Hello, and welcome to the small farms podcast, a production of the small farms program at Iowa State University Extension and Outreach. Our podcast covers the opportunities and challenges associated with rural life.

In this episode, I visit with Suzanne Slack assistant professor of horticulture with Iowa State University specializing in perennial fruit crops, and Brandon Carpenter, agricultural specialists with the Iowa State horticultural Research Station, as well as Liv Meyer, a graduate student in the Department of Horticulture here at Iowa State. And today we are continuing the beginning fruit farm series with what is a trellis and why do I need it? I'm Olivia Hanlon, small farms extension specialist, and we hope you enjoy the show. Welcome, everyone. We're glad to have you all joining us today.

Thanks for having us.

Suzanne, I will let you take it away here and kind of dive into the depths of why trellises are really important for our fruit crops and why we need to think about that before beginning a small scale fruit farm.

Yeah, so a trellis is a fixed piece of equipment that we use to support our plants. So it has many
Yeah, so a trellis is a fixed piece of equipment that we use to support our plants. So it has many different components, including posts, wires, and hardware that connects it all together. And the reason we're here to talk about today is it is essential to plan your trellis before you plant your plants. This is a mistake I see a lot of people make they plant their plants, and then they don't have their trellis installed. And they're trying to work around their young plants to put up the trellis. So it's essential to plan this before you put your trees or grapes or berries in the ground. Also with that, let's talk a little bit more about trellises. So we have Brandon and Liv here joining us today. Brandon, tell us a bit about your experience with trellising,

Brandon Carpenter 02:02
I think you hit the nail on the head I put in trellis is both planned and kind of after thoughts to plantings and you're absolutely correct. If it's an afterthought, it's going to be a lot harder than having your all your ducks in a row and having a plan before you plant your plants. We tend to like to put the apple trellises in at least the posts in the ground before we plant the trees. And on the grapes. Sometimes we do it the opposite, we plant the plants first and then we go back in. But it's that's mainly an equipment decision because we have equipment that we can drive in and drive posts, the shorter posts, we can drive, we don't have a post driver that will drive it a 12 foot wooden post into the ground. So we need to auger a hole and then backfill and that's often easier done when the trees aren't there. But yeah, as far as the plan goes, you definitely want to have the plan upfront. If you come in after and think you're gonna get things done. It's kind of a nightmare, or can be

Suzanne Slack 03:02
yep, yep, the equipment, the equipment within the roads with the trees being there, or the the vines already being there can be problematic. You can run over your trees, sometimes, especially if you have to use an auger depending on your soil type, you planted your trees. And when you put in posts based on the way the auger went and the soil type your trees might be a foot out of the row now from where the posts are, it's easier to set the posts and then put the plants in. So everything's in a straight line. If you deviate more than eight inches for a lot of these plants, it can be really problematic for getting them to adhere to the trellis correctly, especially when they're young. So now that we've talked about why you need to plan for trellis and you're all hopefully not freaking out thinking oh no, I planted these trees a couple of years ago and they need a trellis, you can still put a trellis in after it's just a lot harder. So Liv, what's the point of a trellis.

Liv Meyer 03:54
So I think the number one reason that a lot of people probably think of right away, especially since we're getting into more high density planning systems. So the trees are going to be a lot smaller is structure. So it provides this structural framework to help train a tree that can help promote uniformity in your block and things like that. But some of the other things that are really helpful is with that support. And again, you know, with these high density planting orchard styles, you can encourage the trees to direct because they have that support more energy into fruiting. And again, there's nuances without so trained to, you know, type of training that you do on that trellis and things like that, which can promote earlier yields for people that want apples earlier after planting. Some other stuff depending on the spacing
space, and we'll probably talk about that a little later. But with the spacing, it can help improve penetration of sunlight into that orchard as well which is also really important and key not only for tree development but for pest management as well. You don't get a lot of sunlight coming in A lot shadier in that area, things can get a little bit cramped. And that's definitely helps promote more fungal growth during seasons where that may be problematic, especially if it's more humid and things like that. And then I think another biggie is that with that support, especially with some of the root stocks that you're working with, it can help prevent or reduce the risk of maybe breakage at that graph Union, where that rootstock and that scion on are connected as well. I went to a talk recently where they talked about you want to train them loosely so that way the tree can respond to a little bit of that wind coming in and put out more lateral shoots to help support especially since they're smaller trees, so you'll have smaller root systems beneath, but still having that training mechanism. And that support is helpful to reduce the risk of that breakage and stuff like that. So those are some of the big things that I can think of outside of structure. But I don't know if Brandon's got anything that I missed.

