

Transcript: Plant Breeding Stories Podcast
S2E4 Plant Breeding Stories - Dr Hussein Haji



[Theme music plays]

Hannah Senior: Welcome to this episode of the Plant Breeding Stories Podcast, where I talk to leading lights in plant breeding, asking what they do, what makes them tick and what fascinates them about the world of plants. I'm your host Hannah Senior of PBS International, world leaders in pollination control. We design and produce specialist pollination bags and tents used by plant breeders and seed producers all around the world. And through this, I've been privileged to get a unique perspective on how plant breeding globally affects our diets, farming systems and the environment.

Hannah Senior: I'm excited to share a little of this with you as we meet some of the amazing people who make plant breeding their life's work.

Hannah Senior: Today I'm talking to Dr Hussein Haji, the CEO of Filsan Somalia and the executive director of The Somali Agriculture Technical Group, SATG. Dr Haji grew up in Somalia and, inspired by the food production around him, he studied agriculture and started work at the Somali Agricultural Research Institute. But his interest in plant breeding took him to study internationally, first in India and then in Canada where, due to the Somali civil war in the '90s, he settled. He talks about lessons learned from working with tobacco, using tissue culture to boost a nationally important cash crop, and his commitment to helping rebuild agricultural capabilities in his homeland, despite the challenges of running a business surrounded by civil unrest. I hope you enjoy it.

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Hannah Senior: Hussein, perhaps you could start by giving a little overview about your background. Were you always interested in plants specifically and did you consider any other careers along the way?

Dr. Hussein Haji: Well, thanks Hannah for giving me this opportunity to talk about who we are and what we do in Somalia. I was raised from a family that has no agriculture background whatsoever. But we were surrounded in my early childhood with agricultural areas like in southwest of Somalia where agriculture is the main livelihood for the people there. So I could see when I was even young traveling outside of Merca, going to Janale, to Qoryooley, and all these very rich agriculture areas. And they have really good water resources for irrigation as well, so I was very much attracted by that. In fact when I went to school, to the agriculture sector, my parents were surprised and say, "What are you doing there?" Because they're more on business background and I was more attracted to agriculture, so I had that passion for agriculture when I was even young.

Hannah Senior: And so you were obviously attracted over to agriculture by what you saw around you. But did your parents, in time, come to understand why you've chosen to go down that route instead of business?

Dr. Hussein Haji: Well, of course. I mean, they understood later and I had to also make them understand that this is about food security. We live in a country where there is an issue with food security always. There's drought. There's flooding. There is low production. There's lack of technology and all the things. Over the years, I was able to attract them into what I was doing. Because for them, all what they saw, agriculture, just like subsistence farmers going into the farm and doing very menial jobs. There was no new innovations into agriculture. But what I was able to convince them that this is not like a one man show, this is like a factory by itself. It's like a business by itself with so many facets and aspects to it. It's a whole value chain that you have to work in the agriculture sector starting from the production, from processing, all the way to the consumers, so this is not like a simple thing. So I think they understood at some point that this is very important aspect of life.

Hannah Senior: Came around in the end. And I think that is quite a widespread misunderstanding for people who don't understand agriculture or don't come from an agricultural background, so yes, I can relate to that. You mentioned that you started to focus on plant breeding when you went on to do your master's, so what made you decide to go from the broader range of subjects in agriculture more generally into

plant breeding specifically?

Dr. Hussein Haji: Yeah. When I was going to university, my first degree... So we had a number of courses that we're doing. I mean, you go to university, you start from math, botany, pathology, entomology. And in the last year, in my last year, that's when I took a genetics and plant breeding course from Somali National University. And then I realized that it is more challenging and more attractive to me compared to other courses that I was taking.

Hannah Senior: Mmhmm [affirmative] - so you studied your undergraduate degree and got a job at the Agricultural Research Institute in Somalia - what were you doing there?

