

Transcript: Plant Breeding Stories Podcast

S4 E3 Dr Salvatore Ceccarelli



[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. 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. Series four will be the last in this podcast. And it has been the most incredible experience to dig into so many different aspects of the plant breeding world and *literally* the world. If you're listening to this, you're part of a community that spans the globe from Albania to Zambia, Adelaide, Australia, and Ames, Iowa to Zurich in Switzerland.

Hannah Senior: Dr Salvatore Ceccarelli was born in Italy and began his plant breeding career as an Academic in Perugia, before an impulse decision set him on a course which defined his career. He spent the next 30 years working with the International Center for Agricultural Research in the Dry Areas, ICARDA, based in Aleppo in Syria. His time there was characterised by his dedication to participatory breeding practices, engaging local farmers in incredibly difficult agricultural conditions to select the best varieties - which often threw up unexpected consequences. I hope you enjoy it.

[Theme music fades out]

Hannah Senior: Thank you very much for joining me today, Dr. Salvatore Ceccarelli. Why don't you kick off by introducing yourself and tell me a bit about your background?

Salvatore Ceccarelli: Well, thank you very much for inviting me and congratulations for the correct pronunciation of my surname, which is quite unusual I should say! I started my career as a university professor teaching genetics and plant breeding in Italy. I grew up in central Italy where I was born during the second World War. Then after I finished my first degree at university in central Italy, I moved to Milano where I had my PhD course in applied genetics. And then I started my university career. I was reasonably lucky because within six years from a degree, I had what is considered to be a permanent position. In 1973, I spent one sabbatical in US where I studied genetics in a very prestigious university, North Carolina State University.

Salvatore Ceccarelli: And then I came back to Italy and I was settling down in my university career. And then in 1979, I was attending a conference of the Italian Society of Plant Breeding and at the closing ceremony, the president of that association complained about the total absence of Italian scientists from the CGIR centers, international research center. And they closed the microphone saying, "Well, if anybody's interested, just let me know." And in those 20 seconds after he shut down the microphone and came down the aisle, I stood up and I told him "I'm interested." And I was not aware that in those 20 seconds, I actually changed my life.

Hannah Senior: [Hannah chuckles] A quick decision that changed the direction of your career and your life!

Salvatore Ceccarelli: Well, I'm using that example when I'm teaching young students, when I'm comparing our intestinal flora, which is about two kilograms, compare with the average weight of our brain, which is 1.5 kilograms. By telling them "This decision which comes from inside, does have a certain weight! [Salvatore is laughing] "Is about two kilograms!".

[They both laugh]

Hannah Senior: I like that. I like that analogy. So let me just go back for a second. You talked about how you had an interest in genetics. Was that always plants and what specifically interested you in plants?

Salvatore Ceccarelli: Well, yes, because I did my thesis on plant breeding. At that time, genetics and plant breeding in the faculty of agriculture were actually not compulsory subjects. I'm not sure why I decided to choose plant breeding, but then I decided to have my master thesis on plant breeding. And it was love at first sight. In fact, I consider myself a very lucky person because I always did what I wanted to do.

Hannah Senior: Oh, so you are a very lucky person. You've been able to pursue your interests. And when you followed your gut, it's taken you in a good direction. So both of those things have been very fortunate for you.

Salvatore Ceccarelli: Well, I don't want to jump to the end of our conversation, but I've been now retired for almost 6 years. And I remember the reply to the question which was posed to one of my friends. The question was, "Miguel, when are you going to retire?" And the answer was "You retire from a job, not from a passion".

Hannah Senior: Haha! There you go! So, your plant breeding story is a very international one. You traveled a lot in your university career. And then after that, you worked and lived in Syria for many years, which we'll talk about in a bit. But I want to know, did you intend to have a very international career or was it something that happened by chance?

Salvatore Ceccarelli: Well, somehow I think it is associated with my first scientific interest, which were forage grasses. At that time, one of the leading centers in research

in forage grasses was Aberystwyth in Wales. And there was one point in which the University of Perugia in central Italy and Aberystwyth were possibly the leading centers in Europe on forage grasses. So I traveled to Aberystwyth quite often. I think it was because of that international connection that I travel very often to US after the first experience for international conferences. Again, I was probably the only one able to speak decent English. And therefore, this was one of the reasons why I attended several conferences until 1979, where because of that reaction to the speech of the president of this Italian Association of Plant Breeding, I was sent for a job interview to India, to Hyderabad, which was - still is, the headquarters of one of the international centers.

