Rachel Hultengren: Hello and welcome to Free the Seed! This podcast is for anyone interested in the plants we eat – farmers, gardeners, and food-curious folks – who want to dig deeper into the story of where their food comes from. It's about how new crop varieties make it into your seed catalogues, and onto your tables. In each episode, we hear the story of a variety that has been pledged as open-source from the plant breeder that developed it. I'm your host, Rachel Hultengren.

This episode is a little different from the previous episodes; instead of a moderately uniform, finished variety, we'll be talking with Don Tipping of Seven Seeds Farm about a diverse spinach population that he has pledged to be open-source. 'Popeye', which is available through Don's seed company, Siskiyou Seeds, has been selected for traits that are important to farmers in southern Oregon, where Don's farm is located. In addition to the details of the breeding work behind 'Popeye', Don shared his thoughts on broader topics relevant to the future agricultural system to which he hopes to contribute.

A heads-up about some of the sound quality – when I spoke with Don, he was out in his fields, and you'll hear the wind blowing by a bit.

Our conversation started with Don explaining that his farm isn't in a prime spinach seed growing region of the US, and how that inspired him to breed spinach.

Don Tipping: I live in SW Oregon, which is known as the 'banana belt' of Oregon, because we have hot dry summers and cool moist winters. So a bit of a Mediterranean climate but perhaps a little more extreme in the winters. So typically spinach is grown as a spring and fall crop, just because it doesn't do well in the heat we have here. But in early May, when spring spinach crops would be growing, it can easily get up into the 90's which is not ideal spinach growing weather. So we hadn't produced a whole lot of spinach seed after we learned when we did grow spinach for a few seed companies on commercial contracts that we were just not in the right area to be growing spinach because when it gets hot the plants bolt quickly and it doesn't have the time to build the stature to produce a good seed head.

So 'Popeye' really started a bit as a learning experiment and a challenge to that notion of 'should we only grow seed in the area of the country or the world where it's most well suited', which is the industrial model, I would say, that we breed for a particular market and we only grow the crop in the area where we can maximize production.

So 'Popeye' was a bit of an experiment to see, "Well, can we disprove that? Can we grow a better spinach for our area by breeding one here, for our conditions and pests and diseases and so forth?"

Rachel Hultengren: The first step in the experiment to see if he could create a better spinach for southern Oregon by breeding spinach in southern Oregon was to create what Don referred to as a "synthetic variety" by using many varieties as founders of a single population.

Don Tipping: It's a way of getting a bunch of genetics in one variety, if you will So instead of a cross between just two known parents, you might have six parents. In plant breeding circles, this would be called a 'synthetic cross' or we're creating a 'synthetic variety' from numerous parents. So inside of 'Popeye' is 'Abundant Bloomsdale', 'Bloomsdale Longstanding', 'Winter Giant', 'Monnopa' and a few other strains. I actually got some commercial seed that was bred for disease resistance that's bred into

it, so we have both savoy and flat leaf spinach crossed into it to just basically get the widest genetic profile that we can create. And that gives us something to select from.

Rachel Hultengren: In a practical sense, how did you go from having those different varieties that already existed to having a population that you could select from? We spoke with Carol Deppe in a previous episode about hand pollinations with squash. Is that how you go about making this synthetic variety, or is there a different technique there?

Don Tipping: The initial cross that we created was a cross of the varieties that I mentioned. And that came from ... you know, we run a small seed company here on the farm, called Siskiyou Seeds. We grow about half the seeds ourselves, on the farm, and then I buy some seed from other small family farm growers.

And whenever we're buying seed in, I always grow some of it so I can get familiar with it. So I was doing a trial – this was the origin of where this whole breeding project came from – a trial of I think four different varieties, and evaluating them just so I can be familiar with them in terms of being able to sell it because I believe that you can't sell what you don't know. And then, we have a lot going on on our farm, a lot of diversity, so sometimes things get away from us. So that trial happened, I looked at it, made some notes, and then came back and noticed – oh, they're all crossing. They're all flowering and bolting.