Dr. Hussein Haji: So that is where I was doing more... Not the plant breeding as such but as a research assistant, just helping and understanding the actual work of plant breeding as well because just graduating from university, you know very little about plant breeding. But then, back then in Somalia, there was no real breeding going on, it was more like an evaluation and assessment of the varieties introduced from outside the country. So I didn't have a lot of flavor in plant breeding until later when I went to my first MSc degree in India, a place called ICRISAT, International Crops Research Institute for the Semi-Arid Tropics. That's when I started experiencing my plant breeding work.

Hannah Senior: Can you build a picture of what Somalia's agricultural scene was like in the late 1980s and early 1990s?

Dr. Hussein Haji: In the 1980s until 1990 there was a lot of involvement that the government were doing to restructure the agriculture in Somalia. Production wise, there were food crops that were produced as well as fruits and vegetable crops. I don't know if you've heard about Somalia used to export banana to Europe, to Italy, and to Middle Eastern countries. The agriculture was very vibrant and there was quite a bit of work that was being done. The production was not sufficient enough to meet the demand of the country, but there was a good production system. And the research was trying to address the constraints that existed in the production system like how to increase the yield, how to get varieties resistant to drought tolerance and insects and diseases and all the things.

Dr. Hussein Haji: There were about 200 people working in that research with an immense facility, working all aspects of agriculture research including pathology, entomology, soils, and economy, and marketing and all the things. And breeding also, of course that was my area that I was working in. There was a good structure before the civil unrest for agriculture research, for agriculture extension, for marketing, for storage, and all the things. It was better structured than what we have now.

Hannah Senior: You did two masters degrees - one in India and one in Canada before going on to do your PhD also in Canada. Can you tell me about that and how that happened?

Dr. Hussein Haji: Yeah. My first degree of master, I got it from India, and that was with ICRISAT. ICRISAT being one of the international centers, that gives me really a very good exposure in research because it's one of the CG centers. CG means Consulting Group for international agriculture research. So that is a lot of scientists working at ICRISAT and I was exposed to research in sorghum. I did breeding and I was working on insect resistance. I came back to Somalia and joined agriculture research again doing breeding work on sorghum. At some point, I became the national sorghum improvement coordinator in Somalia and then I was promoted too, as the Director of Research.

Dr. Hussein Haji: Traveling to Canada, so of course I mean, the Canadian system is very rigorous and sometimes they want you to prove yourself. Degrees coming from overseas sometimes they don't recognize, so I had to do another master's again in genetics and plant breeding. I completed my master's and then went straight into PhD in plant breeding again. I was working at that time with genotype x environment interaction in wheat, underlying causes of G by E interaction. So I did my dissertation work. And published some papers in G by E interaction in wheat with the Canadian Journal of Plant Science. So, '96, '97, that's when I completed my PhD in Canada.

Hannah Senior: And it was of course around that time that the civil unrest began in Somalia, so had you originally planned to go back to Somalia when you'd finished your PhD? And how did that change?

Dr. Hussein Haji: Yes. In fact, the civil war started in '91 so what I did is I just continued on with my education with my Somali passport, and I had a visa, Canadian visa, international student. And at that time there were so many, I mean, Somalis coming to Canada as refugees, but I didn't have any intention to apply to any immigration status in Canada until 1996 when I realized that the country was just falling apart and there was no hope for me to go back to Somalia to do any work. So I decided to apply for immigration status in Canada, and I got the immigration status and immediately, I was offered a job with Agriculture Canada.

Hannah Senior: And that's what took you into the world of tobacco, is that right?

Dr. Hussein Haji: So I worked with Canadian Tobacco Research Foundation for almost 10 years in a place called Delhi in Canada, and really, tobacco offers many things. People see it as a crop that people smoke but it has a lot of other advantages when you're working in the breeding section of tobacco. One is tobacco is a model crop for breeders. If you go back into the history, most of the discoveries that was made in genetics and plant breeding, it came through tobacco because they use tobacco as a model crop. You can get a lot of seed from a cross between two parents in tobacco. You can study the population and you can do backcrosses. You can do haploid breeding. You can do hybrid breeding, so many things that you can do.

