

Transcript: Plant Breeding Stories Podcast

S4 E11 Hannah Senior



[Theme music plays]

Rob Coy: Welcome to this episode of the Plant Breeding Stories podcast, where we speak to leading lights in plant breeding, asking what they do, what makes them tick, and what fascinates them about the world of plants. If you've listened to Plant Breeding Stories before, you'll know that this is not the voice of your usual host, Hannah Senior. That's because today Hannah is our guest.

Rob Coy: So today I'm your host, Rob Coy, the commercial manager at PBS International, where we design and produce specialist pollination bags and tents used by plant breeders and seed producers all around the world. Throughout this series, Hannah has met some amazing people who make plant breeding their life's work. And this has given us a unique perspective on how plant breeding globally affects our diets, farming systems and the environment.

Rob Coy: Season four is the last season of the podcast for now. It's been incredible hearing so many aspects of the plant breeding world throughout the series. And that's literally the world. If you're listening to this, you're part of a community that spans the globe from Albania to Zambia, Ames, Iowa and Adelaide, Australia to Zurich in Switzerland.

[Theme music fades out]

Rob Coy: So Hannah, welcome to the Plant Breeding Stories podcast. I've known you for several years now. We've worked together for several years, but our listeners probably don't know too much about you. So why don't you introduce yourself and tell us a little bit about your background?

Hannah Senior: Well, it's very strange to be on this side of the table. [She laughs] So my name is Hannah Senior. I am the CEO of PBS International and normally the host of

the Plant Breeding Stories podcast. I grew up in Yorkshire, which is in the north of England, in quite a rural community. And I left all of that behind in the early part of my career. I studied experimental psychology, so nothing to do with plants. And then I went into business, and I worked for big corporates, including Tesco, the retailer, international retailer, and as a strategy consultant. And really, I didn't anticipate that I would be coming back into agriculture, the world of plant breeding and so on at that point.

Rob Coy: You said your first interest was psychology. Did you have any interest in plants or biology at all growing up?

Hannah Senior: I was interested in biology. I loved biology. I loved studying psychology. But when my career took me into business, and then later on I decided that I didn't want to work for big corporates anymore, I wanted to do my own thing. I ended up acquiring PBS International, and that was my way into plant breeding.

Hannah Senior: So I spent a lot of time traveling to meet customers and understanding their needs better. And because I had a good background in biology and genetics and statistics and experimental design and so on, all of those things were really helpful for me getting very quickly up the curve of the world of plant breeding. And I found myself standing in a field in Oklahoma or a plantation in Indonesia and being like, "Huh, why did I leave science behind?" And "I really love agriculture" [she laughs].

Hannah Senior: So, it was this sense of coming home, and I've really enjoyed spending the last 10 years in the world of plants and plant breeding. And for the record, psychology was not a total waste of time, because it turns out that this sort of sense of G x E interactions, messy experimental contexts, making it difficult to identify signal from noise, those are very common problems across both disciplines.

Rob Coy: So I think I know the answer to this. Having worked with you for a few years now, but for our listeners, what does PBS International do?

Hannah Senior: So PBS International is a very niche business. We make bags and tents that plant breeders and seed producers put over their plants in order to control pollination and to ensure that the genetics of the seeds are the genetics that are intended. What we do is really specialist because we bring together these two branches of technology. There's plants and plant science and the needs of plant breeders and seed producers. But then in order to meet those needs, we bring a completely different sphere of technology, which is around technical fabrics.

Hannah Senior: So how do you make fabrics that you can use, which then let enough light in or keep pollen of small enough pollen grains out? Or how do you make sure it's strong enough so that it doesn't disintegrate while it's in use? So it's that combination of those two technologies, understanding the polymer science and the manufacturing techniques that give you the material properties. And then how do those behave when you use them in a plant setting? That's our expertise. So we make and develop and trial products, and then we supply them to customers, literally all around the world. It's a very international business.

Rob Coy: And there's a family connection with PBS International, isn't there?

