Dear everyone, I'm so happy that you're all here with me today. We have 13 minutes before the Commission arrives, and in that time I would like to give you a brief impression about the research that I've been doing over the past six years. While I was doing my PhD, I sometimes felt a little bit like this guy. I'm studying a tiny, tiny part of the universe, and it becomes my world. And in the end, even writing a book on it does not really seem to be enough to capture everything that I saw and learned in that time. And I'm also very happy that you're all here with me today. What I can tell you today about this little part of the new universe is that it is immensely rich, full of wonders, and much more complex than you would initially think. So let me introduce you to this world. Imagine you're standing at the edge of a forest in spring. The leaves are no more than tiny buds yet, and the sun is reaching the forest floor, illuminating a carpet of yellow and white and purple. A light yellow flower catches your attention. It seems to stretch itself, trying to raise higher than all the other flowers. Maybe it actually tried to catch your attention, or the attention of the only buzzing insect around, a bumblebee queen trying to find the first food of the year. Look at this plant through the eyes of the little prince and start asking questions. What do these populations of flowers need to thrive? As Brauchund is a plant from here, it's a good idea, and it's sublime. Who's pollinating it? And how did the seeds of these plants get here in the first place? You're looking at primula elazio, slankuslerte bloom, ora ruchlesle bloom. I visited over 30 populations of this plant species throughout my research, and I counted how large populations were, how many flowers they make, how many seedlings are present, and I collected leaf samples for genetic analysis. And here are some things that I found. First, small populations face challenges. To understand why, we have to take a closer look at the plant's flowers. Ye de planze, die za aat, kannu eine aat von bloomtückenmaham. Every plant of this species can only make one type of flowers, either flowers in which the ant is at the top and the stamp is at the bottom, or flowers in which it is the other way around. Pollination can only take place between flowers of different types, but not between flowers of the same type. Büch derben kannu zadfinten, zwischen bloomen, das gla... van unter sichtungten, nicht die doch zwischen bloomen, das glaissen tubes. When a population becomes small, by chance, the ratio of those two flower types becomes more uneven. If there are only 10 plants left and all the plants have the same flower and morph type, well, then the population cannot reproduce anymore. I saw this pattern back in the data, where plants produce fewer and fewer seeds when population sizes decline. But not only does the seed production, and therefore the reproductive capacity of the population declines, I also saw that the genetic diversity is lower in smaller populations. Genetic diversity is very important for populations to survive. Genetically diverse populations can more easily adapt to change in the environment, such as climate change. When a population becomes small and loses more and more of its genetic diversity, the chances that individuals with a genetic combination that can cope with a change in the environment become smaller too. So, small populations have low genetic diversity and they reproduce less well. That's bad news, especially in a landscape as fragmented as Europe, where many habitat fragments are small and not well connected to another. Plants that evolved in habitat types that are usually very stable are not that well in crossing large distances, usually. Primula, for instance, produces small, round seeds that fall to the ground next to the mother plant. And, well, how could they reach a forest that is a kilometer further away? Even if the conditions are suitable there, the plant might simply not reach it, especially not in a landscape as fragmented. To cross large distances, they require a helping hand. We can offer that help by means of reintroductions. However, there are a lot of things that we have to consider with reintroduction of plant species. Think of the species' preferred habitat conditions, how large the genetic diversity of the founder population is, or whether partner organisms that the plants need are present or not. One thing that is not yet well understood is the role that microorganisms play in this. There are a lot of hidden interactions in the soil and how generalistic these relationships are and whether plants need a specific microorganism is not well known. So, if we establish a new population in a forest, would the reintroduction success be greater if the reintroduced plants would also receive a soil inoculation treatment? I investigated the effect of soil inoculation on the establishment of reintroduced plants. Soil inoculation means the transfer of small amounts of soil that I collected around the roots of plants from existing populations. I started my experiment in the greenhouse, where I grew a few seeds of three rare plant species, primulolazio, hypericompocrum, and solidargovircaria. I grew those seeds in pots with potting soil and sand, and to each individual pot, I added the soil inoculum. Either I added soil that I left untreated, containing living microorganisms, or I added sterilized soil, or I added no soil inoculum at all. And I'm experimenting in the back of the house, and I'm very happy to see the effect of bone transplantation after a few months ago. I'm very happy to see the plants. I'm very happy to see the growth of the plants. I measured the plants repeatedly in the greenhouse, and after six months, I transferred them to the field sites, where I monitored their growth for another two years. I found that each plant species reacted differently. By the effect of bone transplantation. Hypericum profited from the soil inoculation. It had higher survival, higher flowering, and it grew larger. Solidargovircaria only showed higher flowering, and in primulolazio, the effect was even negative, where plants that received living inoculum had a lower survival. I have an idea about why the plant species reacted this differently to the soil inoculation. Comparing the three species I worked with, Hypericum and Solidargovircaria, grown soil that is relatively lutean poor and dry, while primulolazio grows on nutrient ritual soil. Microorganisms are important for plants to acquire nutrients and water, which is most important when these resources are scarce. That is, in the habitat of Hypericum and Solidargovircaria. Primulol, however, has a lot of resources available, and is therefore probably less dependent on mycorrhizal interactions. The negative response of primulol could actually be pathogen-borne, because when we transfer soils from existing population, we might also transfer pathogens. My research therefore shows that each plant has its own story, and that we have to look closely at the species' ecological requirements to make well-informed decisions about how to restore and conserve populations effectively. Knowing these plants, understanding how they complete their life cycle, how and when they reproduce and disperse, is essential if we want to conserve them well. And conserving them well is so important. While plants are in severe decline, in the Netherlands, more than one-third of our native plant species are on the red list, National Red List of Threatened Species. While we lose more and more biodiversity, we also seem to forget how much we depend on it. While plants make the oxygen we breathe, they provide food and habitat for the insects who pollinate our crops. They are sources of medicine. They are the very base of ecosystems to clean our water and protect us from natural hazards or pests. They are part of our culture. Take care of our well-being and bring us a sense of belonging. When we make ourselves familiar with a plant, when we are restoring our relationship with it, it means that we are restoring a part of ourselves. It is the restoration of this relationship that we should be striving for. Please be seated. I hereby open this ceremony convened by the Academic Board of Wageningen University, in which Sina Baum is offered the opportunity of defending a thesis with propositions entitled Health by the Plants, how insights in population ecological and genetic processes can improve plant conservation and reintroductions. The defence will take place before an examining committee, appointed by the Academic Board as a prerequisite for conferring the degree of Doctor. Good afternoon. I would like to welcome you all to this ceremony. My name is Martin van Ithesen, Professor of Plant Production Systems at this university, member of the Academic Board and representing the Rector Magnificus today. I would like to call upon the first examiner, Professor Dr.