Dr. Hussein Haji: I started doing work in tobacco breeding. I inherited a program which was dealing with self pollinated crop. And then what would happen is that I had to introduce ideas in the tobacco program like the hybrid breeding program and haploid breeding program in addition to conventional breeding method that I inherited. Maybe I should express here my appreciation to the Canadian government for giving me the immigration status and offering me a job while I was... I just graduated from university. And I really have learned a lot by being in the tobacco industry.

Hannah Senior: And how long were you in Canada altogether for?

Dr. Hussein Haji: Oh, half of my life.

Hannah Senior: Half of your life. [They laugh]

Hannah Senior: Because I was getting to go on to ask how did you come back to Somalia? Because I know you got settle d in Canada and you had your family there, but then at some point you decided to go back to Somalia, so tell me about that. Tell me about that transition.

Dr. Hussein Haji: The tobacco program was shrinking in Canada, and then there was an offer for an exit strategy from the program so I was very happy to take that offer. But during that time, I was engaged in the agriculture program in Somalia because what we have done during that period of time while I was in Canada, we established with other friends, Somalia Agriculture Technical Group. So this was established in the US in 2001. We were a group of Somali professionals and non-Somalis who have interest in Somali agriculture. We used to meet at the American Society of Agronomy. When I go there every year, I used to meet with other colleagues who were interested in Somali agriculture. And then we decided to have a symposium within the American Society of Agronomy, we invited a number of people. We established this NGO called Somali Agriculture Technical Group where I was leading that team while I was in Canada, and we made a registration for Somali Agriculture Technical Group.

Dr. Hussein Haji: We were providing supervisory services to the NGOs in Somalia and to others who were interested in working in the agriculture sector. So later on, since we already had that institution established, I started my immediate move to Kenya where we established the SATG office in Kenya. And immediately, we had a very warm welcome from the donors and from NGOs

Hannah Senior: And what's the range of services that you were covering at SATG at that point, was it mainly focused on agronomy or was there a wider range?

Dr. Hussein Haji: It was a wider range. Any issue related to agriculture, because the group consisted of agronomist, plant breeders, plant pathologist, economist, even livestock sector. We have this range of technical people who are offering support and advisory role to any issues that emerge.

Hannah Senior: When you returned the agricultural landscape in Somalia was dramatically different to when you left. What kind of challenges did you face?

Dr. Hussein Haji: After the civil unrest, the whole infrastructure of Somalia collapsed, agricultural infrastructure plus all other infrastructures in Somalia. There's no universities. There's no education system. There's no extension services. There's no research. Everything collapsed. So when I went back to Somalia, I realized that there's a long way to go to reestablish the whole system. Many areas were controlled by the rebel groups and there was fighting all over, and so it was a very, very, very difficult situation to see. You know, a country that has a system in place, there was research, there was services, and now there's nothing. It was a really, really big challenge to think of where to start and how to go about it. I had to start from just a small plot of farm that was offered to me by a farmer. That's where we started establishing, doing our research, in that small plot. That was in 2013, 2014.

Hannah Senior: Was SATG offering services to help NGOs who wanted to intervene or support in Somalia, or was it actively offering services directly to farmers? Just explain to me the scope of the activities and has that changed over time.

Dr. Hussein Haji: When I first arrived in Kenya and when I was in Canada even, we were offering services to NGOs like advisory services. But when we established ourselves in Kenya, immediately after the first year we were offering services on the ground with NGOs and also with the donors. FAO was among those who really supported us in establishing our organization and we were working on post harvest losses in 2011, 2012. And then immediately, there was a program from USAID called Partnership for Economic Growth where they needed some support in the research and extension work.

Dr. Hussein Haji: And we started doing some work with USAID on behalf of DAI in Somaliland. And then we moved to southern Somalia where the real agriculture work takes place. We established an incubation center called the Agri-business Incubation Centre in Afgoi, not very far from Mogadishu. And that's where we started doing our work, providing a wider service to anyone else who was interested in the agriculture sector. We had a lot of customers coming to us to help them in the agriculture sector in the seed system in the agronomy sector and pathology sector, even offering training to a number of NGOs to get back into the agriculture sector.

