**U2 - Interview UNAM bush-based-feed project 2, Windhoek - 8-2-2023**

**Can you tell me more about what kind of projects you focus on? How bush is connected to your research and how it came to be? Because this is department of animal protection and so how bush became relevant?**

You know Namibia is a very dry country. I think you have noticed when you travel around. So because of low rainfall we most of the time experience drought. Animal die, no feed. So there was a devastating drought in 2019. 2017, 18 ,19. So farmers actually try to find ways of feeding their animals and then they try to use the encroachables. That's why that's how we started with encroachables. Although it started back then in the years. So from 2019, that's when farmers really started using the encroachment, the species. And then it's about harvesting the leaves, the twigs, smaller branches or let's say twigs and leaves mostly. And we most of the times harvest them in October when they still have, when they are sprouting, when they have leaves. So then we can convert that into feed.That's what we call boost based feed. And we don't just feed it to the animals, we mix it with other ingredients. Because it formula.Yeah, it's just part of the aeration. So we mix with energy diets, things like maize and we also mix with protein sources. Yeah.Things like we have a higher protein concentrate and we have Marula oil cake, soya bean meal, so forth. That's our protein sauce that we use at Morasses. And we also add coarse salt, yeah, to the diet. So we actually formulate the diet to fit the requirements of our animals, whatever we want to feed. So we need to use bush. At least not more than 50% of the bush material that we put. And the rest now can come from other ingredients that we provide, that we give.

Yeah, I think one of the things which I think you may have picked up from the Department of Forestry is that there are bushes which have been designated by the government of Namibia as encroaching species. And I think even Jay is that BCBU would have given you some posters which they have of all these bushes. So those are the target species to use because really, they've really encroached severely encroached onto the range land. If you find the land which is underbush, which becomes non-productive for livestock, even for game, because some of them are very thick in dense thickness, ##[03:40] cannot pass through. So they have reduced habitats for game. So those are things, areas why they have been designated in encroached species and encouraged to be used.The concept in Namibia is very good because it's not bush control, it's bush utilization. Right. You control to use, not control to bend. So within it, this is where now the value chains concept comes in because the type of bushes you are going to get and in terms of the structure of the stems which you are going to have will give you different products if you process them. So that's why we have in one of our projects which we are doing on this campus, which is a funded project, we are working on bush value chains. What are we looking at? We are looking at fencing poles as a value chain, a product which can come from the encroacher species.There are species which are quite straight, which can give opportunities to communities to harvest them, process them and sell them as fencing poles. We have material which can go into charcoal production.You've talked to the charcoal people.You now know what they want. So there is material. So that project is also looking at some of those products. We have material which then becomes ideal to use as bush. We are having different terms of harvesting. Chapel people not harvest during the rain season.They don't, right? They'll harvest during the dry season. Right? So when they harvest, the material they're harvesting does not have a leaf. So it's not very good for bush. For bush feed, bush based feed.So that's fine. But the material can go for charcoal or can go for fencing materials, fencing timber, that's fine. For us we need to harvest when the trees have leaves, right? And this is why harvesting now, this is the time for bush best feed production. And this is where we are in the project, where we are also using it, the crochet bush as bush feed. As she has said, you cannot feed it as is.You need to put supplements. Because we have had the experience of 2019, 2020, farmers thought the bush fiber is the same as grass.They are different. We are coming from an engineering field. structurality things are different. Some people is the same. So there are people who fed to animals because it was a dire situation.They were trying to save their animals,but to the extent that some of them ended up with animals dying, right? So this really gave us this impetus for us to look at research more on Bush based feed. What are we doing as a department in Bush based feed, as she said? We are doing a number of studies ##[07:07] with him, we also was in the bush, but we used bush feed. We got some funding, initial funding, which we used in the 2017, 2018, 2019, which funded the ##[07:17] and him.Then from there we learned something and we have now grown, expanded on it. One, we are using the Gazetted encroacher bushes as bush based.That's one thing. We have to be within the legal limit, as prescribed by the country's laws, right? Two, we are also using harvesting bush and using stem diameters of 20 mm or less. That 20 millimeter is critical, although we know some farmers have gone even higher than 20 millimeter thickness because of desiring of fiber. When is when it's drought, my brother. It's dry here. It's very, very dry. There's nothing there's nothing. I hope you will come sometime.Come in September, October.That's when you can see the peak of the dryness. So we have been doing recession in encrocher bush feeding. We have used a number of species in bush based feed, as she said, mixing with a number of also locally available feed resources, like the marula cake seed cake. Marula tree is quite common in Namibia. People use the fruit for a beverage.The seed they then get inside and get the kennel, which they extract oil through cold press system. It's not a chemical process, it's a cold press system.Then they get the oil, then the residue.This is the Marula cake, which we use, but there are the cakes of indigenous sources in Namibia, which are quite unique. Now, you have to pronounce the pronunciation.It's a melon. What is it? The small green thing? Yeah, it is.With a lot of roots.You have seen it? Yeah, that fruit.The seed is also, oil is extracted for meat and there is a, and she did a national survey of some of these agro industrial byproducts because we wanted to see to have baseline information of what can we produce in Namibia and use to supplement the mild bush. So we have been conducting research on the bush. Some of the things we have looked at is bush as dry feed, right? Drying it. what you call more like a mash. It's a mush of a feed. We have done pelleting. Okay. Yeah. We have a pellet of our own on the campus. So we pellet and bring out bush pellets.The bush pellet. In bush pellets, we pu tthose other ingredients she mentioned. So that is a full pellet, which you can just give to your animals. We can do pellets for cattle, can do pellets for small stock ##[10:55]. We also have moved on, which Megy is doing now. A clear thing which we decided to do is to make silage. I know, I think you know silage from Europe.There's quite a lot of silage which is made from corn, from maize, from maize coming from India, I think. So from grass as well. And also from you also make it from straw in India. And rice straw. If you get it on YouTube, you see guys from India making it. We are not yet there. I'm going to that one. That's the next one. I want to do. Imitate the Indian ones because we have quite a lot of cereal straws here. Rice straw we also have it. We have some rice straw, we have some pearll millet straw. We also have some maize straw, some of the regions of Namibia. But we are doing bush silage and she has started working on it on a large scale, where we are feeding it now to lactating cows. We are mostly using cows. She has fed it to some cows in the communal area. In ##[12:17] communal area, she did feed lactating cows of farmers. It's not for you now with farmers. So we are working with farmers. Our project is working with farmers becausewe call it Community Action Research Project. It's community Action Research Project. Community Action Research Project abbreviated cup. C-A-R-P. Not the carp, the fish. Right. So we are feeding and she has been looking at meal production during the dry season. She was doing the feeding during the dry season. Consequently, it silage and feeds during the dry season. It was as a critical months for some of these things. So that's basically what we are doing on bush research in UNAM. I think one other value chain which actually Paphos is the one who has done some work on it during his master's project, is of the bush plant.There are some stems which do not fit to charcoal, they don't fit to poles, they don't fit to bush fit.They are somewhere in between there.The crooked ones which we can then chip, and we can use them for mushroom production. And there is in our project a mushroom production which is being done by one of our colleagues, Dr.Owen and her students as the main campus using bush-chips and encrocher bush chips as a mushroom substrate for production of oyster mushroom, which they can market. Right, I'm getting there.That's why I mentioned the ##[14:22]. The bush chips.These are the ones which are also going to be used by Nam Power Orongo Cement Factory. I hope you've been there.