Brandon Carpenter 05:55
No, I think you hit at all one of the root stocks that's been easy to get lately are easy to get trees grafted onto for apple trees has a very weak graph union that first year. So you know, it's kind of critically important to have your trellis up early on those on those trees if you're using something like Geneva 41. And those are those are things that, again, the planning ahead of time, you know, really makes a difference. Because if you don't know what your root stock is, you don't know that the traits of the root stock, you could lose a lot of trees to a windstorm the first year if they're not supported.

Suzanne Slack 06:30
Those are all really good points. And the last reason I think what is the point of a trellis and Liv kind of touched on it a little bit is you make a lot more money on smaller acreage with a trellis. So for apples, for instance, if you have a trellising system, you can get approximately around 2000 trees per acre. And all of those trees are going to be producing lots of fruit. So you can imagine the old old timey apple trees that were 30 feet tall, you had maybe 200 to 400 trees per acre. Now what these trellising systems, we can fit 2000 trees per acre, you don't really need a ladder just a couple times a year, you don't have to harvest them up the ladder, it's a lot easier for your labor or for you. And you can get a lot more profit really fast with these high density trellis systems for apples for brambles, the trellising systems there, we'll talk we'll talk a lot in depth and Bramble episode because there's so many cool things coming out for trellising brambles, which are blackberries and raspberries. Again, you can get way more profit and way more ease of picking per acre with these new trellising systems. And then for grapes, your trellising systems are going to be really key, especially live mentioned fungal diseases. So some of the new innovations with trellising grapes, and we'll talk about that in our grape episode, we'll help you maybe use less pesticides, because you have better airflow. So it's actually really important to think about all this stuff straight up to save money and for better products. So next, what are the basic components of a trellis? What do you need? Brandon, do you care to talk about posts?

Brandon Carpenter 08:00
Yeah, well, there's a couple of options for posts, wood and metal kind of stand out. In Europe, sometimes they use kind of a concrete post, I don't think you see that much here in the States, maybe you do larger fruit producing states, the wood over the last couple of years has really increased in price. As an example, I've got some numbers here, if you're planting a vineyard, you'd often use a 10 foot tall post. And you might use four inch diameter posts in the middle, and like a six or an eight inch diameter post on the end posts, and the the price goes up pretty drastically. So a four inch post 10 foot long is right now about $19 or $20. The six inch post is $36. And the eight inch post is about $65. So it's not quite doubling each time. But you know, every diameter you go up in those posts, it increases quite a bit for price. So now a lot of times what they're doing is they'll use the wood posts on the end for strength and ease of use, and then they'll use a metal post down the middle for trellises. And the metal posts can often save you some money. And I've seen metal end posts as well. You get a thicker gauge post, it's supposed to be as durable. There's a lot of other parts you need wire for both vineyards and orchards we use a high tensile fence wire, it's like 12.5 gauge, we'll use softer wire like a nine gauge soft fence wire for the end posts. You know, when you make your H braces, you got to tie those together. And we'll use kind of a softer wire for that. So you can tension it by twisting it. And then ties you need staples and if you're going to drive those in the last couple of actually the last orchard we built and the one that we're building this spring, we're not using staples in it at all. We're drilling through the post, about a third of the way into the post to drill a hole in line with the direction the wires supposed to go. And we're running And that wire through, so threaded through those holes in each post. And what that does is, it eliminates the pullout of staple, you know, staples, if you drive them in, right, they'll hold for a long time, but they, you know, post crack and things weaken over time. And we've had a few orchards and vineyards that had some really bad pull out problems with the staples. So we've got this idea from, I think it was a research video on YouTube by someone at Cornell, that they were, you know, they had some issues with Hurricane like tropical storms coming through. And they, you know, those have a lot of wind and rain associated with them. So they started drilling holes, and we thought, you know, let's give that a try. And it's a little more work upfront, because you got to have someone who can go through and drill, drill the holes, we made a story poll, which is basically, it was a PVC pipe with the holes drilled into it. So we could just lay that pipe up against the posts and drill, you know, so that you didn't have to think about how high each of your wires was going. Another thing that we're moving away from here is we used to do a two wire system on orchards with conduit. And now we're, we're doing a five wire system. So it's there's no conduit out there conduit got expensive as well, the wire is still relatively cheap, it's a little under $200 for 4000 feet of it. So you can string a lot of wire for the price, it would cost you to do 10 conduits basically.