Hannah Senior: Yeah. So, I mentioned, I acquired PBS International in 2010. It was a family business before that, my family's business. The company has been around for a long time. And actually it was my mum who was really instrumental in creating PBS International as a company in its own right. She was the one that had the enthusiasm for plants and a background in botany. And in the 1980s with four little kids at home, set off to Malaysia to go and find out what are people buying these for, and how does it fit in?

Hannah Senior: And then my dad's side, his company focused on the manufacturing and the sort of logistics part of the business. So, that's how it came about.

Rob Coy: And why did you decide to buy the business?

Hannah Senior: I'd been in California doing an MBA at Stanford, and I knew I wanted to do something more entrepreneurial, but also my parents were reaching a stage where they were starting to think about how they were going to exit their businesses, how they were going to think about retirement. And so I breezily said to them, "I will come and help you find an exit, but I will not be your exit," but I ended up acquiring the business from them. [She laughs]

Rob Coy: So what made you decide to do this podcast?

Hannah Senior: Well, I suppose it originally came out of needs-must with COVID. Normally we would be able to go and visit customers and go to conferences and things like that, but that wasn't possible during COVID. We were stuck at home. And so I started thinking about, well, how can we keep in contact with our customers? But there was also another thing which is, I guess I knew that plant breeders don't normally blow their own trumpet very much. And actually often people misattribute a lot of things to plant breeders. And that felt unfair to me.

Hannah Senior: There's often concern around the GM hoo-ha or, "oh, corporate evils, it's all a plot!" And actually all the plant breeders that I know are smart, genuine, thoughtful people who are really motivated by high ideals. So I thought that if we did this and kind of shared the diversity of perspectives and technologies and personalities that are working in this space, then that would, A, be interesting for our customers. But, B, be interesting for the wider community of people who are curious about what plant breeders do or plant science in general. And so that was my reason for thinking it would be an interesting experiment for us.

Rob Coy: You've had some really interesting guests on the podcast talking about a whole range of subjects. Are there any recurring themes or learning points that you've taken from the series?

Hannah Senior: Well, it has been a really fascinating, uplifting, mind-expanding experience. So there have been lots of themes that have come up over and over again in different interviews at different times, which have actually been quite, I suppose, surprising to me, the... Maybe not ideas that were entirely new, but they've given me new perspectives on it.

Hannah Senior: So an example would be the importance of long-term funding. Yes, on one level it's intuitive. Plant breeding is not a speedy game. You need to have long-term, ongoing funding in order to be successful as a plant breeder. But that feeds into things like, well, if decision-makers and the public don't know what plant breeders do, then how can you get that long-term support? And if the importance of genetic diversity isn't understood, then gene banks won't be well-financed. And once that's lost, it's lost for good.

Hannah Senior: So some of those themes came up and were, I suppose, just much more nuanced issues than I had previously understood them to be. Another example would be the pace of technology and commercial development and how that has changed plant breeding over time. And these things, new technologies, they present massive opportunities. The fact that gene editing is so much more accessible now means that orphan crop development can occur at a much lower cost than it would've been possible before, but it also creates risks.

Hannah Senior: There's unintended consequences or tensions that arise from that. And so, the issues around the technology and the commercial changes over time as businesses have consolidated has really come through. But even with all of that, with

that constantly changing environment, there is lots of scope to be dynamic and creative in the way that you do plant breeding or the way that you commercialize your activities. And I think that's been quite exciting.

Rob Coy: And you included quite a lot of new technologies and startups among your interviewees, so why was that?

Hannah Senior: Well, one very powerful way of bringing new ways of doing things to agriculture or to plant breeding or to seed production is through entrepreneurship. It's a very powerful technique of bringing innovations that maybe are too niche for the very large companies to engage in, or perhaps considered a bit too fringe for other organizations to be focused on. I mean, I'm an entrepreneur myself, and it's hard. It's hard to do something new from scratch.