**We have not been there because it's not working.Shut down.**

But the ##[14:49] must have mentioned, because he is very active in that.Those are the bush chips.They can come from the crooked ones or they can come from the right ones. But we are trying to see the different fractions of the plant right. So that we can see that 110% of it is used. Then there is the component. If you don't go to chiefs, they go to bio-char production. Right. Bio-char production. And ##[15:18] knows how to make bio-char. He did produce it here, and he used it in his study. So, one of the new things which we think we need to move into as a value chain and give it more prominence, just as we have done to charcoal. charcoal is the one which is number one. But bio-char is coming because I think there is now a great interest in using bio-char in a number of products. In livestock production, we need bio-char we can edit as an additive in feed. It really helps increase feed utilization efficiency. And this is what one of the things which came out of study of ##[16:02]. Okay. Right. So that's one area, but we also need to use it in other products. If you have been observing colgate palmolive, you have a charcoal colgate now coming from China. I thought it was coming from India initially. Then I saw it as PRSA and I said, okay, but with our encroacher bush, that's another value chain which we need to do. We need to have the right processing equipment. I'm not talking to the HG. We need to have the right processing equipment, the right kiln. Right .Because there are different kilns of biochar and charcoal.They are not the same.They're not the same.That's one, two, the milling. We need appropriate mills for biochar and screen sizes. Right, yeah. Because we need to understand thebiochar of the different encroacher bushes. Are they the same when you look them?Structurally? We don't know. We have no idea. Right. Okay. We have no idea.That's an area which we need to look at. Right. But you also need to look at biochar's use in agriculture. I think you may have talked with Progress about it.Yeah, we do have it in our thing. We also trying to produce biochar and those kind of things. We had an interest group on biochar. One of the areas which we are interested in is using it in crop production. Even in Horticulture as well.Y eah, indeed. But we haven't done much into that. But that is the potential from the encroacher bush we have.That's a value chain you find in Namibia.