Suzanne Slack  11:26

one other major thing to think about whenever you're putting a trellis, especially the posts is are you going to ever go after organic certification. Because if you use treated lumber, depending on what organic certified you're using, they might not like that. It's really varied depends on your certifier. Some people are okay grandfathering the posts, and I see a lot of people doing that. Other people not so much. And there's a lot of unless they hacks, but I feel like it's Hacks is the right word, to make treated lumber posts organic friendly. I've seen growers actually use plastic tarps to make sure there's no leakage from the posts going into the soil. I've seen growers have the posts on the out like their end posts, be wood, and then just use metal in between, and have their posts not in the certified area, which is kind of an unusual choice. But that's something that I've seen people do. So just work with whoever you're hoping
to get certified with to figure out what their guidelines are for posts, but hate for someone to put in $55 per post orchard and then find out that they can't certify it because they use treated lumber.

Brandon Carpenter 12:34
My understanding on that organic certification is that if you start off with the plan of planting it with treated posts, and then grandfathering it in after three years, I think it is if they get wind that that's kind of your idea that you're going to grandfathered in, they won't. But if it's something that's been up for 10 years, and you decide, oh, you know, maybe I'd like to do organic cider or something like that you want to transition it, they're a lot more likely to actually transition, though. So trying to find a workaround, you know, you'd want to check with your certifier upfront to make sure that that workaround is going to be okay, because if they decide it's not, it's a real tough position to be in.

Suzanne Slack 13:14
Exactly right. So this is why planning with a trellis is so important for fruit crops. And it's the same not just for apples, but any kind of trellis you have. If you have wanting to do organic brambles or organic grapes, it's the same thing all applies. So any kind of trellis, definitely, if you're gonna go the organic, like certified organic route, work with your specialist first. And again, there's no rule of thumb because it depends on your certifying agency. So back to wires, Brandon, why is it important to use a high tensile wire,

Brandon Carpenter 13:45
Mainly for strength and durability on a vineyard, you know, that wire is holding up all of the weight of your fruit, as well as the vine, you know, the grapevines don't have any structure of their own, they don't have a trunk or anything to to hold up that weight. And so you know, in the road, the tensile strength of that wire is really important because all that weight is going to be pulling down and causing a lot of weight on especially pull weight on the end of your wires, if you went with a soft wire may last for a year or two, but it's going to stretch over time, and you're going to have to keep tensioning it and sooner or later, it's going to give because it's just not made, endure that high tension. Now, we don't do this. It's important to kind of loosen up your wires in the wintertime as well, because they shrink and they'll contract in the wintertime. And so you do lose a little bit of the stretch over time. We should be better about that. We used to when we had someone that was full time on just the fruit, we'd have time to go through and actually take some tension off and then every spring when we started back up we put the tension back on the wires before fruit set before you had that weight issue, especially in the vineyard. That's important. We had a big windstorm Um, a couple years ago that broke a lot of wires in there. And we were doing a lot of repairs because we hadn't been doing that. So that's another something to think about.