Hannah Senior: So it's really interesting to talk to those organizations about what they're doing and why they're doing it and the kind of challenges that they're facing, because I think it tells us a lot about where the future could be, and it tells us a lot about how we can make agriculture more sustainable. And there are a lot of really good ideas coming out of that community.

Hannah Senior: And in fact, I've just completed a piece of research work on this very topic around entrepreneurship and agriculture. So if anybody's interested to listen, I have just completed a documentary podcast, which goes through this whole question about how do we bring entrepreneurship and new technology to agriculture so we can do things better for the environment, for agriculture as a whole for entrepreneurs. So that's called *Innovating AgTech*, and you can find it wherever you found this podcast.

Rob Coy: One of the themes that I've this coming up a lot in the podcast is that of diversity, and not just diversity in terms of crops and genetics, but the diversity of

systems, climates and approaches to the agricultural problems to be solved. Why do you think diversity is important in the context of the plant breeding world?

Hannah Senior: There's sort of two reasons why I think diversity is important. One is a matter of principle, so that's the context of equality, diversity, inclusion, sort of human diversity. But then there's also the sense of diversity in the context of feeding humans, and agriculture as a whole is complex. And if you have less diversity, you often have less resilience.

Hannah Senior: It comes out in different ways. For example, the diversity of farming systems is really important. We interview people who are breeders for organic systems, and we interview people who are breeders for other systems. And actually we should be thinking of those not as either-or, but both-and, because we need a diversity of different approaches in order to solve some of the problems that the food system has.

Hannah Senior: Also things like the genetic diversity, which I've touched on previously. We have through the last 100, 150 years, lost a lot of the land races that were used that contained lots of genetic diversity. As we've bred elite lines, we've become more and more focused on a very narrow gene pool. And that's given us huge yield and huge efficiency, but it does also make us more vulnerable to pests and diseases and so on that can then attack those varieties. So again, thinking about how genetic diversity feeds into this is a really important theme that came up over and over again in the conversations that I had.

Hannah Senior: I suppose one other point on the gender side is that we in the UK tend to think of farming as a bit more of a male profession. There are more male farmers than there are female, but when you're thinking about the world as a whole, that changes. A lot of the smallholder farmers are women, and they sometimes have very different needs. That was something that also came up over and over again in the

interviews, which really struck me that sense of making sure that the diversity of perspectives is being accounted for when you're setting up your breeding objectives.

Rob Coy: And another theme I've heard come up a lot is systems and systems-thinking. What do you mean by that?

Hannah Senior: Well, I suppose it's because biology is not an equation. It's not an engineering problem that can be solved in a simple way, because there are all these interconnected behaviors, patterns, consequences, which spin out from a choice that's made.

Hannah Senior: So to give you an example, Norman Borlaug did a fantastic job of reducing hunger by developing new varieties, dwarfed varieties and so on, that really have saved probably a billion people from starvation, which is amazing. But it also had knock-on consequences with biodiversity and dependence on a lot of synthetic inputs that have also had economic impact.

Hannah Senior: And so I suppose the system's perspective is rather than trying to boil these complex biological and ecological cause and effects down to something a bit like an equation, it's saying, well actually, these are really complex interactions, and trying to think about how those interactions pan out when you're making choices and when you are observing what do I need to do differently in the next iteration, is what I mean by the systems-thinking. Kind of having that more nuanced perspective that plant breeding is embedded in agricultural seed production systems, food systems, which are complicated and messy.

Hannah Senior: And sometimes, with the best of intentions, we end up not achieving our goals because things don't quite work out as planned.

[Theme music plays]

Rob Coy: You're listening to Plant Breeding Stories brought to you by PBS International, world leaders in pollination control. We're exploring the personal stories behind people who have dedicated their careers to plant breeding, helping us to more productive plants, greater food security and more sustainable agriculture. Now, back to the podcast.

[Theme music fades out]

Rob Coy: There've been nearly 40 episodes of Plant Breeding Stories, and you have dedicated listeners in over 50 countries in the world. Why are you stopping now?

