lot of the nutrients. It will volatalize with the ... Well, the carbon, and nitrogen of the plant matter will volatalize with the oxygen in the air and form carbon dioxide and nitrous oxide, through the most potent greenhouse grasses.
- Paul: Same goes with the tillage. If you plow under a cover crop, that very act of plowing it under, and tilling it up, is breaking it up from large plant matter and large soil aggregates, down to small chunks. You have a greater surface area to volume ratio after tillage, therefore you have more exposed surfaces. Obviously, in the end carbon oxygen from the plant matter and the soil both, are also exposed to the oxygen being injected through the act of tilling. They combine, again, to form carbon dioxide and nitrous oxide. Those lift off and go into the atmosphere, as greenhouse gases.
- Paul: In both cases, much of your C and N, in the plant matter, or back in the soil, is lost through exposure, and through disturbance. And yet, as farmers, as we know, the two things that you need most in your soil are nitrogen for plant growth, and carbon for soil structure. Versus if you'd removed the biomass from the fields, put it in the compost pile and composted it, you have a much larger percentage of that is being maintained in that compost pile, especially if it's a covered compost that's well managed. Then it gets put back in the field.
- Paul: The trade off is, obviously, to compost it all, requires more labor. To just chop and drop or till under, is much more efficient and easy to do. If you have 100 acres you're working on, this may not work. But, I would love to see, rather than 100 acre no-till veg farms being intensive, I would love to see 100 one acre no-till veg farms being intensive.
- Chris: So, if, instead of chopping and dropping, you're taking that cauliflower plant, or that tomato plant, or whatever it is, chopping the top of it off. Wheeling it out of the field, and now it goes onto a compost pile. Talk to me about the process of turning that tomato plant, or that cauliflower plant into compost, at Singing Frogs Farm.



- Paul: Sure. We do have about seven or eight or nine different compost piles around the property. We wish we had more of them that were more centrally located to more fields. But we try to get a compost pile near every two or three fields, and then have space for two piles. You can make one, and turn it, and then start making a second one.
- Paul: But the process is pretty darn straightforward. We try to keep things as low maintenance as possible, and highly focused on productivity. Rather than saving up different ingredients from our fields and then build a pile all at once, we don't do it that way. We, instead, we are simply just feeding the pile with whatever comes out of the fields at all times. We just feed the pile. Feed the pile. Weeds go in there. Weed seeds go into there. All of our vegetable matter goes in there, et cetera. All the green matter goes in. Then we will certainly rake up oak leaves from our oak woodland. We can bring in some neighbors horse manure from organically fed horses. We can bring in some purchased compost. We can blend all of these better to make our finished compost.
- Paul: However, in the process of making ours, as I said, we keep feeding the pile until the pile is full from our point of view. From our point of view, a full pile is one that we can no longer manage by scale, so a maximize size would be about 20 feet long, 15 feet wide, 10 feet high. At that point, we tell the crew, "Okay, we're done feeding this pile. Let's start making a new pile over here." Then we take that finished pile and we turn it, immediately, 'cause by the time we finish building it, over three to eight weeks of feeding it, usually the bottom half is already mostly decomposed.
- Paul: We invert the pile right away and then cover it with a compost blanket. Then it's a matter of ... we will certainly turn it at least three, or four, or five more times so we can ensure that the pile spikes up to 150, 160 degrees Fahrenheit at least four, or five, or six times. But, we may do that process slowly, over a few months, if the compost isn't needed right away, or we may do that process really quickly, over a few weeks, if the compost is needed right away.
- Elizabeth: Another thing is, we make more than half of our own compost. But, we also do bring in some compost. We feel pretty strongly that, the best compost is two or three different composts mixed together, because each will have positives and negatives. It might have really fantastic body and be great at holding water. Or, it might have really good nutrients. But, generally, you won't get one compost that is good at everything.
- Elizabeth: We bring in compost from our municipality. We've been having some challenges with that the last couple of years, due to some political things going on. But, generally, the idea is that us, as farmers, one of our jobs is exporting nutrients off of our property every single day. Water and nutrients, and those nutrients need to come back from our community. The ideal way to do that, is a nutrient loop, whereby we can get compost from our community. That's what we try to do on our farm.
- Elizabeth: Once we've gotten through the process that Paul just described, the very last turn, we will combine our compost with something that is purchased. Turn it one more time. Cover it one last time. Let it sit there for a short amount of time, and then use that.
- Chris: Again, not to get too focused on compost, but how much compost are you putting down on a bed before you plant?