Liv Meyer 15:08
I got a question too. So during the spring when it warms up, what tension? Do you want that wire to be for the orchard? And then is there a certain tension for the slack that you give or that
Brandon Carpenter 15:24
That's a really good question. There's an exact answer to that. I forget how many pounds of pressure you put on the wire, I want to say it's like 200 pounds of tension pressure that you put on the wire, you can find instructions to make a tensioning board for these wires online. But you lay the board on the wire, and then you pull away. And we have just fishscale, you know, just a simple spring fishscale. And you put the board on the wire, you hook one nail on one side, and you hook one nail on the other side, and then you pull between until you hit like another third nail. And when that hits, if you're at 10 pounds, then you know that that wires at. Again, I don't know the exact poundage that wires that. But I want to say it's like 200 pounds of tension. And so you do want to have that to a specific tension, that tension is actually a lot less than what you would if you were just out there, tightening wires up, you might tighten them until they feel kind of hard to tighten, and you would be way over tension on that wire. So it is important to have a tool that gives you the exact tension the wires at.

Suzanne Slack 16:27
Yeah, I agree it's better to use a tension board than to try to just guess at it because it always feels looser than I feel like it should be. But that's what the board says. So that's the right way to go. And I've seen before where people actually tighten it too much, and it pulls their end posts out. So that can also happen. Think of it like you're stretching a rubber band too thin, and you can really damage your trees and your trellis if you make it too tight. And then same thing if it's too loose, your trees will break or your grapes will break. So there's a fine line, the best line figured out is using a tool to tell you what it is. So real quick. The other part that we kind of touched on is how do you change the tension on a trellis. So there's different hardware that you can buy. Ripple makes a whole line of products. They're called cripples. Basically, what they do is they help you tighten and loosen the wire. There's also traditional fence tensioners and tighteners too. Can you guys think of any other ones ripples? It's pretty much the industry standard right now.

Brandon Carpenter 17:29
cripples got some some kind of neat cam lock style, you know, real ease of operation, they have a tool that tensions the wire. It gives you the poundage, you know you basically set it's like a big tensioning wrench that you can set and get things done. I'm leery of their longevity. Out of curiosity, I've broken one in half to see what was on the inside. And there's not a lot going on on the inside. And I fear that if they're over tension, or you get a lot of wind that those might loosen up over time and not be ideal. We use just the good old fashioned called a fence strainer. And it's just got a ratcheting in, you tie it to the end post. And it's just got a ratcheting end and you can get a little wrench for that. You just put the wire through the center and it's almost like come along, like a little cheap come along. I mean, they used to be real cheap, they were about $4 to two or three years ago, they were about $4 a strainer, they're up to about $8.50 a strainer now, so they've almost doubled in price. But they kind of make things easy. We had an issue with the strainers that, you know, we used to just put them on one end of the trellis wire. And what we found is over time, as you tension those wires every year, your trees...
or your vines start to all lean to whatever side that tensioner is on. So if it's on the north side of
the trellis line, all those trees sooner or later, we'll lean to the north as you tighten that wire up.
And so now what we do is we pay the extra money. And we put two of these on every wire one
on each end. And so we'll tighten from both ends. So every year you go out, you tighten from
one end, three ratchets, and you go down to the other end and you tighten for three ratchets.
And you check it and make sure you could also probably tighten to the north one year and to
the south to the next year. But I'm sure we would forget which way we tightened it one year to
the next. So we just tried to do it from both ends at once.