Hannah Senior: You did go to the job interview in Hyderabad, but you didn't really consider taking it. Why was that?

Salvatore Ceccarelli:

When I came back, I was told, even if they offer you a job, don't take it because we were just told that there is a job which might suit your interest much more closely. And this is in Aleppo, Syria. So in April 1980, I went to Syria for my job interview. It was a fascinating experience. Syria at that time was very troubled because the Muslim brothers were trying to overthrow President Assad, the father of the current president. And therefore the Aleppo that I known was a city surrounded by the army with tanks at every corner. But, I don't know, it looked to me that this was a normal way of living in Aleppo!

[They both laugh]

Hannah Senior: See, not everybody would choose to take a job in a city that's surrounded by troops!

Salvatore Ceccarelli: Immediately, the perception that it was a place in which I could continue to do research at the same level as I was used to doing at university. But at the same time, the possible clients, the possible beneficiaries of my research were just outside the fence. And therefore I decided to accept the job. And in September, 1980, I moved to Aleppo.

Hannah Senior: I want to pick up on something that you just said that the client or beneficiary of your work was just over the fence. How is that different from what you were doing in Italy?

Salvatore Ceccarelli: It's something that perhaps is difficult to explain but you do the same work, and if you do it in a university in Italy, you know that you are the major beneficiaries. You publish, you become known, you get more funds for research, you get invitation to conferences and this continues to roll. While in that environment, you do exactly the same thing, but you look outside the fence and say, "Well, if I'm successful, these people will have more feed for their sheep and therefore the livelihood will improve."

Hannah Senior: So you did two years of research in Syria with a focus on forage grasses, but then you came back to Italy. Why was that?

Salvatore Ceccarelli: I went for those first two years with a special arrangement, which I'm not sure that they still exist in Italy. We had a law on international corporation, which allows university professor to be transferred from the Minister of Education, to the Foreign Ministry, and then authorized to do research in a foreign country. Therefore, you stop receiving the salary in Italy. You will be paid by the receiving institution, but you maintain your position. But that particular arrangement could not be extended over two years unless I change the type of research. Which I was not prepared to do. But then as soon as I came back to Italy, I remember sitting on the balcony of my house in Perugia,

waiting for the truck to bring the goods that we transfer back to Italy and asking myself “what the hell I'm doing here?”

Hannah Senior: Oh, okay. So it didn't take long for you to think, "Oh, have I made the right decision?"

Salvatore Ceccarelli: No, because you come from that situation where you understand the importance of rainfall, the damage that drought can do to people, the interaction with people coming from many different countries. And you end up at university where the major topic was where are we going to set up the new toilet coming to the university. It was very frustrating! [He laughs]

[They both laugh]

Hannah Senior: Okay. So you had a sense of mission shall we say, that wasn't being fulfilled back in Perugia?

[They both laugh]

Hannah Senior: But you did return to Syria a few years later, and you went back to ICARDA, the International Center for Agricultural Research in the Dry Areas, but you had by then switched your focus at that point from forage grass to barley. So before we get going any further, perhaps you could tell me a bit about ICARDA.

Salvatore Ceccarelli: Well, ICARDA is one of the international research center belonging to the Consortium which goes under the name of CGIAR, which was established as a result of the success of CIMMYT, which was a Rockefeller initiative to solve specific problems. The problem of rust diseases on wheat in the Yaqui Valley in Mexico. In the sixties, Mexico decided to become self-sufficient in wheat. They expanded the crop in the Yaqui Valley, very warm with irrigation. There was a problem of diseases. They fixed the problem. And this was a signal that perhaps is more efficient

to do research right in the countries where they need it, rather than exporting result of research from other countries.

Salvatore Ceccarelli: So CIMMYT was the first center to be established. Then this was followed by IRRI. ICARDA was established in 1976. There was quite a lot of debate where the center should be established. And eventually they choose Aleppo because it was close to important university in the city of Aleppo. For many years, our offices were in the city, but then there was a donation from the other countries to erect all the offices and labs directly in the campus. It was not Damascus because in Damascus there was another Arab international center.