**and that's alot of projects, actually, for all this bush feed, do you target a specific kind of species of the bush? Or you have Black Thorn.**

We have used Black Thorn. We have used the which is ##[18:07] river. We have used the ##[18:10] . We have used ##[18:12]. We have used the one from the south part of the country, the short guy, Rigosum trichotomum. Right. We have also looked at Catapractus Alexandria, which is quite common on this one.Those are more of the five which we have been we have worked on.

**And do you see a difference in performance?**

Oh, there is there is difference in performance of animals. Mostly we have looked at growth. We have used sheep and indigenous breed of sheep, which is called the Damara breed. And we did a growth study and all the way up to slaughter and carcass yield. And she is using black thorn for a silage. Or she's only concentrating on black coat and looking at milk production and milk quality. Then there's another student, MSC student from Food Science who is now looking at product development from the milk of Sally Shred. She's working with her supervisors in Food Science.Okay.

**This product is like yogurt,cheese and basically all the diary. I think CCF is also interested in exploring that option of diary from livestock.**

Yeah, I think there's quite a great potential, especially when we look at this part of Namibia where cropping is not much, is not done.Then bush silage becomes something relevant to talk about for someone who is going to go into dairy and use it.There is a farmer, commercial farmer, who has been doing bush silage for years in Namibia who has used it to finish some of his slaughter stock, they sell to Mitcom. Okay.Yeah .And he does quite on the last game. I haven't been there. I've been told in one of our groups, in discussion groups by one of the colleagues.

**Because you said your community action research project, right. So do you also engage and workwith farmers in a real close quarter?**

Yes, our Community Action Research project, we are centered in an area called ##[20:49] region.That's where we are doing it.That's the site we chose.

**And is there any specific reason why you chose that place or that community?**

they have ownership of this African world life conservancy. So they have a conservancy under them. So it becomes easy for them, if they want to apply for a permit as a conservancy to remove, to selectively thin out encroacher bush from their area. So that's one of the because it's very difficult to start this with just communal areas. I think the forestry guys should have told you.

**They explained in detail what's possible and what's not and just what they said.**

Like when she was doing a study in the community, she was using animals from people in that area. She didn’t get animals from elsewhere. She fed their animals. So the study was done using the farmers or people inthat area's animal.

**and I assume the bush you used for production of those feed that comes from your farm of 10,000 ha or where did you collect that bush from?**

We collected some from the community because they have a milling machine. But then that milling machine broke down, so we had to come back and continue with the collection of the rest of the bush that we needed from here because we also have a milling machine, but we intended to collect from there everything. Yeah. And then while we were also collecting or harvesting the bush, we did the ensiling with the community. So we wanted to capacitate the farmers to show them how it's done, practically. And also when we fed, we also engage them in the mixing of the feed so that they know what's to be added.

**What were the challenges?Definitely experience of while engaging with farmers or trying to build capacity building. It's not an easy thing. What were the major challenges, do you think? Because that is capacity building is something it's not fixed for one value chain. it has to be done for all the value chains. I'm just trying to understand what were your difficulties and challenges?**

The difficulties and challenges with acceptance by the farmers or the uncertainties in the farmers, especially on the aspect of participating in the project on the feeding studies, because they did not know what silage is. So they felt like they were giving us their animals and then maybe their animals were going to get sick. And so they were really concerned about their animals and also the time of feeding. So the farmers then started to be feeling uncomfortable because they felt like we have been feeding for so long and because we're looking at the effect of milk production. So we were collecting the milk samples and we fed during the dry season where they don't normally milk that much. So they felt like we were now bringing stress to their animals and probably also giving them extra weight because we couldn't milk. We don't know how to hand milk. So they were assisting us to hand milk and it was like extra weight.

**But were they able to appreciate what they are getting as a return because they get milk during a dry season, as you mentioned?**

Yeah, because when we started, the drought haven't really yet advanced and the animals that we choose were the healthy animals. We couldn't choose sick or animals that were already in bad condition.So they felt like, okay, now we see that the animals are eating and they are actually returning to the homes compared to what was happening normally. So they feel like, okay, now why don't you feed the animals that are now in bad condition, seeing animals, than the ones that you have chosen? So they wanted us to include even those ones that. Happens to community projects because it's the exposure of the farmer not having known what Silage is, it's a community which is I talk about your Indian situation where the milk buffaloes and people talk here india milks what? Buffaloes. They are not exposed to the buffalo you milk.It's not the world when we find here. Right, but you have quite a lot of milk in India coming from buffaloes.They're really good.Yeah, they're really good.Right? It's exposure. It's really good. It's exposure. It's exposure and knowing what Silage is. I know she had tough time to get farmers accepting to participate in the feeding of the animals. We are giving them feed for the animals. But it's silage.They've never heard about it and seen it. And the west. We are talking about Bush silage. Goodness. It's the same I think we had for Mushroom, isn't it? There are people who said Mushroom no, but now we have a mushroom house which we built through the project which is being run by the community producing they've been trained out to produce mushroom.