Pinja Claros, who is Professor of Forest Ecology and Forest Management at this university. Thank you, Rector. Respected candidate, I would like first to congratulate you with your work. I have read your thesis with lots of interest, and it has allowed me to dive into a world, helps with beautiful flowers, that I normally enjoy while walking in nature. But it's a world, I'm less familiar since scientifically speaking, so I'm very happy that I have this moment now with you to talk and discuss more about your work. So I have prepared some questions as you have expected. So you described in your thesis how the populations used in your study were selected and how they are distributed throughout the Netherlands. But it wasn't very clear to me how you decided where to establish the plot. So you went to an area, to a population, what did you do then? Highly esteemed opponent. Thank you very much for your kind words and your question. Well, before I went to field work, I thought about the design of my measurements, and it was important to me to capture as much of the variation of the plant species in their fitness as possible. And in order to do that, I always established one plot at a place where I thought, here the plants are making the most vital impression. And I also established four plots at places where I thought, something's going on here, the plant is not healthy, there are very few plants, there are no seedlings. And the rest of the plots I distributed have a randomly. So with that design, I aim to capture a lot of variation in order to be able to see patterns about what type of soil conditions are affecting the well-being of these plants. Okay, so when you distributed these plots at random, does it mean that some of your plots actually ended up in areas without plants? No.