Suzanne Slack 19:26
That's a really good point. Yeah, you need to have it on both ends. There used to be a lot of
especially trellising is relatively new, except for maybe grapes. But like all the technology
coming out, it's really important to have the tensioners on both sides. The old recommendation
said you only needed on one side and yeah, people realize slowly but surely their plants were
being dragged with the vines and it's a lot of work to go and adjust every single one. Especially
because it seems to happen slowly. It's really Hmm, they're all leaning now 10 years later. So
that's something that we do recommend Now even though it's a little more expensive, last but
not least, what are some common concerns for trellising Liv? What are some common problems
that you think people have with trellises?

Liv Meyer 20:10
Well, let's see, we covered a lot of that tension with wires breaking and stuff like that. Staples
pulling out was another thing, you know, that we had talked about. And Brandon, offered, a
good solution for that, oh, a big one. And this happened again after that storm. And they had to
go back and redo a bunch of the posts. But I think some posts breaking, that could definitely be
a big one, and how you deal with that, and how you re install and what that process looks like
Brandon had also mentioned, you know, we stopped using that two wire system and have
shifted over to a five wire system. But you know, people aren't using that many. And let's say,
your leader gets kind of cold, and you get a wind. And maybe there's not a lot of strength up
there, and your leader snaps from lack of support up in the higher range, that higher height of
the tree. Oh, we've got larger orchard mowers. And sometimes, I'm not going to name names
here. But the wire that connects that embracing posts to the anchor in the ground snap in
relation to how close that mower gets to that wire. That's another big one. Those are some of
the biggies that I can think of right now off the top of my head just from trial and error. And
Brandon being so patient with me in the orchards. But yeah, those are the biggies. I think
anybody else got anything else they can think of.

Brandon Carpenter 21:26
I think one of the common concerns I hear from people when they ask about our trellises. And
why we use them is the initial costs, if you're doing a high density, which you wouldn't really
use a trellis on a non high density planting for orchards anyways, actually, that's probably a
good point. For vineyards, I've never heard any concerns. It's just What type do you you know,
do we do a single High Court on? Do we do a vertical shoot position? Do we do a Geneva double
curtain? And so there's the type of trellis that people are concerned with with those and there's
questions about which one's better. But that often has to do with location and varietal issues with the grapes, with orchards, that trellising question tends to be price, you know, and how expensive is it, and it is, it adds significantly to the price of your orchard, maybe even doubling it, depending on how much you have to pay for trees, I could even double it. And so, you know, the price ends up being kind of the main concern. Another concern is, it's not something a lot of people have installed. So you know, there's this barrier to how do we do this? You know, what steps does it take and you know, are we going to have the equipment to get it done are we going to have the time, it takes a good amount of labor to put a trellis in. And so we like to install our our trellises in the fall of the year, before we're going to plant the trees or the early spring of the year, we're going to plant the trees before we can be doing other fieldwork, you know. So we're out there sometimes in the mud and the muck, putting posts in because we can get it done that time of year, and not be interrupting other things that we need to get done here on the farm. And so those are, I think those are big concerns to people on putting trellises in

Liv Meyer 23:08

to segue into that I have some techy questions, just some things that I thought of throughout the chat that maybe people thought about, and then we can answer real quick, is there a specific angle for that end posts that you want to support? Is there something that they want to look for for that, as far as like structural integrity, especially over time, is there like an optimal angle from the ground to that end post that they want to look for?