**By any chance, do they cultivate the mushroom which actually grows on that anthill or it's some other?**

No. Its oyster mushroom. This is the commercial one.

**The commercial one?**

The commercial one because UNAM provides them with the spawn for that mushroom. Maybe the next project Anthill mushroom. Did you see that one?

**We had a lot because when we were traveling from we traveled to ##[27:50], there were a lot of anthills. And whenever there was a quick rain, then just after one day or two days, we see a lot of people with they have special name for that mushroom. I forgot which oh, they say I forgot.Sorry for that.**

When they are selling it different dialects.Yeah, it's different dialects. But all in all, farmers were aware of the project. So the inception of the project was done in the community to make them aware of the project and different objectives. And then they were informed about farmers were also like they agreed to partake into the project.

**I also assumed then the approach is actually to go to first to the traditional leaders and regional counselors and things like that.Then you actually go to the farmers?**

And the good thing we were working with the conservancy. So these are the people that are from the area. So there's that leadership of the conservancies which we had to discuss with before we could all the other farmers.

**Because you said you had in your 10,000ha, you had livestock, you had game and also you have lot of bush, I assume. Is there any chance like the bush has an impact not just in the space but also in terms of is it like a poisonous or it affects the game or livestocks in terms of when they consume or something like that?**

Yeah, they are poisonous bushes, but I don't know on the farm here, but generally within the region, they are poisonous bushes which are there which animals when consumed, they would die. Yeah, we have poisonous on the region, indigenous poisonous bushes. I think when I mean the region, I may mean the origin of this area, but I mean Sataki as well. Poisonous, poisonous regulant plants are quite common. Are quite common. And these are the ones which when it is very dry, they green up, elevate and animals are excited to but those which are used, animals which are used today, That's so that's what we have been doing in our bush to feed. And we are still continuing. I think we are going to be having another community bush for project which is now looking at beef cattle. Farmers want to bucket to meat core so they'll fit in or they will use bush feed, bush based feed in finishing of those animals.

**And all these projects so you do all these projects right.So once they are done, once they prove is there somebody who takes that further to people how to say practice that further? Or is it like when the project is over, then it's done?**

Yeah.The sustainability issue, that's one of the things we thought our UNAM commercial company actually we are trying to commercialize some of the outputs like making of bush feed. And there is a commercial company which has been registered by UNAM, which we hope we should take that. I think in Europe we have these startup companies which are ##[32:13] of research from universities. Similar approach. I think we had some training 2019, I think from University of Cambridge with some some how do we scale-up research outputs, those commercial which can be commercialized and the model which is used by some universities. And we are in particular looking at the investor of Cambridge.

**Okay, that's nice. That's really good. Yeah .Because one of the things we observed is we have a lot of value chains.Yeah, you have charcoal, you have wood chips,you have bush to feed, you have biochar. But all of these are still in small scale. If you really want to utilize the bush and have an impact, they have to be scaled up.**

I think this is the challenge. We have the scaling up component.

**Actually that's something then we want to address here because I think this is a concept or the idea of the project which we want to do what we call as a biohub concept. Right. Where you can see here, there's different communities.This could be of 100 different forms of communal or commercial where we harvest the bush, actually. And then we process it in terms of like a wood chips or something where it can be used for other local uses, local uses like bush to feed or charcoal or biochar or things like that. Wood chips cannot be used for charcoal. But yeah, biochar is so on and so forth. But it can also be used for a refinery. Where we want to use in this one, we are working with a technology called hydrothermal liquefaction. It's like a pyrolysis, okay? You put biomass, you put water, high pressure, high temperature, you get majorly the two components, one is Bioil, another is biochar. So our prime for the whole value chain, which we are interested in, Bioil is our product, okay? So that we will upgrade in a refinery and then consume it to the shipping fuels. Biofuels. Biofuels for the big ships. For the big ships. And the biochar based on its properties, because we have to analyze the properties.We don't know yet based on properties, either it can be used as an activated carbon for water treatment or poison removal, things like that. Yes. Or it is still a fuel. So you can still burn it to produce electricity or you can use it as soil amendment for fertilizers or to retain the water, groundwater and so on and so forth. Right.Then this can be re-purposed back to the community based on whatever the need of that specific community. Let's say for example in Ozonahi, if they have a problem with the power connection.We can have a small power plant where they use this biochar to produce electricity, things like that. So this is the setup which we are trying to look for in our project. Our first question is, two sub questions. Do you think what are the opportunities here? And second one, what are the biggest challenges? Like, what benefits can this bring when it comes to when it's implemented?**