All of those plots were areas where the plant grows. Okay, maybe with better or worse conditions, or to say. But not being there may be also important to determine under what conditions this plant is striving. You're absolutely right. So if you're looking backwards and looking at your data, how do you think your results would have been or would change if you would include plots that have actually zero plants? There are some factors that influence whether or not there is the plant growing there or not. And it could be that the conditions are not right. It could also be that the plants couldn't reach it. And because of that noise, I think actually, the conclusions would not be that greatly different. And the effect sizes would also not be immensely different. Because you always have the noise of, well, the plant just didn't get there. And that is why it is not standing there. I think that I would definitely see more extremes. For instance, I did not find a relationship with soil pH. But of course, if I would include plots that are far out of scope, then I would see the optimum where the plant appears in pH. I think you're not biasing positively your results for translocation. Then you're basically saying, okay, based on these conditions, these are the places where you should plant the plant. Do you want these species? I think that is something that you would always want, because your introduction is there to be successful. And you want to make sure you plant it in the right place. Yeah. No, you're right. Thank you for that. So going to chapter three now, you have characterized the habitat quality where primula iliator grows. And you found that these species, and I quote, thrives under a specific set of environmental conditions, moderate nutrient levels, relatively moist, solid, and intermediate to well buffer conditions. And I actually find very fascinating that these conditions are found more or less in both grasslands and forests. There are some differences between these two ecosystems, but the differences are not that dramatic as I was expecting. So, but why do you think that this plant is able actually to grow in both in grasslands and forests? I mean, I'm asking this because obviously, you know that I'm a very forest biased person. So I see forest and grassland as very different environments. I see. I see. I think from the plant's point of view, actually many things are very similar. The plant flowers very, very early in spring. It is one of the first when the trees do not have leaves here. So the shade issue is something that is, it is not an issue at the time, the plant flowers. And that is both the same in the grassland as in the forest, for instance. Also in the grassland, it grows on wet grasslands, which are grasslands that are, yeah, because of the groundwater influence, they do not become as warm. And the same thing also applies in the forest. It has a more buffered microclimate. It does not become as warm. So, yeah, there are quite some similarities. And I was curious why you didn't measure light conditions in a more direct way. Because, I mean, in this figure 2.3 in page 32, you relate the number of seed number per fruit in relation to forest cover. And there is an optimum there. Between 15% to 35% of forest cover in a given area. So I was trying to translate that to light conditions, but that seems to be very open to me. Oh, I see. I think we talk about a quite large radius with those kind of numbers. It's a radius of one kilometer in which there is 30% of forest. That does not mean that the light conditions at the spot are relatively, yeah, relatively light. Yeah, but then why not to measure light conditions? Don't you think that it plays a role? I could. Well, what I did measure is it is not included. I have to be honest, but I did take canopy photographs and calculated how much of the area is covered by tree branches. And in the previous, like in the first analysis, there was not, I did not find a lot in these data. On the other hand, there were also the software that I used for that was also not that great. There were a lot of noises in there. And also, that was a high, yeah, relevant measurement because I wanted to include it first, was because my field work was within a period of one month. And when I started, all the tree leaves were not there. And in the end of that, they emerged. And that had really messed up this variable, so I couldn't include it. Maybe something to measure then over the course of the year. And maybe a nice experiment to do with the students in the future. I have a bit of time still, and I'm dying to ask you something. In the tropics, when we talk about protected areas, there's this huge discussion about few at large areas set aside for protection or many small areas. We see that as a trade-off. Many papers have been written to that. I kind of see a trade-off in UTS as well, but between other variables, I see a trade-off between quantity of the area, so size again, but also quality of the site conditions. For which one should we go into in the Netherlands? I think in many places in the Netherlands, unfortunately, there's not really the room to make very large areas. So we kind of stuck with a small, fragmented situation. But it is immensely important to increase the connections between those small areas, because those small areas, and that is a great issue, I think, is often not enough to host as much of the genetic diversity that is needed for a population in order to cope with the changing environment, such as climate change. And to achieve that, we have to make sure that, well, wherever possible, habitat to be enlarged, because that supports genetic diversity. And if not possible, then increase the connectivity. What about quality? Because I thought that quality is a big issue in terms of nitrogen deposition in the Netherlands, and basically, we have given up on quality. I have not. We can still, I think there's a lot we have to do, because otherwise, there's simply not, well, the suitable conditions for the species to survive. So we have to make sure we focus on both. Thank you very much.

I give back the word. Thank you, Professor Piña Claros, for your examination. We then continue with Professor Dr.

Köllemann, who's Professor of Biodiversity and Environment at the University of Antwerp in Belgium. Please, Professor Piña Claros. Thank you, Mr.

Chair. Respected candidates, congratulations on your work. It was a pleasure for me to read, not only because it deals with reintroduction and the interaction with the environment and population restoration, which is also something I am researching. But also because I thought it was aesthetically very pleasing, the work, so, and that's something you should be proud of. I do have some questions, though, and my first question is about the chapter number two. On page 35, you recommend Exito State Storage and Subsequent Re-introductions. But the Exito State Storage, the need to do Exito State Storage seems to pop out of nowhere. So could you expand a little bit more on why there might be a need for Exito State Storage? Highly esteemed opponent. Thank you very much for your kind words on my work. And your interesting question, and it is a very good point that needs to receive more attention, I agree. Exito State Storage, which means like safeguarding seeds in seed banks, becomes more and more important because we are losing populations. And while we focus, while we have to also focus on, yeah, safeguarding the populations in the field, we are just running behind with achieving that. Just last week, we lost another species in the Netherlands, of which the last population was extinct.

And if we do not safeguard the material, we have no chance to bring it back. Okay.