Hannah Senior: It was a very difficult decision. So I am taking a pause on Plant Breeding Stories because I wanted to make sure that it gets done properly. And I have some obligations coming up, which I'm very excited about, but are going to be very time-consuming, and I'm worried that I won't be able to do both. So in particular, as of August, I will be taking over as president of the National Association of Plant Breeders. It's a huge privilege to have that role. And it's an important, entirely volunteer-driven organization. And I would like to do that justice.

Rob Coy: And in addition to that, I understand there are some exciting things to come from PBS International this year. Tell me more about that.

Hannah Senior: We have some really ambitious plans. We've spent a long time developing new products and sharing those with the market. And we are really beginning to build some exciting momentum around commercializing the products that we've done a lot of research on, but also we've got a really exciting pipeline of new products for new crops or particular needs that aren't being met at the moment.

Hannah Senior: So I, in addition to NAPB, want to make sure that I'm devoting my energies to making sure that PBS continues its momentum to make sure that the products that are needed for plant breeders are available to them. And I just have to go

on a rant for a moment there, because one of the things that I have seen, and it's been a big motivator for me is that sometimes I go to talk to plant breeders, and they say, "Well, I don't need a different bag. I'll just use this one, this plastic one that I've always used or this paper bag that I've always used."

Hannah Senior: And then I sort of get into conversation, and it turns out that, oh, about a third of the plants that they're covering die or get so diseased that they can't get any seeds from it. It blows my mind that a plant breeding program can spend so much money in the double haploid work or the gene editing work and all the crossing and all the labor and the greenhouses, and then knowingly lose a third of your plants because you're economizing on a 10p, 10-cent pollination bag. And so part of that process for me, around PBS, is kind of sharing that you don't need to use a fancy bag for everything, but really think about when you are doing it and when it does make sense.

Rob Coy: Yeah, absolutely. I mean, you look at the work we did with sorghum. A third of the crop was being wiped out by bird damage. For us to be able to negate that risk with one of our products has been incredibly beneficial for farmers and the sorghum industry as a whole.

Hannah Senior: Right, because often you don't see the challenges, that often the labor costs sit in one person's budget, and the materials costs sit in somebody else's budget. So, the person who buys the pollination bags may not have any input in the labor, but actually if you look at the organization as a whole, if you are having to send people out on a daily basis to replace pollination bags, that's a huge waste of time and effort. And we all know that finding skilled labor is hard to do.

Hannah Senior: So that's one thing. Plus your results aren't as good. Your crosses are contaminated. So there's lots of reasons why we do what we do and why continuing to communicate that then gives plant breeders and seed producers the choice. They can make an informed choice because they know there are options rather than defaulting to

that thing, that plastic bag or that paper bag that they've all always used, even though it lets them down year after year, because, "oh, I didn't realize there was any other option out there".

Rob Coy: So outside of PBS and NAPB and all these things you're going to be doing this year, what else is attracting your interest and energies at the moment, Hannah?

Hannah Senior: Well, I mentioned that I'm interested in agricultural technology more broadly, and that is something that I do spend quite a lot of time and energy thinking about and working on. We have fairly sizable problems in agriculture. Agriculture is, as a whole, globally, absolutely atrocious for the environment. We have very serious labor issues. In agriculture, there's a lot of labor shortage, and there's a lot of labor exploitation. And we have many farmers globally who struggle to just make ends meet, and certainly to make ends meet minus subsidies.

Hannah Senior: So those are big problems that we need to address, and how technology and particularly entrepreneurs bringing new technologies to market influence that is something that really interests me, and I've spent quite a lot of time and energy on. I mentioned previously the agri-tech work, the podcast documentary that I produced called Innovating AgTech, and that is a thought piece to stimulate discussion, but to have a real impact in the world, you have to go beyond discussion into action. And so I would like to make sure that I can help to get those conversations going in the innovation and agricultural communities.