For me, the opportunities is on the biochar. For soil amendment. The northern communal area, soils are in bed state.They are really sandy soils which require soil amendment. Low organic matter, very high terms of leaching, very highly leached soils. Even if you put a fertilizer, it will be leached down.This is where biochar needs to come in because it helps hold those nutrients. Right.Okay. And by northern community, you say northern communal area, they are referred to as the NCA, the NCA of Namibia, the northern communal area, that whole belt from Zambezi to Kunene, what they call north of the cotton fence. The vital cotton fence, because this is where the cropping is done. So, solar amendment, if we look at Namibia, biochar can be produced in the southern part of the country, where we have a lot of the encroacher species and be used for soil amendment up north. Right? That's one. # Two, another opportunity is in the livestock sector. This country has a lot of cattle and exports a lot of meat. And to assist in one, reducing the carbon footprint of greenhouse gases emitted by the animals, methane, carbondioxide if you add biochar, you improve the utilization and reduce methane carbon dioxide emission.That's one, two. But that increases then the efficiency of utilization of the feed. So in agriculture, those are the two value chains we see which are rare, which have a great opportunity of marketing and even research into it. But as you ask it, what are the opportunities, the other opportunities to understand the quality of the biochar of the different encroachment species and how to process do we process them the same? Right. Are the trees, the wood density the same? If you mill it certain whatever, you know, the powers you talk about in your engineering ,will you get the same quality? So that's another understanding.The quality of the biochar, will they work the same for soil amendment or even supplements to livestock? We don't know. So those are the challenges. We have so many unknowns. Unknown currently, we have so many unknowns.Then when we come to a growth society, the cropping part, how much of it do we need? How much of it per hectare, how much kilograms of biochar do should we spread there to realize what yield? With no fertilizer? With fertilizer. The questions are so many. The challenges are many. It's an infant area.Then you brought in water treatment, which is very important, and it's quite an area which I hope biochar can help. Activated carbon in water, water improvement for the municipalities. And now, looking at different local authorities, ##[39:31] local authorities and possibly even in rural authorities, can we use it? I have no idea. So up until we get something, someone who documents like she's doing in the end, then that's when we because I know when she started, she said, I cannot find literature of Bush silage. I said yes, there's none. There's nothing. No one has done it. The one which people mostly have done is from an agroforestry aspect and they are using ten millimeter. Right? Ten millimeter stem damage. We are talking of 20 millimeter doubling it. What is the savage quality? How do the animal perform? So there are so many questions, my brother, which we hope biohubs can come and we work together.

Okay.You asked about the challenges. What I have seen, especially in the community we have, where they say a machine for milling. Right, a milling machine. So the challenge was that the engineering part, when it was broken, no one was having that skills to fix it. So they waited for such a long time before they could then get someone who traveled from abroad to come fix it. That's another skills for maintenance of equipment. Bush processing equipment. Some of it is symbol welding, I think the other thing, it was welding of somewhere. We should separate it. Maybe there's spare parts also. Yeah. Can we fabricate some of the things? That's another thing. This is why in our CARP project we were trying to work with a vocational training institute where they do things like welding and making because they can help the community from the graduates who get those skills. And if they are equipped, they can also help the community. I think that's a very valid thing. Maintenance of Equipment. 2019, 2020 we had all sorts of bush milling machines which came into the candle. So many, a variety of them. But the issue which if you talk to progressor call in the maintenance, but these guys came, sold their machines bye bye, they went. You work, the machine breaks down, then you start thinking how do we repair this thing? You have no idea. Capacitation Local Capacity development and maintenance is important as well in this whole bush value chain.