Thank you. Building on that, you also state that subsequent reintroduction is necessary. And you state that it needs to be done in suitable habitat patches. And building on the question of my colleague, Professor Claros, what is suitable? Because you have investigated a large number of properties. And following that, what is truly suitable? It is very important and sometimes, yeah, difficult question to answer. I think that while I was studying this plant species and got to know it better and saw many populations, I kind of developed a picture on, hey, I would expect it to be here because I see many other plants that it usually grows together with indicator plant species that are kind of in the same niche. Because to know what is suitable, sometimes we do not have the opportunity to measure everything. And with that, yeah, I think my best advice would be, visit many populations, small ones that are also not healthy, as well as large ones. And look, observing, that will help you to find out. In this respect, in this context, you are here as a scientist, where you seem to be saying that there is an immeasurable quality that you can feel in the field, but you can't really put into a quantitative measurement. Or am I understanding this wrong? Maybe I have to put it differently, though, because I think we can measure it. If we would measure many different soil variables, we would see where the optimum lies for many species. I am just saying, what is the most practical way to do it? Okay, and that's the use of indicator species. And that is indicator species. Yeah, okay, great. In this context also, and particularly in the context of chapter two, recently, I think last week or the week before, there was a publication in Ecology about an exclusion experiment of pollinators in prairie grasslands in North America. And this chapter of yours, you also investigated the influence of pollinators, and you found that if you didn't have enough pollinators, it would negatively affect the population. So it resonated with me, this new ecology paper also. Could you comment on that, whether or not reintroductions might actually fail because of the lack of pollinators? And is that an oversight? We should be looking into more deeply. What is your opinion about that? I do think that given the fast decline in insect population or so that we face in the Netherlands, it is certainly something that we should be more aware of, and that is often not taken into account. And I do think that, well, if you see a forest with great habitat quality, but in a large, in a small size, surrounded by agricultural fields, and you have a plant species that really depends on pollinators to set the seeds, it is definitely something that you have to consider with your introduction, whether this is the best spot or whether other measures to increase the connectivity to other habitat areas are needed. Right.

Thank you. And then jumping to chapter number three, I think, or four, sorry, number four. I have a question about the methodology you are using. So in your general discussion, you also discuss that there is some discussion about whether or not to reintroduce plants rather than seeds to use seeds or plants. And in this experiment, you grow seeds sterile in a sterile environment and then inoculate them. Might that have introduced a bias because in practice, seeds do never grow sterile. Whereas you grew them sterile in the first few weeks. I wasn't growing them sterile. I was growing them on potting soil and sand mixture, which I did not sterilize. So there were microorganisms in it. And to that environment, I added either living or sterilized inoculum, which was only a small proportion of the soil. Yeah.

Okay. But that being said, I do not think that the effects would be much different to directly planting the seeds in the field sites and then inoculating them there. Because the seeds were very, or the seedlings that I transplanted were very, very small. And yeah, just that size. And I do not think that this first phase in the greenhouse does affect the conclusions from the inoculation in the field. All right. Another thing about the methodology in this is you use home soil versus foreign soil, which is, I think, an interesting approach. But what was missing a little bit for me is no receptor soil. There wasn't a treatment where you used the soil of the receptor sites. And I was wondering whether this is a deliberate design or perhaps an oversight, or did you not expect the receptor soil to be important, yes or no? I suspect you did expect this, but I would like to hear your thoughts about this. Yeah. I did this experiment before I got the results from the experiment of primolaylazure that I discussed in the general discussion, where I did add receptor soil, and I saw that adding the receptor soil actually does something. So if I would be able to do this experiment again, I agree, I would also add this treatment. And the effects that I saw were that the plant species that got the receptor soil in the greenhouse inoculation actually grew the best when they were then transplanted through the field sites. This is very interesting. Very interesting. Although that's on the species that had a negative response on inoculation, whereas the other had a positive response. But still, yeah. So this acclimation effect is something to take a look at, yeah. Okay, thank you. I believe there is still a little time. Or a short question and a short answer, yes. Or a short question and a short answer. Also, building on my colleague, Professor Claros, did you think about using soil humidity, soil temperature, and you said it yourself, groundwater is important for primolaylazure? Did you think about measuring that? Because that is quite easy to measure, and I think very important when Dr.