Rachel Hultengren: This is a common thread in many plant breeding stories – the importance of serendipity and observation. Sometimes you find something that you weren't expecting by paying attention and being open to possibilities.

Don Tipping: So I just let the initial crossing occur without any selection, just let them intermate freely. And that was something I learned from Frank Morton, was to make sure you have thorough mixing between varieties before you start trying to select. Because sometimes plant will largely, especially with wind-pollinated plants like spinach, plants will just pollinate with their immediate neighbors. So that first iteration they just flowered and pollinated amongst themselves. Then I grew it out again I think three more times, letting it intermate. And that's when I started doing selection for bolting, because here, as I mentioned, the heat can come on really fast in the spring, and a beautiful bed of spinach will quickly just become just not harvestable from a commercial level.

And then at that point, too, I began to add in other varieties as I learned about other varieties of spinach. Another one we added in there is called 'Noble Giant' and I got that from Alan Adesse, who's an organic farmer up near Eugene. And that one has leaves can get to be bigger than the palm of your hand. It's a really impressive, large leaf.

Normally I don't think people would cross flat leaf with savoy spinach. You'd say, "Well you'll make it too wide and diverse." And that was sort of my goal, of like, "Well let's see all the possibilities of what spinach can do, and then narrow it down."

Rachel Hultengren: And Don has done work to narrow it down since he created the population by selecting for a handful of high-priority traits. He'll walk through the field, and rogue – pull out – plants that don't fit with his vision for the variety.

He explained how spinach has separate male and female plants, which is a rare trait in crop plants. If you're growing spinach in your garden, it's not important to be able to tell the difference between males and females – both of them will produce tasty leaves. But if you're going to save seed from the plants, whether a given plant is male or female can affect how you look at it. Don explained that when he selects for bolt-resistance, he has to take a close look at the flowers before deciding whether to pull an early bolting plant out of the ground.

But you talked earlier about the fact that you have done some selection work on it in the past few years. Can you tell me about the different criteria you used to do that selection work already?

Don Tipping: Yeah, so again my primary goal is bolt-resistance. So when the plants are just first beginning to bolt, I'll go through the rows and pull all the plants that are bolting.

And you know, making note of... in a dioecious species, the males usually bolt first, so you know, can you really select for bolt resistance by looking at just the males? They're always going to flower first. We really need to look at bolt-resistance in the females so that we know that the plants that we're getting the seed from are going to be the most bolt-resistant.

So you have to get in there and kind of get down low and look and see, "Who are you? Are you a male or a female?" because we ideally want to...

Rachel Hultengren: How can you tell which is a male plant? Do the leaves look any different?

Don Tipping: They have to be showing sex organs to be able to differentiate that.

Rachel Hultengren: The flowers of spinach are distinct, but because they're not showy, like squash blossoms, it takes the keen eye of someone who knows what they're looking for to distinguish a male plant from a female plant.

Don Tipping: Yeah, you have to get down there and determine what you see. So if I'm doing that roguing, which is initially happening at a walking pace down the row, and I pull that plant up, I want to look at it and see 'are you a male' and then, if say if I'm ten plants into my rogueing and I realize I've pulled ten male plants, I'll realize I have to pay a little closer attention to what's going on.

Rachel Hultengren: Don also selects for leaf texture, pest resistance, and plant architecture – the way the plant stands up in the field.

Don Tipping: And with 'Popeye' we've been tending toward flat leaf spinach because sometimes we will get aphids in spinach, and I've found that savoy ones tend to harbor those more. But one down side of flat leaf spinach is that... let's say you're growing baby leaf spinach and you're, you want your bags to look full, as a grower, well the flat leaf definitely packs down a lot more, so it takes a lot more leaves to make a bag look full. So I'm kind of looking for something that is a bit of a point in between, slightly savoyed, if you will. That's my, just, preference. I have no idea if the world likes that or not. That's what I like in spinach so it's easy to focus on selecting for the ones that I like.