- Paul: Right now, our heavy compost beds we're putting in getting ready for a six month tomato crop. We are putting on about a half inch of compost. Some beds, especially in our hoop houses, where we, over-winter lettuces, we have found that we can actually create an aphid problem by having too much fertility in the soil. We often put down a half inch of compost and organic fertilizers in August, for our last cucumber crop. Those cukes, we'll harvest out by Halloween, and then we'll follow it with three successions of lettuces over winter until February or March, without any further compost or fertilizer of any kind. We'll do the one cucumber crop, plus three lettuce crops, all banked on the one set of nutrients put in August, as well as the healthy soil biology in the first place.
- Paul: For our field crops, it really depends on heavy feeder to heavy feeder, light feeder to light feeder. We're putting out about half inch of compost on, maybe, 70 or 80% of our beds. The rest of them won't get any compost.
- Elizabeth: Now, when we started out, and when we start a new area, we will do a little bit more than that. It'll be one to two inches of compost for the first few crop rotations, to get things started. That definitely helps get the bed going. It also helps with suppressing the weeds, because ... when you get into a no-till system, it takes a while to work yourself out of the speed bank that's there.
- Paul: Which, is kind of an irony, because it was the tillage, for us at least, that created a lot of the weed problems that we now have, especially vine weed. Vine weed was never very prolific on the farm when our tillage, in the beginning, made it prolific on the farm. We've actually used that one to two inches of compost to start a bed, as just that, as weed suppression, often.
- Chris: When you say as weed suppression, really, you're talking about what I might call a mulch, to control the weeds.
- Paul: Yes, but it'll be, obviously, since it's compost, it's a nutrient dense mulch, as opposed to a wood chip or straw mulch, which is gonna be all carbon based, and therefore, actually deprive your soil, temporarily, of nitrogen.
- Chris: You bet. Now, one of the things that I've noticed as I've been flipping through the pictures of your farm, that are available online, is that it seems like you guys do a lot of ... I call it inter-planting. Having onions and lettuce, or having tomatoes and another crop, all in the same bed. Can you tell me a little bit more about when you decide to do that? How you make sure that process works?
- Elizabeth: I'm thrilled that you asked about that, because we love doing inter-planting. One of the things that Paul said earlier is, keep your soil covered as often as possible. By having ... and diversity. By having two crops in there at the same time, you are more than doing that. And then, also, the main crop that goes in there, there's 100% cover of that when it goes in. That would be the leeks that you're looking at. That would be the tomatoes. Would be the Romanesque cauliflower, things like that. You're getting 100% cover on that, and then you're getting an additional, anywhere from 40 to 70% of another crop. You're getting 1.7 crop outta there at one time, which is fantastic.
- Paul: But then, the interrelationship through those plants, obviously have structural relationships. We'll do a low, wide lettuce with shallow roots, mixed in with a Romanesco cauliflower, which is a tall, big plant, with much deeper roots before they go



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to wide. The relationship is, they both go in as transplants at the same time. While they're growing together, the lettuce is helping maximize photosynthetic capture and cover of the soil, 'cause the Romanesco cauliflower would be spaced too far apart and have too much light going through the soil. The lettuce is helping maximize photosynthesis, helping maximize root exudates. It's helping maximize soil moisture retention. It's not drawing out more water. It's actually maintaining a higher level of moisture in the soil by protecting the soil and covering it. And it's also suppressing weeds.

Paul: Simultaneously, Romanesco cauliflower is growing big. As you get closer to lettuce harvest, the Romanesque begins to close canopy, and the leaves of the plants will begin to touch. So, just as your lettuce is getting ready to harvest, it's getting the maximum sun and wind protection from the cauliflower.

Paul: While the lettuce is benefiting the cauliflower, and the soil, in many ways while it grows. Right towards the end the cauliflower benefits the lettuce. Lettuce harvests out. Now you have a weed free bed with high organic matter and high moisture content, and the cauliflower can go to town and produce its crop.

Elizabeth: In spring, summer, and early autumn, almost all of our lettuce and many of our Asian greens are put in with another crop, not by themselves. We will only do that during that period, because in the winter, we might have competition for sunlight. That is one of our biggest limiting factors on the farm, is, how much sunlight we have. That is the main reason that we slow down in the winter as we get fewer and fewer sunlight hours.

Elizabeth: But, we love doing our inter-planting and do it as much as we can during the main seasons.

Paul: Even an example, like the leeks and mini romaines, or leeks and baby bok choy, we often get two or even three crops of mini romaine, while that one crop of leeks is growing. Or, simultaneous with the tomato crops, we put tomatoes in, starting in early March, even though we have frost all the way until early June. We keep them covered. But when the tomatoes go in early March, we put a side crop of lettuces, or cilantro, or parsley, or something else, or escaroles and [freezes], down the side of the tomato beds. We often can get two sequential crops of lettuce, or Asian greens, while the tomatoes are growing from transplant to their first fruit.

Paul: Having lots of economic revenue rolling in from a bed that is otherwise just growing your tomatoes, is a really nice thing to have economically, but also helps maintain flow entry content, weed suppression, flow biology, all of the other benefits for the soil as well.

Elizabeth: It helps keep your farm small. Having a small farm really allows you so much freedom. You don't have to travel large distances. You can really keep your eye on what's happening. You can keep it intensive. The more intensive that you keep it, the better your soil is, and the better you're able to manage all of it.

Paul: It goes back to the old saying that the best fertilizer is the farmer's footsteps.

Elizabeth: Yes, absolutely.



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- Chris: On that good quote, we're gonna stop here. Take a quick break. Get a word from a couple of sponsors, and then we're gonna be right back with Paul and Elizabeth Kaiser from Singing Frogs Farm in Sebastopol California.
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- Chris: All right. We're back with Paul and Elizabeth Kaiser, from Singing Frogs Farm in Sebastopol California. I'll ask this for both of you, but Elizabeth had mentioned earlier, you wanted to talk about training a crew, or having a crew in this kind of a set up, and how you work with your employees. One of the things that I can imagine, is that with this much complexity in your operation, it's not like you can just hire somebody off the street, send them out to do the work.
- Paul: Farming is a highly skilled job, no matter where you're doing it, especially on an intensive no-till system. It's highly skilled, no question about it.