Fregere and I were at the lab in Luve many years ago, our lab found that the stomata control of primolaylazure is very important in the context of soil humidity and air humidity. Short answer. Yes, I thought of it. Excellent. Thank you. Respected candidate. Thank you very much, Professor Ködermans, and for the short answer as well. We continue the opposition with Dr. Wisser, who is Associate Professor Ecology at Raatbaud University in Nijmegen, please. Respected candidate. Some people hire other people to design their cover, you do not. It's an intriguing cover, and I really love reading your paper. I did a little translocation experiment myself last year. I bought a house, and then you get a garden that is completely barren. There's nothing there. It's a newly built house. And I transplanted a primolavirus plant from my old garden to this new garden last summer. And it was successful because this year, I have about 25 young seedlings growing around it. It's not a hard plant, apparently, to grow by any way, not in my garden. When I look at, say, this one year to the other year transitions, and having been educated in the group where also Hans de Krowne and Ilke Jongions were present, then you probably know what they would have advised you with your data set, which is? Yeah. Respected highly esteemed opponent. It is an integral IPA, not the one that you can drink, but... They would have said, just build a matrix model on your species, a matrix population model. So, a population matrix model. So, is your data set suitable for that? And if so, why didn't you do so? Because then you can predict what will happen with all these different populations that you saw once and again. Once more highly esteemed opponent. Thank you very much for this question. Unfortunately, my data set is not suitable for that kind of model because I only have data from one year. And in order to predict the, what's it called? Overlaving the survival rate. The transition from one year to the other. You have to have multiple years. And we thought of this. In the beginning, I, having had an internship at Ilke, with Ilke myself, really wanted to have this kind of model. But there was a trade-off because if I would want to do that, it would mean that I have to repeat this every year, which is a lot of work. And that I also have to take my plots at the exact same location, measure every exact plant, mark them, which is not something that is many, many nature managers are very happy with. So I can, maybe I'll make it more complex then. Because you said there's a trade-off. But now you visited so many populations, you could also say, well, I'll only do a quarter of that and then go into depth and then I know much more about those. Would that have helped in terms of time management? Or still, the arguments about the managers of the nature reserve would not be happy with you actually following up? I think that is happening with other species as well. That is true. Of course, there might have been ways to do it with a smaller subset. I think, yeah, I took a different path to focus also on the reintroduction, which takes the yearly monitoring and extensive amount of time in the greenhouse. And then the trade-off would have been with the other chapter and the conclusion for the reintroduction. So yeah, but yeah, maybe a postdoc will come. That's fair. I'm sure I will do that with my starting population of prima in my garden, but it's easier to visit. Yeah, I agree that the insights from this type of molar are extremely relevant and very, yeah. Okay, let's move to another question. It's still on, say, chapter two, because at page 21, you mentioned that, well, we selected populations that have experienced the same habitat type since at least 1950. So that's 75 years ago. So it's 75 years, grassland or woodland. Is that enough? Because these are long-lived species. They may live for 25 years, maybe, or so. And then this is maybe only three generations. Is that enough to assume that adaptation to the local habitat has taken place in that population? Yeah, very good question. Yeah, it is also, I don't like this kind of answers to always say about the restrictions that are there and the current material, the resources that you have, but there are limitations about the maps that you can use. But rather than why take the 75 years? Yeah, because of the map material. Ah, I see. You had a map of that time. Yes, yes, and there was no map material. I think it's fair, but still, I'd like to hear arguments, but this is a very practical one, which is probably fine too. Talking about, say, durations and all, you know everything about storing seeds, also from, say, other activities that you have. And you mentioned in the introduction, a paper from Rauskell is actually quite nice. They look at different species, and they had a seed collection that, for a seed that had been collected 20 years ago. They sowed these seeds, and then they compared how well these seedlings were dealing with drought, compared to, say, the present populations of where these seeds were collected. And then they found a difference in drought volumes, and that might be an indication that plants can actually, over 20 years, already adapt to dry conditions in populations. But what does 20 years of storage of seed do with the quality of the plants, and therefore maybe their response to drought? Would that be maybe an easier explanation of that? And also something maybe to take into account if you store seeds in, for instance, living archive. You are saying that, if I understand correctly, well, when you store seeds for 20 years, then there are some seeds that will die, and the selection that takes place there, which seeds will survive or die, does affect the response of those plants to drought. Do I understand this question? Yeah, because they found that, say, the seedlings from the older seeds did not do as well as, say, the present population. Very interesting. To be honest, I have not thought about whether the seeds that won't survive, whether there's a selection going on in the seeds that won't survive, affecting the effect to drought. And I wish to have a closer look at the storage facilities and conditions that they used, because we do know that for certain species, if you do it very well under dry conditions and minus 20 degrees, then the effect of the storage will be much lower. So I would like to look into this to see how much do I expect the storage to affect this. And then it is also just a very small experiment and a small study. And I do think that in order to give a more evidence-based answer on this, it is very important to keep doing these experiments also. Yeah. I think I have time for one question, right? Yes, please. It's about pollinators. So you visited the sites and then looked at how many pollinators you found in the months of March and April, but you also say it was a relatively limited attempt. We didn't have that much time, and there are not that many pollinators. Still, there was a kind of an effect. But maybe also looking back at the population in my garden, there was one plant. Does it not just take one bee for a patch like that to pollinate all plants that have at least the same style? And that's enough. And then, well, just having a survey of maybe two, three days. Well, if there is one or two or three bees, that's enough already. So is it likely that there is really a limitation of pollinators for this particular species? If there wasn't one, then I would not expect the strong positive relationship that we found between the number of pollinators and the seed set. And also not, which, yeah, no, that, yeah. So I agree that it takes only one bee. But on the other hand, it also, the flowering time is not very, very long. The moment of pollination is not the period of pollination where pollination takes place, it's short. And it is very early in the spring. So when I was in these populations, sometimes spending the whole day there, I did not see a single bee. And yeah. So the bee has to be there, and it has to be at the right time. Thank you so much for your questions. Thank you, Dr. Fisser, for your examination. We then finalize the examination with Dr.