[Theme music plays]

Hannah Senior: 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've 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]

Hannah Senior: We've been talking about SATG and how that operates, but I now want to touch on your other organisation you're involved with, Filsan. Can you tell me about that and why it was set up?

Dr. Hussein Haji: Well, the reason that Filsan was set up was that with the NGO type of work that we were doing, we were not able to do what we wanted to do. So we decided to have Filsan as a private social enterprise business that goes along with SATG.

Hannah Senior: And Filsan has a wide range of activities doesn't it? The soil analysis and seed production and so on. Tell me a little bit about that and the range of things that Filsan does and why, why those things?

Dr. Hussein Haji: Well, as I mentioned to you, the whole infrastructure in Somalia collapsed. So if a farmer wants to do soil analysis, they don't have any place to go because there's no soil analysis lab in the whole of Somalia. If a farmer wants to test his seed, there is no place where they can test their germination and purity for the seed. We felt that it's very important to set up a private sector because there is no private sector in place that works on improved seed varieties or soil analysis. That is what prompted us to get into Filsan, to at least get some of the services back to the farmers.

Dr. Hussein Haji: With Filsan, we have established the soil laboratory, which is in small scale but it serves the purpose because if a farmer has a problem in his farm, he brings the soil to Filsan, we'll be able to determine the soil nutrients like nitrogen, phosphorus, and potassium which are the three key elements for the soil. We are able to tell the farmer if there's a shortage in any of this. Plus soil the salinity if the

soil in the saline, and we'll tell him his pH is very high or very low. So at least it will give some indication to the farmers to correct and we'll give some recommendation measures as well. And the same thing with the seed lab where we have farmers who bring the seed, we will test that for purity, germination, and moisture content, and we'll tell them if the seed is viable enough to grow. And that's what we do with the soil and seed lab.

Hannah Senior: A clarifying question, when we're talking about farmers, what kind of scale are we talking about? Is this subsistence farming smallholder farming or is it larger scale than that?

Dr. Hussein Haji: Majority of the farmers in Somalia, almost 90% and above, they are small scale farmers, subsistence small scale farmers. But then you have also commercial farmers which are composed of a small percentage, and these are mainly farmers who grow bananas and citrus plants. They're not as big in number as the small scale farms. And of course there are a certain percentage of middle scale farmers as well.

Hannah Senior: You've touched on citrus and bananas as an example of the kind of crops Filson deals with - and I'm going to come back to bananas in a moment, but what other types of crops are you involved in?

Dr. Hussein Haji: We are involved mainly in food security crops and also commercial crops as well. We are working with maize and sorghum which are the two most important crops in Somalia, and we are also engaged with cowpea which is also a very important legume crop, and mung beans. In addition to these four, we also engage with sesame which is an oil crop. We produce and purify seeds of this crops, package it, and sell it to the farmers. In addition, we also do some vegetable work, all tropical vegetables grown in Somali like tomato and onions and carrots and watermelon and all the things. But in this case, we are not in a position to develop the seeds locally so we import bulk seeds from outside the country and we repackage it according to farmers' requirement.

Hannah Senior: And are you doing breeding on those crops as well? Or is it more like screening?

Dr. Hussein Haji: Well, most of the work that we do is more on screening to see which varieties are adaptable to the condition of Somalia, but we do a little bit of breeding in partnership with CIMMYT and also in partnership with the ICRISAT for sorghum. The breeding work that we do with CIMMYT is that we have got some inbred lines of a hybrid which we tested in Somalia. So what we do is more of like a seed production rather than breeding as such because we have the two inbred lines. We have to cross these two inbred lines to get the F1 hybrid that will be commercialized and sold to the farmers. Because nowadays if you talk about maize, CIMMYT is doing quite a significant work in developing inbred lines. Sometimes you don't need to repeat the same thing that's being done by already giant international organizations. We take advantage of these, of ICRISAT and CIMMYT to get the proper materials that's suitable for Somalia.