- Elizabeth: We absolutely love our crew. Because we are such an intensive operation, and a year round intensive operation, everybody needs a break. We need to work together, and we love that.
- Elizabeth: For us, what's actually most important is that people come that are in love with the work, and that know how to move their body. Once you have that, and you can just get stuff done, you can just go, we actually are able to train a lot. No, we don't just take anybody off the street. We want somebody whose passionate. We want somebody who can move. We want somebody whose got a decent amount of experience. Then we want somebody who fits into the crew.
- Elizabeth: We have just really wonderful cohesion in our crew. We have so much fun. You should've seen us yesterday morning, packing CSA boxes in the barn. It was too cold. We got everybody in the barn working all at once. It was a riotous crew. Somebody brought chocolate, and we just had a lot of fun. Sometimes we're talking, "What's gonna happen next on the farm," or farming practices, or there was a rare-seed exchange that somebody went to and they were really excited. Sometimes we're talking, "Hey you're going camping next weekend. Tell us about that." That is very, very important.
- Elizabeth: We train people ... We have a core crew of full-timers, and then a bunch of part-timers who come and go. They are a wonderful addition. They might have a job in a farm related, nonprofit. Or they might run their own farm on the side, or they might be a soil scientist on the side. We love having them pop in and help a couple of days a week, be a very important part of the team, but have a core of full-timers that keeps us going through.
- Elizabeth: Everybody does very similar work. There are a couple of people who specialize in little areas, but overall, we're all working together. We meet in the morning with a to-do list. And, "Hey guys, here's what we're doing for the day. Two people should work on this. Let's get a crew on this." Then people sort of self-select on what they're interested in, how they're feeling that day. They just did a lot of bed prep yesterday and they're body's a little tired. They wanna do some seeding. So, it works really well.
- Paul: We actually, for the most part, people are working on multiple different projects during the day. It isn't just one thing for four hours, or eight hours, or 10 hours at all. In fact, we don't really have 10 hour days. Everyone here works a 40 hour week, or less. It really is focused on a diversity of projects. We are kind of doing a little bit of everything, every day of the week.
- Paul: For the most part, most of the year, we're harvesting four or five days a week. We are transplanting four or five days a week. We are bed prepping and managing four or five days a week. We're doing speed sowing in the nursery about two or three days a week. We just usually knock it out. It's sort of a constant flow of productivity. There's not a lot of time for maintenance. We don't need to do weeding. We don't do any sprays of any kinds, not organic, not conventional. We don't do fitting. We don't do all of that kind of management stuff. We just focus on the production part. We do a little bit of production of all kinds, every day.
- Elizabeth: In the winter, we do a little bit of ... We'll save some of the projects, the management projects. That is also an important part of it, so that we keep our crew here, year round.



- Paul: You know, like re-skinning a hoop house, or widening the gravel parking area for our CSA members, or helping put in some hedge rows, that kind of stuff in the wintertime. Getting straw mulch ready for the spring growth.
- Elizabeth: Yes. By keeping people busy with those in the winter, this year, as people are asking for work on the farm, I'm having the problem of having to say, "Hey, nobody left last year. I have a full crew. We're just rearing and ready to go."
- Paul: No hiring this year, so far. We have just an amazing crew we kept for the past, well, year plus.
- Elizabeth: Yeah.
- Paul: Just ongoing.
- Elizabeth: And now, on our slightly less than three acres of production, we find that about five to six full-time equivalence is what we're using out here.
- Paul: Not counting ourselves.
- Elizabeth: Correct.
- Chris: That was a question I had. You said nobody on the farm works more than about 40 hours a week. Does that include Paul and Elizabeth?
- Paul: It does include Paul and Elizabeth, actually.
- Elizabeth: At this point. When we were starting up, we were doing a little bit more.
- Paul: When we started, Elizabeth did have a off-farm job as a public health nurse, and then she worked here about half the week. I worked, certainly full-time, more like the 50, 60, 70 hour weeks that most farmers know. But, as we got our no-till system up and running, and began to hire people, we definitely pulled back.
- Paul: She became a full-time farmer, three plus years ago, which is fantastic. And now we are both full-time, but our full-time is really sort of that 20 to 40 hours a week, because a lot of our time is put into education and outreach, and networking, and conferences and that kind of stuff. Our actual farming hours are not at all full-time for either of us.
- Elizabeth: Yes.
- Chris: One of the things that I oftentimes see, when people are doing a lot of education and conference work, and consulting, is a lot of criticism. Like, "Oh, well, that's clearly where you're making your money." Are you guys making your money on your farm? Or are you making your money from your teaching and consulting, and telling everybody how cool you are?
- Paul: I'm glad you asked. I was just thinking the same thing, that when we talk about the numbers for our farm, that does not include education, outreach, consulting, or conferences. It is strictly the vegetable production.