van der Meer, who's senior project leader at Floron in Nijmegen. Thank you, Chairman. And thank you, respected candidate, for this really nice thesis. I really enjoyed reading it. I want to start with saying something about your cover. It's really nice. My daughters would actually say it's heart-shaped, and the title is Held by the Plants. I saw that you acknowledge the plant species as contributors in your book. Do you feel held by the plants? Or why did you choose this title? Highly esteemed opponent. Thank you very much for your kind words and your question. With this title, I wanted to address two things. First, the reason you would think of first, and that is, yeah, we are held by plants because they are critical for our lives. They provide many gifts that we have to receive in order to survive. Only dimension one is that they provide all the food that is needed for the pollinators who pollinate our crops. So that is one. But also, I wanted to make sure to give credits to the knowledge that I present in this book because, well, I write this up, and I go to the field and study everything and have my thoughts about it. But actually, yeah, the knowledge itself is still something that I take from the plants. And yeah, they are the ones that are the teachers here. So we shouldn't forget about that. Thank you. And was the hardship intentional or no? I wanted to ask you something about chapter four. You studied Solida Khovir Khareya and he beat it in a reintroduction experiment. So what I thought it was really interesting is that one of the populations that performs really well, if you see figure 4.2 on page 68, is the population Osirang. And now I wanted to ask you if you know how many plants were in Osirang between 1950 and the year 2000. I had to look this up myself, so I would understand if you don't know. Do you know how many plants were there? There were no populations of Solida Khovir in this period between 1950 and 2000. So the populations that are there, and now you have quite a few growth sites and quite a number of plants, considering it's a rare species. But it's a relatively new population, actually. It's expanding. It has a high population growth rate, which is very interesting because in the figure, you really see that this population actually performs really well in the reintroduction experiment. So I was wondering if you think that the selection of your donor sites and the population viability of your donor population might play an important role in the success of the reintroduction experiment. Of course, I do think that a population that is highly viable, produces many seeds and many flowers, will also turn out as a more successful population in a place where we perform a reintroduction, which is why it is very important to take a careful look at the populations that are the donor populations. And what might be the mechanism behind sort of the success of a population of Osarang B? Yeah, I could imagine that... Well, there are several factors. One could be that the population received material from a couple of different source populations, and which means that the genetic diversity of this population is very high. It could also be that the population itself is like the soils of those populations mimic the reintroduction sites more closely. So that could be that, yeah, there's something in terms of adaptation going on. Thank you. I have another question on the primola elatia and also about demography, as my colleague Dr.

Fischer also asked. You study primola elatia in the spring of 2020, and the spring was characterized to be extremely warm, sunny, and dry. And in demographic experiments, we see that actually these type of conditions can have a large effect on the demographic build-up of a population and also on reproductive success. Do you think that the results of your study would have been different if you would have performed your experiments in another year? And if so, how? Well, the year effect is something that plays a role, for sure. What gives me more confidence is that I measured different plant variables that are also not only dependent on the conditions of that year, but also on the conditions before. For instance, the seedlings, the number of seedlings that are there, it also has to do with the viability of the seeds that were produced the year before. And by looking at variables that are connected to just, yeah, not only that year, you can, and seeing that, well, many of these variables are connected to phosphorus, for instance, in terms of a negative effect of phosphorus on these variables, you could, yeah, be more certain about that it is not only a year effect. Thank you. Is there time for another question? Yes, and you shouldn't look at that clock, but the clock in front of you. Thank you. As you know, I work in plant conservation, so we do, when plants become, plant species become increasingly rare or populations are declining, we sometimes perform rescue experiments, and this rescue sometimes involves a habitat rescue, but can also involve demographic or a genetic rescue. So we, actually, we sow seeds or sometimes we plant plants, near a declining population to rescue this population. You performed experiments on inoculation. If you haven't studied the effects of inoculation on certain species or in certain populations, would you advise us to not only sow seeds or plant species, but also to inoculate the soil with soil from donor sites? I think that there lies a great potential in that, and I think, in general, which is also based on a review that I read, is that the positive effects are larger than the negative ones, and that more species benefit from it. There could, of course, be a publication bias in this, but still, I think what I would advise you is first, of course, first consider it and then look at the species' traits and see whether you think that based on the traits, the species would benefit from it, is likely to benefit from, for instance, a pioneer plant is less likely to be that dependent on specific mycorrhizal fungi because its strategy is to pop up wherever there's habitat available. For those species, I would think it is of minor importance, but for species that are more later in the succession, it is likely to become more relevant. Thank you.