Rob Coy: And bringing that to the next stage, what concerns do you have for the future? When you've looked at all these different technologies and the issues that we've got in agriculture in general, what concerns do you have for the future?

Hannah Senior: One thing that concerns me is this failing to recognize the complex nature of the challenges that we're working with. They're messy. They're complicated.

Sometimes the impacts are unexpected, and that needs a whole different way of thinking about things, which we typically don't learn about as we go through our education. So I think there's something that I'm concerned about around how do we get more systems-thinking training into the brilliant science that goes on around the world?

Hannah Senior: So that's one area. Another area that I am concerned about is that agriculture is not viewed as very sexy and very interesting by a lot of people. And that is such a misunderstanding. And I find it really frustrating. Often people think food is really exciting, but when you get into where that food comes from, how it's produced, "Oh, no, I'm not so interested in that."

Hannah Senior: And maybe it's because when we're growing up, we all read books with "Old McDonald" on his ancient tractor chewing a piece of corn. It's not like that! It's a hugely exciting area with loads of opportunity and loads of different disciplines go into agriculture, really cutting-edge science. And I think it's such a crying shame that the excitement doesn't get communicated to young people who are thinking about what they want to do with their lives.

Hannah Senior: So, I guess those are the two concerns for me, more systems-thinking and more illustrating just how interesting agriculture is so that more bright people want to come into it.

Rob Coy: What excites you about the world of plant breeding? What inspires you to continue the work that you're doing?

Hannah Senior: I think one thing that's really exciting is how international it is. Again, it's something I realized from doing these interviews is how many people have the opportunity to live and work in different parts of the world and how that's opened their eyes to different ways of doing things, different cultures, different farming environments and so on, and being part of a community that is so international is really exciting.

Hannah Senior: I also think that a lot of plant breeding has been focused on the rich world. And that means that there has been a bit of a neglect. They're called orphan crops for a reason. There's been a neglect of species, which are really important in poorer parts of the world. But as the cost of the technologies to characterize those species, to develop and improve those species has come down, there is more and more opportunity to really make a difference.

Hannah Senior: And in the context of climate change, that cannot come soon enough. We really do to make sure that everybody in the world stands to benefit from improved varieties. It doesn't mean we have to lose the heritage varieties that exist. It doesn't mean that we need to lose seed sovereignty. There are lots of ways of doing things that allow us to bring the benefits of plant breeding so that a wider proportion of humanity can benefit. And I think that's really motivating.

Rob Coy: Why do you think the developing world has been overlooked?

Hannah Senior: I think one of the reasons is that there hasn't been enough long-term funding. So plant breeding programs cannot be supported on the basis of three-year grants. They need long-term support in order to build capability, develop germplasm collections, and preserve genetic diversity in order for each new development to build on previous developments, and also build relationships within the farming and seed production community so that innovations do actually get out into the real world.

Hannah Senior: Now, that is hard enough in the rich world, particularly if you're talking about species other than, I don't know, maize, soy, wheat. It's really hard to get long-term funding. If you are then asking for that long-term funding to be focused on parts of the world where there just aren't the resources for self-funding, and it's relying on international donors, that's a lot harder. And I think it's a big failing to be so short-termist, but I also recognize how difficult it is for organizations to make very

long-term funding commitments when sometimes it's quite hard to put your fingers specifically on what the outputs of these programs are.

Hannah Senior: But I think that's probably one of the big reasons that plant breeding has tended to focus on the commercial organisations that can fund their own work, but it is short-term thinking. And I think that will have very undesirable consequences in the long run.

Rob Coy: Where do you see there are more opportunities for plant breeding?

Hannah Senior: I think, and I would count myself in this, I think people in general don't think about plants very much. So I think there's a massive opportunity to just increase awareness about plants and how fascinating they are. There's this idea of plant blindness, isn't there? Where you can look at a picture, and actually most people look straight past the plants and focus on, I don't know, the rabbit or whatever it is in the picture that's not a plant. And I think chipping away at that and trying to share our enthusiasm for the world of plants is a massive opportunity.