- Elizabeth: Yes.
- Chris: You say when you talk about numbers, that's actually something that you didn't just sling out there right away, which I really appreciate. What do the gross and the net look like on your farm, if you're willing to share that?
- Paul: We didn't put it out there at the beginning, because that is not my goal. It's actually sort of embarrassing to talk about the money aspects. I want us to be sustainable and viable. I want everyone to be able to be sustainable and viable. But, I don't wanna talk numbers. The only reason we brought up the numbers was because, we wanted to give validity to our ecological no-till approach to farming. We wanted to ensure that, yes, we are doing all of these wonderful things for the environment, and the soil, and our crew, and all of that. And yes, it happens to also be economically viable.
- Paul: Typically, we're grossing around \$100,000.00 per crop acre, per yer. That is on the two, two and a half acres of production, plus another half acre for the nursery area and the barn, and the compost piles and all that, and roadways.
- Elizabeth: Net is a very different thing, because I'm actually proud to say, we had almost no profit last year. All of our money went out in payroll, which included payroll to us. So we wanna keep it that way. In terms of what you're asking of, "What is your net?" I'm gonna actually take you back a few years ago, before we were doing the consulting. Say, three years ago, when I was still just finishing working and doing public health, and Paul was working six days a week on the farm, and I was working two days a week on the farm, we were netting 75 pay a year. I think that's relevant to your question. It's not the answer that is right now, because, yes, we are doing a lot of education. I don't think that's a useful answer.
- Chris: Right, I agree. But I think that 75 number is an interesting number, because it does really say something about the economic performance of your farm. That is, that it is an economically ... like you said, an economically viable operation, not just in terms of gross per acre, but in terms of what it's actually returning to the two of you.
- Paul: Correct. Correct. I would say that, of our gross right now, a good 62 to 68%, it really sort of varies, but it's been growing every year. Somewhere in that two thirds of every dollar we bring in, goes to our employees, not us, but to our employees. They're collecting 65 cents on the dollar of what we sell, which is great. It makes us feel good. We really appreciate them, which means there's less than a third of our money coming in goes to the farm owners, us, and to all of our other inputs and tools, and fees, and insurances, and those things.
- Chris: When you say crop acres, when you say, "About a \$100,000.00 per crop acre," is that beds and walkways? Or are you guys ... is there a way that you're kind of fudging those numbers around?
- Paul: We tend to measure the entire field corner to corner, which includes all the beds, all the pathways, the hedgerows that are associated, and the tractor roads in between. It's the crop area. We're not counting our ponds, not counting the Redwood trees, not counting the bamboo groves, not counting the sheep pastures, et cetera. But, we're counting the fields with their beds and pathways, and hedge rows. The whole rectangle, and then adding it all up.



- Paul: There is one, very nice photograph of our farm from over head. You'll see the beds running across the length of the photograph from left to right in the bottom, on the foreground. Just to give you an idea, those beds, in that photograph, they're actually 120 foot beds. You're not seeing entire length. You're only seeing about 100 feet of length of that bed. It looks much larger than it really is.
- Chris: You got those 120 foot beds. I actually happen to be looking at that picture while you were saying that. I'm also seeing that you got other beds on the farm that are so much shorter than that, that aren't 120 foot. They must be ... I see the tractor and I'm going, "Well, of course, those aren't 120 foot beds." But, they look like they might be in the 30 to 40 foot length range?
- Paul: Yeah. The shortest beds we have are sort of 30 and 40 foot. The longest is 120 foot. One irony is that, that 120 foot long field is the one where we, about five years ago, I was out there managing crops and crew. We had cabbage growing, some nice Dutch head cabbage, and I had told the crew, "Hey, we gotta go out and harvest cabbage." They asked where. I said, "Oh, in field three." The entire crew groaned.
- Paul: I'm like, "What? What's wrong harvesting cabbage in field three?" They said, "Paul, don't you know? That's the long field. It takes a lot more distance to get the cabbage out of the middle of the field."
- Paul: "Oh." So, it was an employee morale aspect to having certain bed length. We found that our 120 foot beds, you can't see the other end of the bed well. You can see that it's there, but you can't see the irrigation hoses. You can't see the weeds. You can't see the gophers from the far end. So, we actually really appreciate our bed lengths that are between 70 and 90 feet, or 60 and 90 feet, because you can see the far end of the bed. You can see when there are issues and challenges and things failing that need to be fixed. It doesn't require you to walk the entire length of the bed, necessarily. We appreciate our shorter length beds from many management aspects, as well as just employee morale of getting those heavy crops out from the middle.
- Elizabeth: If I were to redesign our farm, I would try and have more beds the same length. We have all sorts of different lengths. It's just because of the organic growth that our farm has had. This field over here and that one over there, it's the way it is. It works out fine. But, I would have more of the same length, as well as having our composting operation in the middle of the farm, and maybe also our pack shed in the middle.
- Paul: But the bed length brings on an interesting other topic, if you don't mind, which is, we want the more bed length, so that we can cut one cross line without get out, and go any bed on the farm. But, I also like having different bed lengths, because the different bed lengths creates a more patchwork, quilt work feeling that's less uniform and mechanistic, and planned. So, it has a more organic feeling, by having different bed lengths.
- Paul: That brings up the topic of how do we do crop planning. The traditional way of crop planning is looking at your field or your beds as the unit. You look at the beds. Say, "How many units can I get in there? How much parsley will it hold? How much tomatoes will it hold? How many carrots will it hold?" The bed becomes a unit around which you do crop planning.