Interesting. There's still time. Yes. Still time. Okay.

I wanted to ask you about the genetic study, actually. You found a genetic similarity between populations in western Brabant, Merksk and Everland, and southern Limburg. I was wondering if you had an explanation, actually, for these genetic similarities between these populations. Yes, yes. Actually, I do. Yes.

I think it has to... Well, the Netherlands is... Next in the Netherlands, yes, Germany, and then Belgium. And in those countries, primulilots are also gross. And I think one explanation is that when species recolonized Europe after the last Ice Age and came from the south, there were different routes that these species took. And it could very well be that one route was more from France, Flandren, coming up to... Yeah, Belgium, coming up to Flandren, and then reaching at Merksk and southern Limburg. And then on the other hand, we have this other post-lacial recolonization route, more from the east of there. Then you don't see this effect in the Kamsi-Baker area and Ufnaus-Vobos, which is actually very close to at Merksk. How do you explain the difference? Yeah, it is very close. But yeah, at some point, two points reach, right? So it could very well be that somewhere there is a border. And yeah, that is why we have this difference. Thank you. Thank you very much, Dr.

van der Meer, for your examination. I now adjourn the meeting, and the examining committee will withdraw for consultation. Please be seated. I hereby reopen this meeting. The academic board of Wageningen University, represented by the Deputy Director Magnificus and seven committee members appointed by the academic board, having noted the content of a thesis entitled, Health by the Plants. How insights in population ecological and genetic processes can improve plant conservation and reintroductions. With propositions, having noted, having heard the defense of that thesis, has decided to confer the degree of doctor on Siena Bohm, born in Hanover, Germany on March the 20th, 1995. And to grant to this person all rights and privileges and showing from that doctorate by law and custom. The academic board assumes that you accept your duty as a scientist to execute your future research adequately, and with due diligence according to the Netherlands Code of Conduct for Research Integrity. I now invite the promoter, Professor Dr.

Sramineh, to present the new doctor with the degree. You have heard the decision of the academic board of Wageningen University to confer on you Siena Bohm, the degree of doctor. It's now my honor to present you with the degree signed by the Deputy Director Magnificus, the promoters and the co-promoter, and sealed with the great seal of Wageningen University. I first invite you to sign the degree as well. With this signature, you declare to act according to the Netherlands Code of Conduct for Research Integrity in the future. Follow me then, Deputy Director Magnificus, to offer my congratulations, and I would like to invite Philipine Vergheer, Dr.

Vergheer, to add a personal address. Dear Siena, is it working? Yeah.