And then another thing I've been looking for is that sometimes we get leaf miners, which I'm sorry I don't know the Latin name of them, but they affect swiss chard, beets and spinach. And they're an insect whose larval stage tunnels in between the leaf margins, leaving these tracks. So I'll rogue out any plants that are showing significant damage from these leaf miners, hopefully breeding for resistance in

that way. Another thing – we use predominantly overhead watering with crops like that. I'll look for plants that have a lot of mud-splash on them, and I'll rogue those ones out because for one, it requires more washing, and two, I believe I'm selecting for more upright plants, which are easier to harvest, if less of the leaves are lying on the ground like a rosette like a plantain or something, or a dandelion, more upright, like the way a swiss chard plant would grow. So that's been another primary consideration for me – the growth habit.

And with my breeding protocols, I've really shifted toward breeding things for most home gardeners because I realized that's primarily our clientele. So things that are novel, spinach that is late bolting but also produces really large leaves can be of a lot of interest to home gardeners and extend the period over which they can be harvesting food from the plant.

Rachel Hultengren: Have you had feedback from people in southern Oregon, in the same region you are, growing it off your farm and giving you feedback on it?

Don Tipping: Yeah, I'm beginning to. Market gardeners, they're a difficult bunch to sway to try a new variety. Home gardeners will just try something because it's more of an impulse buy, I've noticed. They're just like, "Huh, this sounds good." However, market gardeners, they settle on the varieties they grow, and they know that that works for them, so they just continue to buy the same thing year after year. So it's taken a few years to break into the density of that mindset, and to have people try it out. And I'm grateful for this opportunity to share a bit of the backstory behind this, because I think, those of us who are doing plant breeding, it's a bit of an obscure art form, for folks even who are farmers to understand the level of work that goes into it, and the level of attention, and the thought process behind it. So I think once people are able to hear a bit more of – what are you doing? Why are you creating a new variety? There are so many varieties of spinach out there, why do we need a new one?

Rachel Hultengren: In the catalogue description of 'Popeye', Don notes that it's a good example of 'bioregional adaptation'. It's a phrase that describes a variety that has been selected to do particularly well in a specific environment, like southern Oregon, instead of being selected to do moderately well over larger geographic areas. Don explained that because Oregon doesn't account for a large portion of the US spinach production, spinach hadn't been bred specifically for the conditions experienced on his farm.

Don Tipping: Most of the spinach that's eaten in the country is produced in central California, Salinas Valley, so the breeding is done for that environment, in that environment, for that marketplace, but the seed is produced in Washington, and many of the seed companies are Dutch. So it's just such a specific thing.

So nobody was breeding bolt-resistance spinach for the Pacific Northwest, or particularly for the warmer climates in the Pacific Northwest. So I saw an opportunity and a niche there, because I also knew that, from talking with market gardeners and CSA farmers that they had difficulty with spinach. You know, we'd get these heat waves and all the sudden a whole bunch of beautiful spinach would all bolt and become useless as far as a commercial crop.

Rachel Hultengren: In addition to bio-regional adaptation, we also talked about the idea of 'workhorse varieties', that is varieties that don't need special treatment or extra attention, but can be grown successfully under standard commercial conditions.

Would you say that your goal for 'Popeye' spinach that it go from being a bioregionally adapted variety for southern Oregon to being a workhorse variety that anyone in the US could grow it and they would see that it did well for them? Is that your vision for the variety eventually?

Don Tipping: Yeah, that's my vision. I don't know if I'm going to be the person to take it all the way there. Maybe, like, to use a baseball analogy, I'll be the person to get 'Popeye' to second base. It's gonna be someone else's job to come to bat and take it all the way there, 'cause I can't claim to see the breadth of what niche spinach fills in dynamic food systems.

Rachel Hultengren: It's a bit of a paradox, according to Don – he's not in a great spot to produce good spinach seed in general, because the warm temperatures early in the season cause plants to start flowering while they're still too small to be able to produce a large seed head of high-quality seeds. At the same time, that region provides the perfect environment in which to select for spinach that doesn't bolt early. Don saw that gap – the lack of spinach varieties that do particularly well in southern Oregon – as an opportunity for a breeding project to create one. He hopes to partner with folks in a better spinach producing region to bulk the seed up to start offering it in larger quantities through Siskiyou Seeds.