**Do you see also in terms of farmers? Do you think we will face any issues o rany problems with their participation in this one? Because it's not just bush here. In any biomass value chain you take across anywhere in the whole world, one thing a value chain will always ask is constant supply of material. Without that, nothing else will happen. So for that you need what we call as supply security. You think that will be an issue. It's not just for this value chain, but for any value chain?**

That's a question. If we look at our bush one there is harvesting alternatives which people we have talked about.There's the one of cutting from below ground, above ground and removing right. Then, depending on what you want, do you want to let it re-grow and you reharvest. That's the aftercare. Or you want no regrow to okay. This is where you have to paint in a body side so that you kill it, right? That's one.Then the other option is maybe your area is open. It's not very close. Do you need to cut it at the bottom? Or you need to prune the steam of the ideal size so that you leave the established tree there and next year it will again copies and grow again. So you call it security, supply security. That in itself may be one of the areas, one of the potential supply security harvesting we should do to ensure we have a constant but we are talking of how many hectares? 45 million. Don't know if we'll be able to clear that. In fact, you have so many farmers who need to partake into a project, there are some who need to partake in the project. Because they cannot afford to get a harvester. Like, what I have seen in tune when I was doing my field attachment 2014 is that the farmer had his farm encroached by bushes, so they had a partnership with Ohorongo cement. So the Ohorongo cement was then harvesting, mechanically harvesting the bush, and then they benefit from the open up space. Okay, so that's a good thing for farmers then.

**That's interesting.**

That's how we see about bush thinning. Not really clearing where I have seen they have cleared the bush and just left us so apart like such that you can see a person coming from them. But that's not also good. Clearing out all the bush is not also good. Ecological is not good. But we have also seen a farm we went with close to Ohorongo cement factory where they controlled the bush and it came back with the vigilance. I have it. So it also depends with the species of the bush. Sickle bush ##[46:56] scenario.That guy is bad news.You may regret why you tried to control it because it came back stronger to the extent that you could not.The farmer told us, oh, this was grass all along after we had controlled. But look at how what has happened. It has come back because its ability to start growing from ratooning from the roots which are close to the surface.That's the danger it has.That's the challenge. With sickle ##[47:34]. Terminalia series is easy. But that was a ##[47:38]. So those are some of the challenges of regrowth which can come tropical trees. By nature, they are very stubborn.They don't always grow from seed.They can grow from root. And ##[47:55] is a very good example of that.

**Sometimes some people told us, well, like if you have mellifera, mellifera is the good one because they protect other much more problematic ones from coming because they are already present over there. Mellifera is there. Make sure you thin it, but don't remove it. It's like how one person told it as it's the lesser of the two evils. So let's have mellifera there.You should be happy that it's mellifera and it's not something else. But also I saw something when I was traveling around, like some of the animals eat bush, right? Like kudu. Yeah, they eat the bush, the leaf, the pods, the small twigs. Do you think that could also be a way for controlling or something like that, or no.**

Yes, it is okay. You can biological control sometimes goats. We use goats as well. If they are still below 1.5 meters heights. Good browsers. But there is we need to have established a certain tree population per hectare to say we are now using them.Otherwise some of them will not be good for goats because they are above reach for the plausible item. So it will depend with the animals you are having only for.

**And with all these projects, I assume it has been done in a very multistakeholder basis. You involve more than you have collaborators from government or other institutions and things like that. Do you have any challenges from that?**

Collaboration is always very difficult. Can be very challenging.They can be collaboration, but active collaboration. Participating now can be something challenging. I don't know from your experience, when you were working or working with the government officers in the area.Yeah, mostly it was just their availability. That when we expected them to be there. Like when we were going to the farmer, to the farmer houses and they were not available to travel with that because sometimes you want also to let the different government ministries in an area we are working with the council, the local authority guys also come in so that you are together with them and they are seeing what you are doing.

**Actually, that is something that we are also trying to understand how it is. So for that, before coming to Namibia, we prepared something like this, power interest grid. So in this Y axis, you can see the power ranging from low to high. What we mean by power is their ability to make things happen.That they have the enough resource and the authority to make something happen today or in the next few years, if they set their mind to it. Right. And then in the X axis, you can see the interest to valorize the bush. The bush, yeah. And that goes from low to high and how they are impacted by that. So this matrix is about that. And we have positioned different people, different institutions. Like, you can see governments, you can see farmers, you can see institutions, academia,harvesters, so on and so forth. Can you take a look at this from your experience? I know you all have different might have different experience. Feel free to individually comment on do you think this is the case? Is this the reality or something has to be adjusted or some stakeholders are missing? Please have a look at it.**

We have been in the field, an agricultural office before, she was in that local Carra area. There could be interest.There's interest, then there's thepracticality of that interest is it applied interest or is just interest for the purposes of say, oh, we needed to control bush. Because it has to go with the resources. I'm seeing the transport here because this is one of the challenges which national and regional government wil lhave as an excuse of not participating. As she was saying, they don't have transport, right?