- Paul: Through our no-till intensive model, we used to do that kind of crop planning, with the Excel spreadsheets in the wintertime, and getting ready for the bed units to figure out what goes in where, when, and how much. But as we went to intensive no-till, we threw that out the window. Now, our crop planning comes down to about five minutes every Wednesday morning. That's it.
- Paul: The crop planning doesn't focus on the bed as the unit. It focuses on the plants as the unit. What I'm doing on Wednesday morning, for five minutes, every Wednesday, is, I'm thinking, "What is the harvest rate and sales rate? What is the market demand? From our restaurants, what is the Japanese restaurant in town want for baby bok choy, how can we encourage them to buy more of it? What is the farmers' market able to sell in terms of head lettuce?" Or I just think about our overall sales. I know it week to week. It doesn't change that much, but we can keep pushing certain things.
- Paul: Therefore, I sit there Wednesday mornings and think, "What do I need to sow, to have a harvest rate, to fulfill that demand at the markets?" I sit there and make my seeding list on Wednesday morning, five minutes, and the seeding list isn't very hard, because I'm mostly looking at the prior five weeks to figure out what I'm sowing this week.
- Paul: I know that every week, I've gotta sow 40 flats of lettuce. Every week I have to sow 24 flats of baby bok choy. Every week I've gotta sow whatever it happens to be. We keep moving through the list. Then I know, let's say beets. Beets we sow four to six seeds in a cell, and transplant that cell as one clump. That means we do selective harvesting. We don't harvest the entire clump at once. We select out the big ones as they come ripe, so that our beet harvest lasts four weeks. If I know the beet harvest lasts four weeks, then I wanna sow beets in the nursery every four weeks.
- Paul: So, our sowing rate is dictated by the harvest rate, and the demand from the market side. I simply make a sowing plan that morning for what I sow this week, to make sure that we can meet or push that demand to be even larger. That's our entire crop planning, is plant based.
- Elizabeth: And then you also have your specials. Your seasonal specials, be it brussel sprouts, or tomatoes, or cucumbers. You also do that in the morning. Where, you'll flip back and say, "When did we start cucumbers last year? When did we start cucumbers the year before? How did it work? Great. Let's start cucumbers, not this week, next week."
- Paul: The whole crop plan is really just a spiral bound journal that's about 400 pages. We've pulled up about 250 of those pages in the past four years. I simply just add another date and list of seeding on the next page, and we keep going from there.
- Chris: Anybody who knows me knows that I'm having some ... I'm like breaking out in hives right now.
- Elizabeth: I was gonna wait and see what your question was, but then there is the second half of that, of, "Where do those beets or fennel, or lettuce crops go?" That's the second half of it, which is sort of the fun half.
- Paul: That's where you walk through the fields, once a week or so and have your little voice recorder on your phone. You walk through the fields and say, "Well what beds are ready and available for harvest and transplanting? What beds will be ready next week to



transplant into? Which beds need a little bit of TLC here and there?" Then you walk through the nursery and say, "What plants need to go in the ground this week? What plants could go in the ground this week or next week? What plants need to go in the ground next week?" You go back to your computer, play the voice recording, and you list all your beds out, list all your plants out. And you just match them. It's just a dating game. It's a big puzzle you're putting together. That process takes, maybe, about a half hour. We do that once a week, or once every two weeks, it really depends on the need. Often we can eyeball it. We have very much a living oral history. We keep things flowing very fast on the farm.

Paul: There's a few times we gotta kinda plan it out and say, "Well, you know what? We did strawberries in this field last year. Yeah, there's a bunch of beds ready now, but I don't wanna put strawberries back in there. Let's put the strawberries over in field 18, 'cause the brussel sprouts are coming out right now." That played perfect. A little planning here and there, but for the most part, it's all just on the spot decision making, knowing what the living oral history is, and moving forward and making sure that the plants in the nursery get in the ground, and the plants in the fields get harvested and go to market. The plants become our unit of focus, not the beds.

Elizabeth: And an important part of that is our large transplant size, and the large cell size. It gives us a little flexibility in the nursery that, "Those don't need to go in today. They have a week, and sometimes two weeks to go in, and they will be healthy and fantastic without any transplant shock."

Elizabeth: But, it's also more observation based, again, of what was there, how did it go? "We had cauliflower there, let's not put in that broccoli in there. Let's put in this. We're having a bowl pressure here, let's not put the beets down over there."

Elizabeth: It's very active, and we also ... It allows us to be really flexible so we don't have holes. That crop did really well, and we harvested that kale much longer than thought we were going to have to. There's not another crop behind it pushing to get into that spot. You just moving it into another spot. You had poor germination in this lettuce, because you had a heat wave. Well, you don't have an empty spot then, you just put something else in it.

Elizabeth: It's really flexible and in the moment. I think it fits with some of our other practices of just working with the seasons, and the weather, and the soil, and just being really flexible.

Chris: I think the other thing that it seems to me, besides the big plants, is the fact that you're removing the tops. The crop that's in the field, it's not like you have to wait three weeks for that to break down and disappear. It is something that you are literally pulling out in the morning and planting in the afternoon. I think that's also got to give you an additional element of flexibility there, with that planning and kind of making it more of a dance, rather than a ... What's the right analogy here? Come on. Rather than an assembly line.

Paul: Yeah, sure. It's not pulling the plants out. It's cutting them out. We leave the roots intact.

Chris: Thank you.