Don Tipping: So we'll see, because I'm not in an area for producing optimal spinach seed because of our warm temperatures, but we're in a great spot to be doing breeding. So I'm seeing that one of the next steps for this would be a good collaborative relationship, like a former intern is the farm manager at the farm school up at Vashon Island, Washington. And that would be a great collaborative process, to give him some stock seed and then grow up, you know, 50 or 100 pounds of 'Popeye' so that we could have it available for market growers. And then we'd kind of have to do a little bit of a user survey to find out, "Well, what do you guys think? Where should we go with this?"

So. It's interesting when we think about plant breeding as an art, because normally an artist just creates art, and you either like it or you don't like it, and if you don't like it the artist says, "Fine. It's my art, and I didn't make it for you to like it." But as a plant breeder, we are ultimately trying to produce something that is of value to people, that they can see an intrinsic benefit to the effort that's gone in to developing the variety, that ultimately serves the need that they have.

Rachel Hultengren: I've heard plant breeding described as a craft, versus an art. You know, it's not just art for aesthetics sake, but having... thinking of varieties as being crafted, so there being this engagement with the person who's going to use it and also having it be something pleasing and that has taken focus and attention and care in its production.

Don Tipping: Yeah, and I really like that distinction. I'm going to have to start using that to differentiate plant breeding as a 'craft'. That's a useful difference there.

Rachel Hultengren: So what about the name? Don described the contrast between the cartoon sailor and how spinach performs in the warmer parts of the Pacific Northwest.

Don Tipping: I was really surprised in looking at the <u>Seed Savers Exchange</u> that nobody had named a spinach 'Popeye'. You know, maybe somewhere it's not documented that somebody had, but for me and my age group and for those older than me, it's one of the few vegetables that had an iconic place in, you know, American pop-culture.

And then when I thought about it more, I was thinking about - 'Popeye' was strong, the sailor cartoon character. But when we think about spinach as a farmer, it's kind of a wimpy plant. In my mindset, because most of the material available to me had been grown in Washington, in terms of the seed, where a 90 degree day is like setting records, whereas here that's normal for a big chunk of our growing season... So, to me, there was a bit of a paradox, that here's spinach which in the 'Popeye' mythology is the source of strength, and yet as a plant it's pretty wimpy here in our climate. So is that just something that we accept? And I found that I had begun to accept, "Oh, spinach is just this wimpy thing that you could have for a few weeks in the early spring and maybe in the fall if you're lucky." And I think ambitious plant breeding looks at quandaries like that and asks the question, "Can we do something about this?"

That's again, back to the bit about this being an experiment. Because I don't really know if I am creating anything better. I do know from looking at trials that we'll continue to do where we'll grow 'Popeye' next to a more commonly available variety, like Winter Giant or Abundant Bloomsdale or so forth, and see, "Oh, wow, ours bolts a few two to three weeks later!" So you put four or five years into breeding and selection and you can extend the harvest window by a few weeks, which is a significant thing.

Rachel Hultengren: So it sounds like you've provided the initiative and put in the work to create this diverse variety, or this diverse population that others folks can take and select out something that works for their specific production, and you've given it this aspirational name, hoping that it would be a strong spinach, and so it sounds like you don't have one specific vision for what it'll end up being, but rather an open hope that it will evolve and become a useful variety for a lot of different people.

Don Tipping: Yeah!

I'm reading a book by Gary Nabhan about the pilgrimage he went on through Tuscany and Umbria in Italy. And he visits with a lot of farmers who, they just have their varieties. And their varieties, if you ask them, are the best in the world. And if it's an old Italian farmer and you ask them where tomatoes come from, they'll say, "Italy, of course!" They won't even acknowledge that they're a Mesoamerican crop. So that's the kind of agriculture that I want to be part of and I want to see proliferate, is where there's a real, deeper sense of intimacy between growers and their crops.