**As in transporting the biomass are connected.**

No, this is transport of participation in the project. Right. But it can also be transport, as we saw of pulling that machine. Remember the bushfield, what do you call ##[54:00] machine? It needs a four wheel drive vehicle. Right. This is where it comes back to machinery design. Are we designing high tech for people who have four by fours or we are designing for people who have ##[54:19] power. Right. So the transport type here becomes critical whether to take it to bush ships to Nampower, Center. Do we have transport? We may have good interest, but this becomes, this is also related to the road infrastructure. Do we have ideal roads in that area? Yeah, off to the farms. This is where the interest can be there. But as I said, I have the other axis of is it possible, is it applied? But it's good. Usually government, I like it, because government will have here high interest, high power. Yes. So this is one thing, but is this also true? Yeah, this is also true in terms of the value chain. Now, in terms of value chain here. these guys do not have power. Their interest is because their rangeland has been encroached and they would want to reduce the bushes. But sometimes they are limited. That's why their power is low. And you know, from the legal aspects, the forestry people, this then puts them there. Even us, we have to fit into the national laws as well. Like the small scale farmers are mostly, the main issue with the small scale farmers is mostly finances. Even though they are willing, they might not be able to have the equipment or do something. Yeah. So the cost of the equipment to debush its more than they can even imagine. So that's why maybe they can go into manual harvesting, which is labor intensive.

And the project which you worked in, because it's in communal farm, most were small scale farmers. Right. They were communal farmers. They were not commercial farmers. In that conservancy.

In the conservancy, I can say they are commercial farmers because the sole purpose of keeping those animals, even if they are not so, I mean, even if they are so many, the sole purpose is to sell them. maybe compared to the farmers that are found in the north end, but those ones are more on, they are not subsistence. And they are not really interested in selling their energy, but in that community or in that conservancy, they are interested in. But they're still in the communal setup.

Yeah, communal setup, but thinking in the commercial.

I'm saying that because they also host auctions. They host auctions and because they are in the south, they can participate in the auctions and marketing of the animals for about twelve and so forth. It also has to do with the policy because across that line, across that fence, people can't exchange the livestocks. Yeah.It was established long, long time ago. So if you want to read about the veterinary Gordon fences, you need another day to just understand what's happening there. Okay.Yeah. And we do have the local communities. Local communities. If they're not really involved in the whole farming, then they are more here. No interest, no power. But if they are interested, because if something doesn't really directly affect you, you are just in your own zone. And it doesn't directly affect you, then maybe your interest will also not be that's true. That be high.

**But all the communal lands are affected. Because communal lands are pretty much present in this region. Windhoek and those regions are pretty much heavily bush encroached.**

Yeah. Then it becomes an issue because they understand what farmers are going through. But if it's not an issue in their area, then they don't have such interest. Yeah.The Bush processors, of course, maybe power, but ofcourse they have higher interest in the whole chain. Civil society. What do you mean by civil society? Local and communities.

**The civil society just a normal society, like people living in cities or people living in Otjiwarongo or something like that. People who are actually living. Those are really communities like, let's say Ozanai community. That's really restricted to community. But civil society is much more bigger than that. In cases it's like here, bush processors and collectors might be one and the same. Let's say, for example, Ombengu Energy. They come and process. Yeah. So they don't harvest, but they come in and then chip the chip or something and then collect them and proceed.**

The marika industry?

**Yes, the shipping industry.**

Shipping industry. For now, I'm not sure whether the value chain is that advanced. Talk about this one. But yeah, maybe there will be somewhere there. Communication platforms.

**Yeah, that's like NBig.**

Oh, NBig.

**I would say that's a communication platform because they area member based association who brings a lot of all the members together who are working in the biomass sector, who has the ability to actually communicate or update members on what's happening in the field. New things, things like that.**

So is this where also this NNFU,you spoke about NNFU, the farmer union.

**The unions, yeah.**

It could be falling under the union.

**Yeah.Because they act as their representatives of farmers.That specific farmer categories. Okay, so let's say, for example, if I want to do some a pilot project in a resettle form, if somebody from the Necfu or I think yeah, somebody from Necfu says that okay, you can do that, then government will be like, yeah, sure, why not? Because they are saying it's possible.**

Like you came here with NBC and you're like, yeah, we have worked with NBC before. We know them. And they know that they trust them. When you are going to visit farmers and you use their traditional authorities, they kind of have that trust because they worked with them or they work with them.

**Like exactly what John mentioned because of ##[01:03:21] here, he was like completely trusted. That's a very big influence on people. So that is really important.**

**Okay, so based on your experiences, so this is correct so far, the position of the stakeholders?**

I think so. I think so. Most of the things academia asks, we have interest, not so much power. We rely on the policy seas that are actually there.