- Paul: Which also adds to that, just to be clear, the weeds do get pulled. We tend not to have very many weeds, because we are intensive system, and we're using large transplants. So, what weeds we have, had to germinate from seed and compete against these huge transplants that were already weeks ahead of them. The very few weeds we tend to have are long and thin in competing for sunlight against the established vegetables, which means pulling the weeds is quite easy.
- Paul: We do pull the weeds. We don't cut them off at the ground level, because weeds might regrow, first of all. But, secondly, the rhizosphere associated with the roots of weeds, is a very different rhizosphere than that which is associated with the vegetable crops. The vegetables tend to prefer more fungally dominant rhizosphere. The weeds prefer more bacterially dominant, with different specie mixes.
- Paul: By pulling out the weed roots, first of all, it was a long spindly weed competing for survival. Its root structure's very minimal. Secondly, when you pull it out, you're removing that rhizosphere, which you don't wanna encourage anyway.
- Chris: How are you controlling weeds in the paths between the beds?
- Paul: Many different ways. I think it really depends on, again, time of year, and climate, and soil needs, and associated crops. But, you can see in the picture, we definitely use a lot of straw mulch. We love the rye straw going down as some pathway protectant. That can happen, especially if we have a particularly weedy pathway. But, another system that we've used frequently is to get a three foot wide landscape, kind of like a woven black plastic, it doesn't solarize. It allows some gaseous and moisture exchange. But it does cover and suppress weed growth.
- Paul: We'll put down a three foot wide landscape fabric that goes from the top of the shoulder of one bed, down in the pathway, back up at the top of the shoulder of the next bed. We only have to put it down for three or four weeks. You put it down for two weeks, it kills back the weed, but you pull it off, and the weed regrows from the growing head. You put it down for three or four weeks, it kills them off so they won't regrow.
- Paul: We eventually found that by doing that black fabric in the pathway for three or four weeks, or five weeks, it seems to also, because it's black, help to germinate a lot of weed seeds, because of the conditions under the black. When they germinate and are killed off immediately from the lack of light, that three or four weeks of a black covering, tends to give us weed suppression for many, many, many months to come after the fabric is removed. Now we don't have to have fabric in all of our pathways at all times. I personally find that to be very unattractive. I don't want plastic out there. But, to be able to use it in one out of every 20 beds, just for a few weeks, and then move it onto another bed and keep it moving, is a much nicer system for managing weeds and pathways.
- Elizabeth: Now, I actually wish we could do something else. It depends on the resources that you have available. Paul mentioned that we use rye straw. That's because we're here in California, and we have that as a resource. A lot of people have wood chips as a resource. I wish we had more wood chips. I would put them in all of our pathways and I think that would be great. Not up on the beds, but I love some of the work that's coming out of David Johnson, with his wife, Sue, and their bioreactor, where they are looking at



having a heavy, carbon based slow cold composting process to create a very diverse microorganism-

Paul: It's a heavily fungally dominant-

Elizabeth: ... compost.

Paul: ... compost.

Elizabeth: Yes.

Paul: Out of a heavy carbon feed stock. So it's slow decomposition, slow cold decomposition.

Elizabeth: I would love to just do that in situ, in our pathways, and yet keep the soil covered and keep the weeds suppressed all at the same time. But, honestly, for us, in where we are, if we don't have anybody who will drop off wood chips, and if we purchase them, they are actually more expensive than compost for us. It's just not a resource, that's just ridiculous. It's just not a resource for us. But, if you could do it, I would love to have that.

Elizabeth: We've thought about doing a green cover in our pathways. We definitely do it in our roadways. But, in our pathways, we've talked to a lot of people about, maybe, doing a low clover. There is a small no-till farmer up in Oregon, who tried doing that, and it just ended up getting into her beds. That really slowed us from doing that.

Elizabeth: But, I would love to come up with a better solution there, than the black plastic.

Paul: Yeah. We're always looking for other solutions, especially that are living plant solutions, to maximize photosynthesis and cover.

Elizabeth: Absolutely.

Chris: The beds that you have look like they're raised a lot higher than a lot of the other no-till farms that I've seen pictures of. Did you guys raise those beds intentionally at the start of the process? Or has that just been through the buildup of organic matter and seed yield?

Paul: They were raised intentionally in the beginning. How we managed ... How we created the beds was to mark out the field and mark out a four foot nine inch wavelength at each end of the field. That four foot nine is what works for us, in our system, in our context. Every mark of four foot nine became the pathway. Then we scooped out a shovel and a half wide worth of soil from the pathway and put it on the bed. It wasn't dug out, although you can. You can dig it out from a field and turf. But we actually tilled first and then scooped out the loose soil, added it to the beds. The beds now have one and a half, or two times as much topsoil, and there's no topsoil on the pathway anymore.

Paul: The reason that we're lifting our pathways and raising up our beds, is that we are in a cold and low valley bottom, with a shorter day length up here in a more temperate zone. As a result, one of our challenges is getting our soil to warm up and become more vital to be active.



- Paul: By having a raised bed, you actually have more soil surface focusing on the sun, especially early in the morning in late in the afternoon, to help create more warming conditions, which is why we often like the black plastic as the mulch in the spring and fall and winter, to help create warming conditions. Then we can use the straw mulch in the summertime, to reduce the soil exposure to the heat and the wind of summertime.
- Paul: But, raising up the beds was critical in our cold, wet, temperate zone. Interestingly, when we began doing this in West Africa in the Sahara Desert, I was inverting beds. The beds were sunken. They were lower than the pathways. That was to protect the soil from the exposure and the elements of the wind and sun in the Saharan Desert.
- Paul: It really is about context and exposure, and managing for soil health, and soil protection.
- Elizabeth: Actually, just last week, we visited some friends of ours who are doing a no-till operation, Mike and Shannon, of Hillview Farms. They are not doing raised beds. They actually have very minimally raised beds. They're hoping to not do raised beds in the future. They are in a very different climate. They're very dry, and they have a much more clay based soil.
- Paul: And much hotter summertime as well, and windier.
- Elizabeth: Absolutely.
- Paul: They need to lower their beds down, to protect the soil more. It's a great idea.
- Elizabeth: Yes.
- Chris: You've talked a lot about this very context-specific development. You were just saying this with the beds, right. Sunken beds in the Sahara, raised beds in the cool valleys. You've talked about this in terms of all of the decisions that you guys have made on your farm being very heavily contextual. How much of that came because you looked at the situation that you were in? "Oh, we've got these kinds of soils. We've got this kind of climate. We've got this kind of daylight. Therefore, we need to do those things." How much of it came from you guys screwing stuff up, and then having to fix it?
- Paul: Perfect.
- Elizabeth: Wow, that's a great question.
- Paul: I love how you said it because, that's something that we love to talk about, is, you gotta go out there and do stuff. You just gotta start doing things. We started doing things on a two acre agroforestry plot in the Sahara Desert. Just growing bushes, and growing trees, because we could. Then we were in Baltimore doing master's degrees, and was started growing tomatoes and planter boxes in our window in Baltimore City. You just gotta start doing things. That is such a critical component. We learned, definitely through observation, and through prior research, it's helpful. But the act of physically doing all of this, and making mistakes, constantly, is great, because every mistake is a learning opportunity.
- Paul: They might be failures in the immediate sense, but they are bountiful nurseries of knowledge and experience you're gaining from that failure. So, you just gotta start doing