Suzanne Slack 23:32

Oh, we didn't talk about end posts, that's something else. There's a lot of options for end posts. So we mentioned a couple of them in passing. So some people use an H brace. It's literally what you think it looks like an H has two posts going up and down and then one going across. That one's really useful for grapes. That's kind of industry standard for grapes. It alleviates that mowing problem that you just mentioned. It also is better for high wind situations. A lot of growers use that. Then there's the traditional angled post at the end, which is what lives getting at. So you put a post in at an angle and it helps brace the system. And yes, there is some angles that are required for that. I can add that to our handout for here, because that's kind of a little complicated to maybe explain, it would be easier visually, we'll add that to the list, then they have a grounding aid that could just an earth anchor. So either I think they literally sell them as Earth anchors. Some of them are metal that you put in with an auger attachment into the ground. Some people just pound in a post down to like a four foot post three feet into the ground that they use for an anchor. There's no wrong way to do it unless your soil type says it's the wrong way to do it. So whenever we get into sandier soils, the H brace may actually be better than having an auger din if you have a high clay soil, those ones will be fine. So thinking about your soil type is really important too when thinking about your end posts. Again, this is why the planning is so important that you have to do for this or else you'll end up with a row of collapsed trellises. And we alluded to it, it can get really expensive. The more trellising you put up. So if you put in a five acre trellis and might cost you $40,000, you're gonna make the money back. And apples, usually, the cost of return from economic data is between year six and eight. So you do make that money back and then every other year, the orchard it's all profit, people wouldn't be doing it if it wasn't profitable. But if you don't put it in, right, that's a really big investment to lose.
Liv Meyer 25:36
So my next techy question, then, is there sort of optimal spacing within the row that you would put the post? And then between the row? So how much room do we want between the row and then between each post inside of that row?

Suzanne Slack 25:52
That's a really good question. So within the row post spacing, typically the recommendations are, you don't want to go more than 40 feet between your posts. In Iowa with our high winds, you actually want to be closer to the 30 mark, I wouldn't do anything closer than 30, because you're wasting your money. So between 30 and 40 is kind of like the optimum bang for your buck, you feel confident that you're not in as windy a situation as some other people in the plains 40 would probably work. But typically 30 is the safer option. Brandon, what is your trellising spacing,

Brandon Carpenter 26:26
the one we put in last year was 28 feet, so it was just slightly below 30. But it was because our tree spacing was four feet, I wanted to post in between two trees. In hindsight, we could have gotten to 32. We were also a little gun shy, we had lost 460 trees the year before to a straight line wind storm called a derecho, where the wind blew for like an hour at 85 to 90 miles an hour. And so we had lost a lot of trellises that we thought were well well built. And so that next one, we kind of went a little overboard and went down to 28 feet between posts in line, the one we're putting in this spring, it's at 30 feet, and the trees are spaced in that one at three feet apart. You know, so the tree spacing was kind of what you know what determined that we wanted to end up with a post right between two trees when everything was said and done, and not at an odd place where you got to take trees out or skip trees somewhere.

Suzanne Slack 27:22
So right, so that's actually a good point. So whenever we put in our trees, we do research on them. So we need them to be even like we need to have eight trees between posts. For instance, in our orchard, where you're not doing research doesn't necessarily matter if it's uneven or not. So that is something unless you're like really interested in making sure it's super uniform. That's not necessarily the high priority, unless you're planning on doing research. Or if you have multiple cultivars, something like that. So it just depends on your situation. If you're planting a whole block of Gala apples, it doesn't necessarily matter how many trees are between your posts. Yeah, I would be very upset if ours did not have even numbers, because it would be harder for me to do research for all of you guys. The other thing that Liz said was between the trellises. So between each set, that's going to depend on your rootstock for apples, it's also going to depend on your equipment. So if you have a tractor, that's pretty big 14 foot tractor, that means you got to make sure I hope no one has a 14 foot tractor they're trying to do stuff with apples on. Most people use a vineyard tractor for their high density systems. So a smaller tractor. But whatever equipment you have, make sure it can fit between your rows, then if you're working with a root stock that's a little bit more vigorous, that will
grow a little higher, just making sure that your trellis will accommodate that because you don't want to accidentally shade things out. We'll also put a diagram on how to figure out your spacings because there's some trigonometry that I'm sure everyone's super excited to do to figure out that optimum spacing. But luckily, people have already made it easy. So you kind of just plug and chug.

Liv Meyer  28:57
And then my last question, because I'm just trying to cover the gamut, especially since we're catering to you know, a wide range of expertise in this area. I've got my trellis set up. How am I attaching my trees to those wires?