In 2019, we initiated a BHC project on the conservation and reintroduction of woodland plants together with Boshooper. And as always, we were looking for a perfect candidate, and your name was recommended to us by several people from Nijmeh. And after our first meeting, we were sure you were the right match for this project. However, at that time, you had not been graduated. So you still had to complete an assignment for your biology degree, but as inventive as you are, you designed the final assignment in such a way that it aligned perfectly with your PhD research. You managed to achieve two goals at once. So you gave it a flying start to your PhD, and you got your master's degree in biology with excellence. But beyond your motivation and enthusiasm, one of the first things people will notice about you is how much you enjoy being around others. Your PhD involves a great deal of fieldwork, and doing fieldwork is usually better with two. So heading out alone, not for you. It did not happen. There was always someone by your side. And if by chance no one was available, there was always your lawyer, Ronya, the best trained dog I've ever met, who can thank you. The same way, you're always there for others. So whether it's offering a listening ear, helping out a day in the field or greenhouse, joining two weeks of fieldwork to Norway, or helping to keep 60 students on track at the campsite in Gärdera, you were there, and you were there for others to help with genuine interest and care. So for your work on Oxlip, you mapped an impressive number of populations across the Netherlands. Being environmentally aware and sporty, you went by bicycle. Carrying your field and camping equipment along the way, you cycled across the entire country. And what you modestly described as some sort of cycling trip was in reality the basis of a high quality and extensive scientific study. The data you collect are always of high quality. So your careful fieldwork and precise lab work have resulted in outstanding data sets, including one of the most impressive genetic data sets our lab have seen. In fact, Niels, Martin and I, we still hope to come across another data set like yours. You showed that small populations of Oxlip have less genetic variation and produce fewer seeds due to a disrupted balance between flower mores, which makes pollination more difficult. You also demonstrated the importance of the pollinators. So the more pollinators are present, the higher the seed production, and that presence of the pollinators is strongly shaped by the surrounding landscape. And this was also something really new. So from your work, we also learned that Oxlip populations perform best in varied landscapes with a high level of environmental heterogeneity. And this is something which is often overlooked. You showed that environmental heterogeneity not only supports larger populations, it also contributes to a higher genetic diversity, showing that not only larger, but also more diverse habitats are crucial for population recovery. And these are highly relevant insights for conservation that are really warmly welcomed by many nature managers because it provides them a better understanding and most important, clear goals for nature restoration. Finally, you addressed another important applied question, how to successfully introduce plants? Because it looks simple, but it's not. So you tested whether soil inoculation could help. And aside from some unannounced visits by wild boars, this experiment proved to be very successful. You demonstrated that soil inoculation had clear positive effects from species from nutrient poor sandy soils. But in contrast, no effect was found from species from more organic soils. And this shows that such measures are not universal, but strongly depends on species and local soil conditions. Again, a very valuable insight for practice. And for your research, you really grew thousands of plants. But experiments come to an end, and greenhouses need to be cleared. So throwing plants away was not something you could easily bring yourself to do. You always try to find new homes for them. As a result, most people in our group, now with hot slips growing in their garden or on their balconies, my garden is certainly full of them, they're doing very well. So, Zina, over the past years, your work's incredibly hard. You combined intensive fieldwork with greenhouse experiments, soil analysis, molecular lab work, both here in Wageningen and in Eimear. And your thesis shows that many plant populations are influenced by factors at multiple spatial scales. So from the soil directly surrounding the plant, but also the broader landscape. And all these factors are interconnected. So for successful nature restoration, we must understand and incorporate this complexity, and your work makes an important contribution to this understanding. But beyond being a strong scientist, you are above all a wonderful colleague. You're engaged, you're social, positive, cheerful, and always open to collaboration. It is also no coincidence that Wageningen Environmental Research was so eager to welcome you to their team and offered you a position. Personally, I'm also very pleased about this, because I also enjoy very much working with you. And we can now continue our collaboration in the Kokaris Grasslands in Limburg. And I hope we will continue to do so for a long time. But for now, let's put work aside for a moment, because now it's time to celebrate. You are now Dr.

Siena. You have every reason to be super proud of yourself and of this beautiful thesis. We certainly are. And then I also speak on behalf of Joep and David. So congratulations. And also, of course, congratulations to your family and all your friends. Thank you, Dr.

Vergier, for these nice words. Highly esteemed. Well, Adels here, Gilead, Dr.

Baum. We approach the end of this ceremony in which you've successfully defended your thesis in public. And it's my pleasure. It's my honor to congratulate you on the new title, the highest degree that our university confers, the doctor's title. After your bachelor and master's from Nijmegen, you again are an alumnus. You are a graduate from Dutch University. And we hope you will stay in touch with us wherever your future will bring you. And of course, I would also like to extend my congratulations to your proud parents, extended family and friends present here, or perhaps watching you online. And of course, to the proud supervisors behind this table. Your research adds to scientific understanding and also has applied value, as we could hear. And that's often the case with Wageningen dissertation. Science for impact is one of our mottos. I'm hoping your work will find its way to many applications. And there were no questions about propositions today in the defense, which is quite exceptional. But of course, I want to refer to proposition. Your second one is about monitoring. And I think your next step in your career, your new position at Wageningen environmental research in the vegetation and landscape ecology group gives you probably opportunities to monitor the success of or the follow up of your work. I hope it will happen. There are more propositions that struck me. You clearly, nicely reflected on some important things in science and in life. And on the other hand, in your CV, you're right. You always wanted to be a little bit of a Pippi Longstocking and follow in unconventional avenues. And you gave an example to me. You said, I didn't know, of course, but you told me the example of us buying a sailing boat. And while your sailing skills yet had to be developed. So I'm hoping you will embark on many more adventures and challenges in a positive manner in your life. And I'm wishing you all the best in your professional and your personal life. And once again, congratulations and a very happy continuation of this day. I would like to thank the members of the committee, Professor Pinha Klaros, Professor Guilhermans, Dr.

Visser and van der Meer for your opposition, of course, and for being present today in the ceremony. But also, and in particular for your work in evaluating the dissertation already some months ago. And in that way, maintaining the standards and the quality standards that we try to uphold in Wageningen. Thank you very much for your time and for your efforts. And finally, I thank you for attending this ceremony and for supporting the candidate and now doctor. That makes an enormous difference to everybody, but certainly to the new doctor. Thank you very much for being here. And with these words, I close this ceremony.