Hannah Senior: I'm curious about sorghum just for a moment, to go slightly off to one side, because sorghum is indigenous to that part of the world, isn't it? It's native to that part of the world, so does that mean that there is a lot of genetic diversity of sorghum types in Somalia and landraces and so on? Do you ever tap into that wealth?

Dr. Hussein Haji: Yeah. We did. We did. In fact in Somalia, as you mentioned correctly, sorghum is indigenous in that part of the world. And what we have, in fact, is more of a landraces than varieties. What we have done in the past, we have done a local germplasm collection in partnership with ICRISAT in the mid 80s. In fact, we have collected about 152 landraces which we have stored. Now in partnership with ICRISAT, we are repatriating some of these promising landraces back into Somalia so that we can start some breeding work among the local varieties and among the local and introduced varieties as well. When you have a landrace, when you have an indigenous crop, it's very hard to beat. Unlike maize, sorghum needs really to focus on your landrace before you get introductions of improved varieties from outside because most likely, the landraces will have more tolerance to drought and to diseases than any other introduced variety.

Hannah Senior: I'd like to get back to bananas now because that's an emerging part of Filsan's activities and I know you've been putting a lot of time and effort into it. Can you tell me a bit about that.

Dr. Hussein Haji: Well, as I mentioned earlier, banana was an export crop in Somalia and one of the major cash crops that was bringing foreign currency into the country. But after the civil war, the banana industry collapsed. So this, I mean, tissue culture idea was something that I've been thinking about for a long time. Even when I was, I mean in Canada, I was doing some tissue culture work in tobacco. I thought that this technology can easily work in banana because banana is very simple to work with when it comes to tissue culture.

Dr. Hussein Haji: Many African countries now have resorted to using of tissue culture banana. I did some research on the challenges that the farmers in Somalia are facing using suckers from the previous crop. Because what happens is that when they plant the sucker, almost 30% and above will die because of the diseases and insects that comes along with the sucker and it's not clean. That is what brought me. And do so much labor into planting suckers in the field. So that was what brought me to this world of tissue culture, to think about introducing this technology back in Somali.

Hannah Senior: Okay. What variety of banana are we talking about here?

Dr. Hussein Haji: We're talking about the local banana varieties which is a Cavendish, and the variety name is McNairn. This is a variety that's being used in many countries and it's very famous, but this introduction took place a long time ago in Somalia. And the other interesting thing is that we didn't want to introduce any other variety in Somalia because of the Panama disease and all these issues with the banana. And banana is a very important crop in Somalia and we didn't want to contaminate it with any other introduced varieties because we don't know what happens if you introduce a new strain. What we did is we started working with the local variety, which is Grand Nain, took the suckers from the Grand Nain, and started doing the tissue culture initiation with varieties that are known to the farmers.

Hannah Senior: So you've set up this tissue culture capability so that farmers can get large enough volumes and clean material and it's more likely to establish, and where have you got to? When will that go live?

Dr. Hussein Haji: Well, now we are at the pilot phase. We started this work establishing the tissue culture lab and bringing all the media that is required to regenerate the plant. So our idea is first of all, get these things working, which we have done successfully and we have reached the final stage. Now, the tissue culture plants that we have produced from the lab are now in the greenhouse. We have seen at least the fruit of our work through the lab for many years. So now, where we are going from here is that to establish and upscale the lab and equip it properly because now we know that at least it works, and the technology is beneficial to the farmers. So in this small lab, we have a plan of producing about half a million plants in the next year so that at least to get into the market. We want to make it commercial, make it readily available to the commercial farmers.

Hannah Senior: And that in itself, the activities that you've described that Filsan's involved in, setting up a tissue culture capability, doing seed screening and production, soil analysis, setting those services up in any country would be challenging, but particularly in Somalia where the infrastructure is more limited. It must have been quite difficult so can you just tell me a little bit about the kind of day to day challenges that you faced in getting all these different components off the ground?