Hannah Senior: And you were headquartered in Aleppo, but had research stations in other countries, yes?

Salvatore Ceccarelli: We had experimental areas in Lebanon, in the Beqaa Valley. For some time in Cyprus. And of course, connection with all the other countries where we could use the facilities of ministries, for example, in Jordan, which was very easy to reach. And when I started, because barley is the last crop before the desert, I thought that I will need an even drier site. So I ask the Institute to rent about 10 hectares in a place where basically, I was the only one doing research. This site was very important because it was in that particular place, interacting with the farmer looking at the security of the place so, kicking out animals when they entered the field, it was my interaction with him that start changing my way of thinking research.

[Theme tune fades up]

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 of plants, greater food security, and more sustainable agriculture. Now, back to the podcast.

[Theme tune fades down]

Hannah Senior: You were breeding barley for growing in drought prone areas. Can you give me an idea of how much or perhaps how little rain these areas could get?

Salvatore Ceccarelli: Well, the fascinating aspect of that area was that you have a drop in rainfall very rapidly in very short distances. Somebody made a calculation that the rainfall was dropping by about 10 millimeters a year, every 30 kilometers, which means that from... If you start moving from Aleppo where normally you will receive about 350 millimeter rainfall, is an area where agriculture is reasonably safe in the sense that there is not a big risk in raising a crop. Within 40 kilometers, the rainfall drop by 100 millimeters, and you get into the 250 rainfall. Now with 250 rainfall, if it's not well distributed, you may actually miss a crop. Then from there, I move to an area in which you get about 180. And this is where my heroes were! Because if the people farming in those extreme situation will stop farming, then what next? What next is a desert. The desert will take over. So they are a sort of protection for the rest of agriculture, even though they basically rely on something that they cannot control, namely, the rainfall, for their life.

Hannah Senior: Wow - It's hard to imagine trying to farm with so little rain.

Salvatore Ceccarelli: I was still from time to time taking a few weeks from my job at ICARDA to give a few lectures in Italy to maintain my position. And I remember it was February-March, 1987, and I left Syria where we planted the crop. But until I left, there was no rain. And I remember I was giving exams, so I was exposed to a range of students sitting in front of me waiting to be admitted to the oral examination. And then the secretary came with a telex and the telex was my secretary in Syria saying "We

receive 30 millimeter rainfall". And I remember saying, "Wow!." [Hannah Laughs] And the students were like, "What happened?" I said, "Well, we got 30 millimeters of rainfall!" [Salvatore is laughing] And, you know, in a place where you get 800 millimeter rainfall, they did not understand what 30 millimeter rainfall was! [They both laugh] And then I realized that I started thinking like the farmers. So we're very happy about the drop of rain.

Hannah Senior: And this connection with the farmers is something that's been quite defining throughout your career. Not only do you engage with the importance of the rainfall, but you also see more of their needs and their risks, and that led you to do participatory breeding work. So how did that come about and how did it change the way you were working?

Salvatore Ceccarelli: Well, I was mentioning these 10 hectares that I asked ICARDA to rent to expose all the material under selection to a very intense drought. And the person who was looking after the field, used to bring me a cup of tea when he saw me the field. And on one of this occasion, he was waiting for me to finish a set of observation. And then, as I was drinking the cup of tea told me, "I never have thought that there are so many different types of barley." I found it normal to ask him, I said, "Well, can you tell me which one do you like?" And this was a big revelation because he was actually selecting all those I had discarded. In other words, I was coming from breeding for short crop so that you can put a lot of nitrogen. And he was exactly selecting the opposite, the tallest plot.

Salvatore Ceccarelli: So I asked him, "Why would you choose this?" And so he explained to me, he said, "Well, look when we get a drought, the crop becomes very short. So short that not even a combine can help because we have stones in the field. So if I start from a very tall crop, even if it becomes shorter, it will never be that short that cannot be harvested by combine. And therefore, I will never to harvest by hand,

which is much more expensive." And so I decided, I mean, how can I continue to work if I'm not coming in this places and interacting with these guys.