I personally believe that all farmers that are growing annual crops should be doing some seed saving, because I believe that whole practice is foundational to the word "agriculture". I believe that's when civilization really occurred, is when we began saving seed. So I don't want to have to play the surrogate mother for all the crops that farmers grow. I want to just, maybe, be like for a painter, the person that's mixing the pigments, and just creates new pigments so that there are more choices to play with, and more beauty and creativity and productivity can come out of that. So that's where I see the role that I can fulfil, because I, you know, can't get out into all the production fields and see how spinach is being grown. But if our local growers around here, who are filling the CSA boxes and the produce shelves at the organic grocers have a better choice than the commercial hybrids that are coming from one of the multinational seed suppliers, then I feel like I've made a contribution that will hopefully have some benefit and lasting impact.

Rachel Hultengren: I asked Don about his involvement with the open-source seed initiative, and he explained that he's been interested in issues of public, collective ownership of seeds for a long time.

With 'Popeye', Don was initially unsure whether he should pledge the variety to OSSI.

Don Tipping: Carol Deppe was really encouraging when they were first getting going to pledge as many varieties as I developed, and helped shepherd me along in order to do that. Even though, when we'd have these discussions, I'd say, "Well, you know, I'm a little hesitant to put things out there in terms of saying, 'This is totally ready for prime-time,'" because I'm aware of the amount of effort that goes in, when for instance, seed companies that are producing hybrids will put a lot of work into developing a variety before they release it.

So first I saw them as synonymous, that by pledging something you were saying, "Hey world, this is a totally done, ready for commercial planting variety." And she in particular said, "Oh no, you know, just be transparent about where the variety is in the process. If it's still being developed and selected, just say that so that people understand that there's gonna be some variability."

Rachel Hultengren: And that's the case with this variety, right?

Don Tipping: Exactly.

That whole notion of open-source has always been near and dear to me. We used to use the term 'public domain' back before the OSSI and there was a project quite a number of years ago that J.J. Haapala spearheaded, called the <u>Farmer Cooperative Genome Project</u>. It was probably in the late 90's, and I was a part of that. And Dr. Alan Kapuler had always been a vocal proponent for public domain plant breeding, and the idea that it's part of our collective, almost as if seeds are something that should be in the commons, like air or soil or water and not privately owned.

And I would like to see the system evolve to incorporate some aspects of how I understand it happens in Europe. We've been a biodynamic farm for over 20 years here, and I've been involved in a few seed initiatives through the biodynamic community, and there there's more of a public understanding that seeds are a part of our commons, and people will support plant breeding as a necessary aspect. Just like most people don't balk at the idea of their property taxes going to schools. Children are our next generation, so we have to invest in their future. Likewise, the varieties that people are developing open-source will be the future of our agriculture, so we have to invest in it if we want to have a future in agriculture. So I believe we're still determining out how to articulate that, and I applaud the idea of using the term 'open-source' as a term rather than 'public domain', because people understand 'open-source', and have accepted it as a worthy element of reality.

Rachel Hultengren: Would you have any advice for someone who has never taken on a breeding project but is interested in dipping their toe into that water?

Don Tipping: Well, first off, we produced seed for a whole bunch of different seed companies for about 12 years before we started Siskiyou Seeds.

And I began to be frustrated after doing that for a number of years, because we would grow a variety for a company on contract, (who would) say "Hey, here's the stock seed, can you grow this for us and we'll buy it at this price." And we would begin to notice certain things about it, and then a year would pass and we would say, "Oh, well we'd love to grow that one again," and they'd say, "We don't need seed of that one, how about this one?" So we never got to develop a deep degree of intimacy with the crop. You know, we learned a lot about growing seed through doing that, but in terms of really developing that

relationship where you're growing it year after year and seeing what's possible and where you could go with a variety, and really becoming more of a, what I think is a, seed steward, where we're really curating a population for the future – for the present and the future. And that's far more interesting to me.