Dr. Hussein Haji: I mean, working in Somalia is a big challenge. I'll just give you an example, we have tissue culture lab facility or whole Filsan facilities placed 11 kilometer away from Mogadishu. And we have a farm, our incubation farm is about 30 kilometers away from Mogadishu. But for me to get from Mogadishu to kilometer 11, it takes me two hours to get there. The whole Mogadishu area is so closed that you cannot cross from one area to another area without going through lines of checkpoints and searches for the car or for you. It's really, really challenging, plus all these explosions that take place and assassinations and killings and other things. The government is doing really a great job in overcoming this problem but it's something that you have to go through when you are in Mogadishu. And you go through so much risks to your life as well because you never know when your day will come. I mean, as I was working in the last several years in Somalia, I have lost many friends in Somalia who died because of explosions that took place.

Dr. Hussein Haji: The thing is that we took a mission which we have to do this work with or without peace, so we could not just sit and wait for the peace to come so that we can operate.

Hannah Senior: It sounds like an incredibly tough environment to make things happen in, and yet that is exactly what you're doing and that is remarkable. And this will also affect, I assume, the way that you get your products out to customers too - these are living materials that need to be transported quickly and carefully. How do you work with your customers to get things out to them?

Dr. Hussein Haji: I mean, we have different customers. Some of our customers are the farmers who will come and buy from us and they will come to maybe the facility to buy the product. Other customers are like an NGO or development organizations. We tell them where we can reach and where we cannot reach. And sometimes, in fact recently we had to send shipments by plane into remote areas where we could not reach by car because there's no road infrastructure or maybe there are checkpoints where you cannot cross. There are some bad guys around the area so we have to take whatever means possible to reach into the remote areas. Sometimes we have to hire small planes that goes from one location to other location and pack them with seeds so that they can land into that location and distribute seeds.

Dr. Hussein Haji: It's very, very difficult and that makes things expensive for our buyers. For example, if a kg of maize seed is \$1, probably the price can go up to \$3 or \$4 because of the additional costs of flights and all the things. It's not an easy task.

Hannah Senior: You've been on an amazing journey setting up Filsan and SATG. What have you learned throughout that process?

Dr. Hussein Haji: Well, what I have learned is that if you have something in your mind and you're passionate about it, you can do it no matter what. With all these ideas and experience that I've accumulated over the years in Somalia and in Canada, I felt that this is the time to do something and I've been dreaming and I've been putting my projects together and thinking through it, but then if you don't do anything about it, it will just remain as a dream and it will be on the shelf. I felt that I

have to do something and that's what pushed me to get into that. And I think it's very rewarding because you're changing lives of very poor people. That's what drives me to this adventurous things to do.

Hannah Senior: And what next? What does the future hold? What are your next plans?

Dr. Hussein Haji: My next plan is to retire. [They both laugh]

Hannah Senior: I think well earned!

Dr. Hussein Haji: Yes! I've done enough. I'm 65. But we say in Somalia, Somalis won't retire until they die, they just keep going. All my friends have retired, my non Somali friends, but my Somali friends are still around doing some work. Honestly speaking, I just want to see these things working. I still think that I'm healthy and fit enough to do some work. I just want to push some of this agenda forward. I'm really very pleased because in the last 10 years that I've been involved in Somalia, we were able to get some policies and regulations from the Minister of Agriculture side working. At least seed systems is taking shape in Somalia now. The tissue culture is taking shape. At least there are some labs that people can come and do some work. I feel really satisfied with that and if I can push a little bit farther to upscale this into a more commercial and productive aspect of it, I will do it as much as I can do.

Hannah Senior: Thank you very much for your time today. It has been such an interesting and inspiring conversation. Dr. Hussein Haji. Thank you.

Dr. Hussein Haji: Thank you. Thank you, Hannah.

[Theme Music Plays]

Hannah Senior: You've been listening to plant breeding stories by PBS International and I'm your host, Hannah Senior. 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 science community to find it. By rating this episode and subscribing to the series. I'd love to hear from you if you want to suggest people you'd like me to interview, you can contact me on twitter @PBSInt or on Instagram @PBS_Int. Until next time, stay well.

[Theme music fades]