Hannah Senior: And part of that is recognizing that it's really hard for people to get their heads around plants often because the time scales are so different. They're so different from human time scales, and the biology might not be as familiar, but there's some brilliant authors out there writing really interesting books on plants that'll get people who otherwise might not be super-excited about it engaged, and documentaries and things like that. So there's lots going on in that area. But I think that's a big opportunity.

Rob Coy: Are there any influences you are particularly grateful for in your life?

Hannah Senior: Lots of influences. People throughout my life have been hugely supportive, and I have been incredibly lucky to have the opportunities I've had, but there is one person who stands out when you say that and in connection with what we've talked about today, which is my biology teacher when I was at school, Mrs. Fitter. Mrs.

Fitter was a really inspiring teacher and responsible for my love of biology, but she also helped me to recognize that it was a subject that I was good at. I don't think I recognized that I had capability until she believed in me and supported me.

Hannah Senior: And it was as a consequence of her support that I ended up applying to Oxford and being accepted. I didn't see that as being a route that would be relevant to me at all, and she was the one who supported and encouraged me. And actually, one of the things that makes me really sad is that I never thanked her for that and never told her what an impact she had on my life. A few years ago, I heard she was ill, and I didn't realise how ill she was until it was too late, and she'd passed away. And so, I think this is a good opportunity to recognize Mrs. Fitter and say thank you very much for setting me on a path that I love and that I have really enjoyed.

Rob Coy: If you could go back to the start of your career, would you do anything differently?

Hannah Senior: Well, there have been times where I've thought maybe I would, if I could go backwards, but actually, I think the thing is about the way careers unfold is that each thing builds on the thing before. And I love what I do at the moment. I love working with PBS and in plant breeding and in agricultural technology, more widely. And if I made different choices earlier, then I might not have ended up here. And that would be a shame. So everybody's life and career has moments where we think, "oh, that was a bad choice" or, "oh, I wish I hadn't done this". But actually that's what shapes us, and that's what helps us to work out where we really do have a good fit between our interests and passions and what we do. So, no. In a word, no, I don't think I would change anything.

Rob Coy: Fantastic. One last question for you. What would you say you are most proud of so far?

Hannah Senior: I think it is the PBS team in the last couple of years. In the UK we have had a rocky ride off it recently. [she chuckles] I mentioned PBS is an almost entirely export-oriented business. And with Brexit, we've had this massive turmoil in our trading terms, the logistics of getting things in and out of ports, all those kinds of issues. And then we got COVID on top of that. And now we've got inflation and a war, and it's just been one thing after another. It's been a very challenging time, but our team have just kept on going, and have been really focused on “what do customers need” “how do we keep making absolutely the best quality products?” and making sure that they get into customers' hands when they're needed?

Hannah Senior: And I suppose when you see a good team, you realise just how much that group can achieve. They have moved mountains. There's no doubt about it. So I think that's what I'm most proud of is just being part of such an awesome team.

Rob Coy: Well, thank you, Hannah. It's been an absolute pleasure to have you on the other side of the microphone instead of on your interviewees. [They both laugh] It's been wonderful to hear the whole series of Plant Breeding Stories. And thank you for wrapping that up and talking about your life, what's influenced you and what's exciting about the future. And I hope everybody's enjoyed listening to the series so far.

Rob Coy: We keep saying it's going to finish with series four, but knowing Hannah as I know Hannah, I think we might see another series in the future. So, I guess we better watch this space.

Hannah Senior: Good stuff. Yeah, it's been fun.

[Theme music plays]

Rob Coy: You've been listening to Plant Breeding Stories by PBS International. Plant breeding is a pretty specialist podcast topic, which can make it difficult for people who share our interest in this kind of thing to find it. So if you've enjoyed the podcast,

recommend it to your friends and colleagues, and please help others in the plant community to find it. You can contact us on Twitter @PBSInt or on Instagram @PBS_int. Until next time, stay well.

[Theme music fades out]