Salvatore Ceccarelli: And so this was the decision that we took in 1995. So about 10 years after I started the job at ICARDA as a barley breeder. And we went out in some villages where one of my technician already knew some farmers and we start discussing with them what would've been this sort of collaboration. I would bring them a number of varieties, and I will let them decide which one they thought would be useful in their context. And we start doing this in nine villages, and there was a measured response by the farmers in terms of accepting this sort of interaction. Immediately, they told me, they said, "There is a substantial difference in the way we are interacting with you, and we are interacting with our scientists from the Minister of Agriculture of Syria. Because you are listening to all our requests. And if you do not agree, you tell us. If you agree, this becomes an element of change in the way we're doing research. But our scientists will never do that. They never ask us what is our opinion."

Salvatore Ceccarelli: And this was the beauty of that relationship, but what was also in the long term, what eventually made that sort of relationship very dangerous, because it gave them back a dignity and the self confidence that their opinion counted.

Hannah Senior: And how did that impact the methods that you used and the varieties that you were producing?

Salvatore Ceccarelli: There were a lot of implications in the methodology because first we had to reconcile how much diversity we bring to the farmers, but how much land we could use, because they also need their land for their own purposes. The second was the actual methodology because working the farmer field is of course less precise than working on research station. So we need to refine our experimental design, statistical analysis to set up a mode of collaboration. And therefore, there I enter in a territory in which I did not have a lot of experience. Was very useful, for example, in the first couple

of years of this relationship to go to these villages with my American colleagues, anthropologist, with a gender specialist, with a social economist, because these people were able, for example, to perceive them during discussion with 15, 20 farmers, there were only two or three doing all the talking. The other did not dare to talk.

Salvatore Ceccarelli: So there were power relationships within the village that you should consider, take into account, because if the work was based on considering the collective opinion, and not only the opinion of the people who had the power in the village, then you had to set up different meetings. So there was all these aspects, which of course were completely new compared to the type of work.

Salvatore Ceccarelli: The other important thing is that because of the importance of plant height, we start using, for example, the wild progenitor of barley, which is still widespread in that region. Don't forget that we are talking about the upper part of the fertile crescent. So it's an area where you still have the wild relatives of barley or wheat or pistachio, of chickpea, of lentil. So is a treasury of germplasm.

Salvatore Ceccarelli: And in some cases it's difficult to use the wild relatives because of crossing barriers. In the case of barley fortunately, the crosses are very easy and therefore, because *hordeum spontaneum* is able to remain very tall, even under very intense drought, we start transferring that attribute to the cultivator barley and most of our successful varieties in dry areas had *hordeum spontaneum* - the wild progenitor, as one of the parents.

Hannah Senior: And what about disease resistance? Were you breeding for that?

Salvatore Ceccarelli: Well, the problem with diseases was that the humidity was so low that disease pressure was not very, very high. The other trait which was very important was straw quality. In fact, one of our surprise when farmers start going through all these different types of barley was that they put their hands inside the plot and they tested the

straw. So you see this was another drastic change because in industrial agriculture, logic resistance, therefore strong straw is very important.

Salvatore Ceccarelli: But in that context, because the crop is almost entirely fed to sheep and because the nutritional value of straw is low, what counts is how much you eat. And how much you eat, it depends how palatable it is. And of course, their ideal crop under 200, 250 millimeter rainfall was a crop which will fall flat in the 350 millimeter rainfall of the research station. So all this, their selection would've been discarded regularly in the research station. And so this was a major achievement in transferring all the research. With the same scientific sort of precision, in fact, we continue to publish and we became well known for that work, which is still widely cited today.

Hannah Senior: And just go back to the point that you made about encouraging the people that you are working with, the farmers, to feel more confident in voicing their opinions and having their opinions heard. Can you expand on that for me? Because you said it became dangerous. So, what were the implications of that?

Salvatore Ceccarelli: I should have understood this when farmers were telling me, they said, "All this work is very interesting for us because it gives us varieties which are more productive, so we can better feed our sheep, we get better income. But even more importantly is that we feel change as person, because we now are no longer a person who from time to time, you get the technician or the scientist who are telling us what to do, but we know that our opinion count. And therefore we feel that we are different people when we go to offices or when we interact with authorities. We know that our opinion count." And of course, in many political systems, this sort of self confidence is not well accepted.