So in terms of advice, when I think about that – the wholesale multiplication model of contract seed growing – I see as akin to playing as a musician in a cover band, where you're playing other people's songs and you're not using your own material. It's not much of a space for your own creative expression. And when you think about, in our world, "Where do cover bands play?" Well, they pretty much play in bars. And they never really go very far. Whereas the singer-songwriters of the world are who captivate our attention, and are part of that discussion about where's the culture going, what's going on? The more I get involved in plant breeding, this really rings true to me, and I'm seeing how that I want to be involved in what's going on. And not everybody's gonna like, say, every song I write, but that song is a personal expression of my life and my experience, and just me being real. So, you know, we still grow varieties that other people have bred, for sure, but we're always adding our little touch, and we're telling the story. So let's say we're growing seed of a variety that another grower has developed; I'll mention their name in the variety description, but I'll also talk about what our experience was like growing it.

Rachel Hultengren: I have to say I love that, the singer-songwriter analogy. I think that's a fantastic analogy.

Don Tipping: I don't want to diss on anyone, but I do call it as I see it.

Rachel Hultengren: I've really appreciated getting to hear your thoughts on open-source seeds, and on plant breeding for your particular farm and how people can do that for their own farms, and have plant breeding projects be an expression of, you know, they're story and what they're' doing and what's important to them on their farm. Is there anything else you'd like to tell me about your experience in breeding 'Popeye' or taking part in conversations about open source seed that you think folks would be interested in?

Don Tipping: I think just in closing I would say, "Choose some crops that are a challenge." That's really that spinach project encompasses that for me. John Navazio, when he first came to my farm, he basically said something to the effect of, "You have no business growing spinach seed. You're in just the complete wrong area." But people still grow spinach here, so... No better way to learn why somebody who's an expert feels so absolute about something than to take the opposite of their advice and learn why or understand that there's other ways.

I really want to encourage anybody who wants to get into this thing – I think it's important to do some wholesale seed production to understand how the industry works, even on the small organic scale, and begin to make connections with the people involved. But ultimately, as I learned from one of my mentors, <u>Harold Hoven</u>, who was the farm manager at the <u>Rudolph Steiner College</u> in Fair Oaks, California for a number of years, he articulated that growing seed was a way that the farms individuality could be expressed, and that the unique weather, soils and so forth, terroir if you will of the land, can find expression. So very much so by breeding your own varieties and then producing and sharing the seed is a way to make the maximum contribution of what your skills as a seed steward can be! Again,

back to my music analogy – be a singer songwriter, and you'll go far. A man or a woman with a guitar and some good lyrics can go real far in our world.

Rachel Hultengren: Thank you so much for taking the time to talk to me today about your breeding work with 'Popeye' spinach, and your thoughts about open-source seeds, and the joy it can be to write your own song and breed your own variety.

Don Tipping: Yeah, thanks Rachel. I really appreciate the opportunity. I enjoyed getting to talk with you.

Rachel Hultengren: We've been speaking today with Don Tipping of Seven Seeds Farm and Siskiyou Seeds about 'Popeye' spinach.

Seed of 'Popeye' spinach can be ordered on the Siskiyou Seeds website at

<u>https://www.siskiyouseeds.com/</u>, and we'll have a link in our show notes on the Open Source Seed Initiative website, at <u>http://www.osseeds.org</u>. Twice a year, Seven Seeds Farm hosts a program called the Seed Academy, which is a five day workshop focused on seed growing, seed cleaning, seed enterprise and plant breeding. The program includes tours of nearby farms so that participants can see models of integrated seed growing and vegetable production. The next Seed Academy will be held in October 2018. If you're interested in making seeds part of your livelihood and life path, check out their website for more details.

Let us know what you thought of the episode by tweeting <u>@OSSeeds</u>. You can find us and like the <u>Open</u> <u>Source Seed Initiative on Facebook</u> to join an online community of folks interested in the future of intellectual property in plants. If you'd like, you can give us a review on iTunes, which will help other potential listeners find us there. Our theme music is by <u>Lee Rosevere</u>.

Thanks for joining us – until next time, I'm your host, Rachel Hultengren and this is Free the Seed.