**And who has maybe this is a question probably I'm asking to the right persons because you say the policies restrictor dictates what others can do. Who has the ability to change the policies?**

Who can change the policies? It's the government.

**Yeah, but who can tell? Because I know government themselves can't, will not change unless they are told to. Who can tell? Or recommend government to farmers representatives?**

This, NBC, all these other groups that are your communication platforms, they can make recommendations.They use groups.Yeah, they can make recommendations for the changes, but then it can then be discussed in the setup.

**Okay, that's good. Perfect.Yeah. And he briefly mentioned that you worked as an agroforester in the community in Okakara, before joining.**

Before I joined the university, I worked as an extension officer. People were just working with farmers, both commercial and communal farmers, to advise them on either technologies or just new feed or crop or whatever, just to advise farmers on farming practices.

**Okay, and you are part of which organization then?**

By then I was working for the government, so I was working for the Ministry of Agriculture. The Directorate of Agriculture,Extension and Engineering Services. I don't know how they call them. I think in most countries they are called extension offices. It's only now that maybe if you were, did you visit the Minister of Agriculture?

**Not yet.**

Okay, so now the name change, they are now called scientific officers or something. I thought the agricultural extension officers are still existing, but then there's also agricultural research officers. Scientific officers. But the officers are the technicians because you have the officer and the technicians.

And how was your interactions? Because I'm just curious, because this is the first extension officer or somebody who has that background I'm meeting. So how was it like? Were the farmers receptive? Because working with farmer is one experience, but training them or speaking to them is a different experience. So where they're receptive for new information, where they eager, where they?

so the whole setup is that I was the extension officer and in the areas locally, like ##[01:07:40] Okakarala, you have a technician. So we work closely with the technician in the area. So if there are any training or anything that is happening in that area, we go with the technician. And the technician is the one who knows everything about his area. So he introduced you that you are from the main office and so forth and so forth. But then you are working with him. When we are going to the farmers, we don't exclude him from the trees or whatever activity we are going to do in this area, like coming into somebody's house, you don't have to exclude the head of the house and just deal with the kids. And when you deal with the head of the house, then even the people in the house are certain that even if any decision is to be made or to be implemented, then he was also part of the team. And then in most cases, then he's the one also if we're not even going to his people or his farmers, he's always in communication or in touch with his farmers. And technologies, then you get like services that they get. In most cases, it benefits them. So they are also aware of the benefits that they are getting from these services.They're eager and they're willing to learn.Okay, but you also get those ones that are not so eager. But then if they see the benefit from that project, when the other farmers partake into it, they are like, yeah, next time they'll be more willing to take part in the project.

**So then all the farmers there, either they have interest or they're waiting for a proof of concept or something like that.**

So they want to see it work, but not they don't really want to participate.They just want to see the results. Like the example that she was giving when they selected the animals. Because when you're doing a study, you kind of have also to adhere to what you want. So you have a design. So then once you design the project, these are the kind of animal we want. We want them at this age.They must be at this stage of milk, at the stage of lactation. And then now that they see the benefits that these animals are getting, now they want you to feed the whole heard of the animals so that then the other animals can also benefit because they can see that their animals are not dying because they were then afraid, like,am I going to lose my animals? How is this going to affect my production? And so forth. So, yeah, but I think in most cases, with all this research that we are doing we want to actually that's why most of the times we say industrial research, like we want something that is actually going even to benefit the people in the community. We don't want to do research that is going to just be on the paper and gather dust, whoever is journal or something. We want also our people to actually get benefit from it. And when you are doing it in the community, that's actually also you tend to pick up a lot of things when you are doing it practically with the people in the community. And it's not easy to satisfy both the community and your scientific setup of your research. Because then sometimes when we are in the offices setting up those project, it's like, yeah, then we have this and we are going to do this and this. And you go in the field, things are going south and you are going to be sometimes they tend to be very difficult to implement, especially with animals. Sometimes you don't get enough number for your study to be statistically sound. Yeah.You need like for instance, how many animals? Like 20, 30, 40. And then in reality you can only get from yeah. Then you're like, what now? What can I do? Or maybe you had an agreement with the farmer that at this period of when we are going to start. But then when you get there, you would find that the farmer has transported the animals already and you had probably treated the animals so that you start with them so they can change in the middle of agreement. But they signed the agreement. Right. You had consent form. To say I'm going to partake in this project for this long. You always had to do that. Just like the way you did this with your.

**That's interesting. I think these were my questions from my side. Do you have any questions for me? I have asked a lot of questions.**

How long have you been in Netherlands?

**Two years.Since December 2020.Yeah. So I first.**