Salvatore Ceccarelli: And we had two episodes, one in Syria and one in Iran almost at the same time, we're talking about 2007. In the case of Iran, it was only one province in which I was told that I was not welcome. And in the case of Syria, the Minister of

Agriculture wrote a letter to the Director General of ICARDA saying that the work that I was doing was a threat to the food security of the country. And therefore, because up to that point, I mentioned before that we started with nine villages, but with the support of the Minister of Agriculture, their staff, their machinery, their research station, we expanded to 24 villages. So covering all Syria. And as a consequence of that letter was that the support of the ministry was withdrawn. And therefore I had to explain to farmers the reason why we had to scale down. It was not a matter of financial support, it was a technical support. Where I had one technician, one vehicle and I could not cover 24 villages.

Salvatore Ceccarelli: Farmers were horrified by that letter because I made copies of course of that letter. So they wanted to organize a march to Damascus in front of, to the Minister of Agriculture. And then I told them better not to do that if they want me to stay in the country. And in fact, I stay in the country. Eventually, I had to scale down at work. But then, together with my wife, because we have been sharing all this, we thought about a different way of making farmers self-sufficient in terms of seed and of managing diversity. And that's why we came back with this, not our idea, but we actually used this idea which was already going around since a long time of using evolutionary populations and mixtures.

Hannah Senior: You mentioned that you were working with your wife at that time. Did you encounter many issues having women in the field and in your research teams?

Salvatore Ceccarelli: The inclusion of women was a particularly complex issue in Syria. In Jordan, there was no problem in having women come to the field. And very often they had a different perception of what to select. And when in Syria, it was only after a young female PhD student decided to take the issue of women participation as her PhD thesis that we found a way of involving also Syrian women.

Hannah Senior: And I know you retired and your wife took over the role of manager around the time of the conflict starting. How did that pan out?

Salvatore Ceccarelli: The philosophy of the program of course did not change, but the gender of the manager changed, and this unfortunately, unfortunately for my wife, made a lot of difference. So she was really under a lot of pressure, a lot of discrimination. And in 2010, this was before the conflict, the conflict started in 2011, but in December, 2010, my wife resigned. So physically we left after the conflict started, but the decision was taken before the conflict. So our decision is no relationship to the conflict.

Hannah Senior: You've both left Syria now, but the conflict is ongoing and there has been so much upheaval in Syria, particularly in Aleppo. Do you know what's happened to the research center since you left?

Salvatore Ceccarelli: Well, unfortunately the institute decided to decrease their involvement in participatory plant breeding. Since we left, we never came back. We know that some of the farmers have to move in other areas. We still have some contacts through Facebook or WhatsApp. What very interesting is you are calling a person who comes from 10 years of war in his country, and you would expect that the first thing that he will tell you is that he's safe, that his family is good, but the guy, the first thing that he told me, he said, "Dr. Salvatore, I'm still planting the seed that we selected together." And I mean, knowing the Syrian farmers, I believe that unless they are prevented from doing so, they still use that seed. Because the way in which we interacted, that seed is no longer Dr. Ceccarelli seed, it's their seed because they selected.

Hannah Senior: So through all of the upheaval, the genetic legacy has been maintained. That's great.

Salvatore Ceccarelli: Yeah, but that people have a level of resilience which is unbelievable.

Hannah Senior: We're running out of time, but wrapping up I have one last question. You have spent a large part of your career working towards creating resources for very low income countries and very difficult growing conditions. How has this changed your perspective over the years?

Salvatore Ceccarelli: I am able to see how all these problems actually have always the seed at the center. And therefore, the issue of who owns the seed is becoming crucial. The root of this problem is that if somebody has the seed in his hand, everything else depends on him. What we eat, what type of agriculture, how we're going to cope with climate change. But if that seed becomes different seed in the hands of other farmers, is probably the cheapest and the more efficient weapon that we have. I'm not sure whether I continue my life in academia, whether I would've been able to see all these connection between all different problems which seems to be disconnected. Unfortunately very often are discussed as if they were separate problem, but it's so difficult to convince people that in the center of all this problem is the seed.

Hannah Senior: That feels like a great place to leave it. Thank you so much for your time today it's been a fascinating conversation. Dr Salvatore Ceccarelli.

[Theme music fades up]

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 at PBS_Int. Until next time, stay well.

[Theme music fades out]