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the stuff. A lot of stuff, and a lot of different things. Try things out and try five different ways of doing it and see what works. It's a really critical component to any small business, especially one as, I think, complicated and complex, as an intensive no-till farming system.

Elizabeth: And also, going to see other farmers' farms.

Paul: Oh yes.

Elizabeth: Once you've started doing stuff, going to see somebody who does something similar, it makes you think, "Wow. If they do that, why do I do what I do?" For that, I really appreciate your podcast, because we need to hear what other people are doing. Maybe we don't feel comfortable sharing with our direct competitor at our farmers' market or something like that, but hopefully it'll give us ideas. That's also why we like sharing.

Elizabeth: I wanna stress, again, that I do not think what we do on our farm is in any sense a model or what you should do, or he should do, or she should do on their farm. I just wanna say, "This is what we do and what works for us. Now take whatever you can out of it and do something."

Paul: It's not the model, it's a model. We found that we can't extract too much of it. It really is a cohesive symphony of systems working together. What we have created works very well for us. Somebody else, there have been other farms who have replicated our model down to the T and they have had great success as well. There are other farms who have taken a lot of the ideas and the science background, the why it all works, and they have focused that into their own context and their own systems to create their own models that also function beautifully as long as that understanding of the science and the why, and the networking connections is all there.

Paul: Then the actual how of farming can be contextual. That's really critical. There are many models out there doing great things.

Chris: Boom. With that, we're gonna turn to our lightening round. But, first, we're gonna get a quick from one more sponsor. This lightening round, and the Farmer to Farmer Podcast is brought to you by, BCS America. A BCS two wheel tractor is the only power equipment a market gardener will need. With PTO driven attachments, like the rototiller, the flail mower, the power herald, the rotary plow, snow thrower, the log splitter, and more. You name it, you can probably run it with a versatile BCS two wheel tractor.

Chris: The first time I used a rototiller, way, way back in 1991, it was mounted to a BCS two wheel tractor, and it spoiled me for life. When you get behind a BCS, you can tell that it's built to the same commercial standards as four wheel farm tractors. It has many of the same features. I have used other tillers and mowers. I spent most of the time that I was using them, thinking of how much easier it would be with a BCS.

Chris: Check out BCSAmerica.com to see the full lineup of tractors and attachments, plus videos of BCS in action.

Chris: Elizabeth, what's your favorite tool on the farm?

Elizabeth: What is my favorite tool? I consider myself to be the logistician and the communicator, and so forth. So, my favorite tool is the cell phone for communicating with the



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restaurants, and my CSA member, and the communities, and people out in the fields, and my husband. Can I tell you how much I communicate. I'd have to say that is my favorite tool.

Chris: And Paul, your favorite tool on the farm?

Paul: I appreciate that question. It definitely assumes a certain paradigm. It assumes that-

Chris: Yes it does, right?

Paul: ... farms needs tools to be successful. The truth, for us, in our system, is that the tools we value most are actually our farm crew family, and our healthy soil, and our ecology. Those are the things that make our farm function.

Paul: If you ask us about our physical tools, it's like a wheelbarrow and a shovel, and a five gallon bucket and yogurt cup. That's like the tools that we use. So, for us, to make our farm work, it's the people, and the soil, and the ecology.

Chris: I'm gonna let you get by with that. Paul, what's your favorite crop to grow?

Paul: Oh, boy. I'm gonna do another non-answer for you. Diversity is my favorite crop to grow. I'm quite honest in that. There's no single thing I love growing more than others. We all say carrots are the gateway drug to vegetables, and cherry tomatoes are as well. Tatsoi is always fun, 'cause people tend not to know about it, but it's nutrient dense. We love head lettuces. Head lettuce is just as gorgeous thing to crunch into and take a bite of like an apple.

Paul: All kinds of crops are fun to grow. But, it's the diversity that's thrilling to me. That's what I enjoy, it's not just having diversity, but watching the interrelationships and the interplay among all of the species making the diversity. That's what I enjoy.

Chris: You're not making this easy.

Paul: I'm not.

Elizabeth: We don't follow rules very well.

Paul: If you really wanna take it one step further, my favorite crop to grow are my hedge rows. It's my bushes. That's what I love growing.

Chris: I love that answer. That's really ... that's really interesting to me. Now, just one quick question about those hedge rows. You're basically putting woodchuck habitat in the middle of your fields.

Elizabeth: We don't have woodchucks, but yes.

Paul: We have bulls. We have gophers. We have field mice. We have all of those things.

Elizabeth: Actually, birds. Birds-

Paul: Song birds.