Suzanne Slack  29:11
Oh, that's a really good one, too. How do you attach your trees or your grape vines or even your brambles to the wires? There's a lot of options. So the easiest option is especially when they're young or tree clips, especially for orchards and grape vines, they actually make clips, specially for this already. Of course they do right. The main issue with them is you have to really watch the girth of your trees because the trees will eventually outgrow those clips. And that's something we see a lot as people accidentally girdling their trees or their vines because of those clips, but they are an easy way to get them for like the first couple of years. What are some other ways Brandon that you can think of that people attach him?

Brandon Carpenter  29:51
People use the old horticulture. It's like a tie. It's almost like a rubber tube that you tie around the tree and tie that to the wire, I think price wise, it's a little cheaper than the clips, longevity wise, it's not going to hold up as long, it's also a little less likely to girdle because it's flexible, so it stretches. And then by the time it doesn't stretch, it's brittle enough that the tree just breaks it. So ties, I've seen people put wire on them too. And that's, that's a bad idea, it's a really good way to girdle a tree, because you're most likely going to tie it too tight to begin with. And then the tree is going to outgrow that fairly quickly. That's mostly the ways I've seen it. We've gone over to the clips, and we really liked them. And we get a guide with those as well. So the clips are about a dime a piece, you know, so each tree is going to take five of those about 50 cents of tree to put clips on and then the guide wire goes from the top wire down to I think about the second wire above the ground, it doesn't go all the way down to the bottom wire. But you know, it gives you something to kind of get the tree growing straight up on so you can tie as it's between wires. And that guide wire, we get it from the same company we get our clips from, it's about 80 cents a guide wire. So total in tying your trees up, you're looking at probably about a buck 40 Buck 30 Somewhere in there to get everything done. And so it's kind of a little bit of cost, you know up front, but it really saves you a lot of time and energy. And you don't need that conduit are the people use bamboo, I believe they'll use bamboo between to kind of uses a guide. The nice thing about the wires is they're reusable. So once our trees are sturdy enough, we can take those off and move them to another orchard or something we can reuse them.
Suzanne Slack  31:41
The other thing that people use is the lock link ties. I think there's different ones like pro lock, there's, I think there's a couple of other companies that make them very useful, especially things that move around a lot. So vineyard especially or brambles, I've seen some people use them for high density trees, I think it's a little more expensive than some of the other technology that we mentioned. Or if you go like per foot. So it just depends on what you already got to.

Brandon Carpenter  32:10
We also, you know, on the planning side of things, if you're buying ties to tie your vineyard or tie your trees up, buy extra upfront, twice in the last two years, we've had issues. Once with the cable lock that plastic chain that we do for vineyards, out of stock, no way to get it because of COVID it was out of stock because the manufacturer couldn't get it. And then the wires, we had an issue with that too, because everyone was out of stock on that chain lock, a lot of people went straight over to those clips, and the companies that make those clips were months behind. So on those clips, we ended up waiting for, I think a month and a half. So we had to go through and we bought an initial amount and we had to go through and partially tie up every tree. So we only got two clips on every tree. And then once we got the extras in we had to go back through and make sure all of them were tied up all the way up the tree. And so that costs extra labor and extra everything where if we had ordered the right amount up front, we wouldn't have had those issues. So you know, maybe order what you think you're going to need plus a little more and have that on hand before you start to do the construction because you may end up wanting something and it's just not there.

Suzanne Slack  33:18
I think that's all we have on the basics of trellising. So what we're going to do is we're going to add some episodes on each different types. We mentioned some things specific for orchards. We mentioned some things specific for grapes, and for brambles, so we'll talk more about those in depth. So hopefully whenever you start planning you'll feel a little bit more comfortable knowing what you need to get and some of the pitfalls of each of these different systems. Thank you so much Liv and Brandon for joining us today and thanks to Olivia for hosting us.

Brandon Carpenter  33:48
Thank you.

33:48
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