- Elizabeth: ... is the problem with hedge rows.
- Paul: We never mentioned how the obvious part of hedgerows is they promote beneficial insects. They promote pollinators. They promote songbirds. These are all pest control majors. They promote snakes, even, underneath them, that help prevent pests, or manage pests for us. The other part of hedgerows is, they can, also, encourage rodents.
- Paul: One management technique that we do, and that's often in wintertime. It's once every three or four years, is will go to a hedgerow that's established, and we'll prune up the bottom eight or 10 inches from the ground. We don't wanna have any twigs or leaves in the bottom eight inches. We only want branches. That allows for a little bit of open airflow under the hedgerow, which prevents rodents, and encourages snakes. Actually, the snakes love that open space, because it means they get morning and evening sunlight to be warm longer throughout the day. But then they have overhead protection from the hawks and the predators of them. So, we prune up the underside of the hedgerow, just minimally, to create that space that affects a lot of the rodents.
- Chris: I guess I would be remiss if I didn't ask you to quickly tell me what you guys do about weed control in the hedgerows, because I know from experience, that can quickly turn into a haven of quack grass and Canada thistle.
- Elizabeth: Yes.
- Paul: Right, the goal is not to make more management. The goal is to make less management. One of the ways that we do that is, we actually prepare the hedgerow with a straw mulch, many, many months before we ever plant it. For us, with a dry season in California, we often do that planting in February, March, and April, when we still have our last spring rains. We'll put straw mulch flakes down where we wanna eventually put in a perennial plant. It could be in a row, or it can be in a triangle, or it can be in a big circle. It could be just one little plant here and there.
- Paul: That straw sits there all season long. Then, by September, when we're about a month away from the rains beginning again, we can pull back the straw. The soil is still moist, compared to the soil around it, which is bone dry. It's also completely weed free. So you pull back the straw. Dig out the hole. Put a little compost in. Transplant the perennial plant. Put the straw back and water it by hand once.
- Elizabeth: You don't need to put in irrigation.
- Paul: Right. So by having the soil already moist, it can receive the water you give it better and hold onto it. It's already been mulched, and it's gonna continue to be mulched. The plant now goes in the ground a month before the rains begin. That one watering is enough to keep it alive until the rains begin. At that point, you've given the plant two or three or more months of growth before it goes dormant in winter. Then, when it comes out of dormancy, in February of the next year, it's already had those few months of growth to establish roots, have weed suppression, and then it just grows gangbusters all season long.
- Paul: Maybe, if it's a particularly harsh drought year, we do a deep hand watering once in July and once in August. But we never have to install irrigation equipment. Never have to manage irrigation equipment. By mulching before it's even planted, we've already



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suppressed the weeds. That mulch will usually last, the flake of rye straw, it lasts a good year, year and a half. By the following fall, when the plant is now one-year-old, you can often go back during the winter, when you need winter projects, and put down another layer of straw mulch. Those two mulchings, over two years, is enough to get that hedgerow plant up to three or four years of age, and three or four feet wide and tall, so that it begins to shade its own roots and knock back the weeds itself.

Elizabeth: That provides a really phenomenal habitat for a lot of smaller critters under there. All sorts of beneficial beetles, and things like that-

Paul: And spiders.

Elizabeth: Yes, that'll go out and do all sorts of predating of our pests that have soil cycles-

Paul: Life cycles.

Elizabeth: ... life cycles, thank you. We love that.

Chris: Paul, if you could go back in time and tell your beginning farmer self just one thing, what would it be?

Paul: I wish we had never started tillage in the first place, on our farm. The prior owners had tilled, but the really only tilled like 10% of it a year. It hadn't really been tilled. We came in and we thought, "Hey, let's be good organic farmers, and let's till." The only reason that I regret that, it was a great learning practice, and great learning experience. It helped us get our farm started, but it also proliferated many of the weeds we now face today. If we hadn't done the tillage, we wouldn't have quite the weed pressure, I don't think.

Paul: Some of our beds that went from meta grass to no-till, have very little vine weed. But the fields that got tillage for a couple of years before going to no-till, they are prolific vine weed nurseries now, unfortunately.

Chris: Elizabeth, how about you? If you could go back in time and tell your beginning farmer self just one thing, what would you say to her?

Elizabeth: I would've quit my off-farm job earlier.

Paul: Woo-hoo! I agree!

Elizabeth: I think I would've been out there more earlier on. I was out there a lot. But, I would've wanted to be hands on earlier.

Chris: Elizabeth and Paul, thank you so much for bringing so much energy and so much knowledge to the Farmer to Farmer Podcast today.

Elizabeth: Hey, thank you so much for doing this. I just wanted to throw a really quick shout out to our employee, Rose, who got us to do this. She listens to every single one of yours. I think it's great sharing what lots of different people are doing. So, thank you for doing what you do.

Paul: Chris, thank you very much for the opportunity, and for what you do. Yes, thank you.



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Chris: Thank you so much.

Chris: All right, so, wrapping things up here, I'll say, again, this is episode 161 of the Farmer to Farmer Podcast. You can find the notes for this show at FarmertoFarmerPodcast.com, by looking on the episode's page, or just searching for Kaiser. That's K-A-I-S-E-R.

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Chris: Finally, please let me know who you would like to hear from on the show through the suggestions form at FarmertoFarmerPodcast.com. I will do my best to get them on the show. That's how I got Elizabeth and Paul on the show today. Thank you for listening. Be safe out there, and keep the tractor running.