**U1 - Interview UNAM Bush-based-feed project, Windhoek - 8-2-2023**

I1

**Could you just briefly introduce yourself, but maybe could you give a little bit more introduction about the projects that you're working on related to the bush? Let me start with you.**

P1

Thank you very much. My name is [name] and as I said earlier, I'm the rancher and pasture science lecturer here in the Department of animal production, Agri business and economics, formerly known as Animal Science, and I've been here in Noidem for about 11 to 12 years now. We have now been dealing with bush to feed. Is that what called bush base feed because it's feed that has been harvested, processed and made in such a way that it becomes an animal feed. It is primarily coming from bushes, and this initiation actually started when we experienced drought conditions when drought normally like in 2019, we had a severe drought and farmers do not have anything to feed their animals on because our residents were actually dry and there were no vegetation which animal could feed on or what they had available was bushes. So that's why the initiation of coming up with a vessel of bushes and then processing to feed. So we look at it as a green diamond. So because farmers, they only had bushels to feed to feed the animals with. So the idea is that. bush is not actually fed to animals, the whole country being uprooted or being just chopped. So what is? What is being done is that it's only some branches that are proned of which are of the size of about 2 centimeter that is prone of and then get. It get milled, chopped and then milled and it can later be mixed with the other additional ingredients such as corns, molasses, actually to just improve the quality and the digestibility of the feed. Which will actually help to survive. They get formulate. I mean they push feed. Feed is normally formulated based on animal requirements. It can be for an animal that is maybe lactating. Or just for maintenance purposes. So there are various purposes and then those fields are formulated based on specific animals so there's also feed a bush tree that is being formulated but is mainly targeting either small stock and some farmers like we had most farmers coming during that drought year and they could bring in different bush species which they have in their own vegetation types because various the vegetation types in Namibia so they can bring probably like you said early here we have Senigallia mellifera which is an intrusive species. They're sort of using those ones now to sort of also control bush but also trimming this bush from being a problem species by making it an opportunity which can be made use of for purpose of feeding animals, so that's why I'm saying now. I said earlier this can be looked at as a green diamond. So and then, farmers could bring them here. We analyzed for them. Alternatively, they can take them to the ministry. But we also have. Because the study scenario, which is one of the species also in like in the thornbush savanna. And in some areas, like the northern part of the country, you can find the proposal mopane, which is also an intrusive species, but protect the tree again. So for you to harvest it, you need to acquire payment as well. So because otherwise you have no right to that. We have also like automatic bottom which is in the southern part of the countries, sort of a shrub, and that's what farmers are feeding the animals. They also with us and then mill it and they feed it to animals. So this bush base feed can be fed as a meal and the meal it cannot be stored for long, so it can only be stored short amount of time, either year or half a year. But some farmers that have actually pelletizers they use now that to pelletize the field which we can be stored for a longer period more than a year. So that is when they have that part some local farmers do not have pelletizers, so they resort to just feed it as a meal. But they now have to add other ingredients so that at least they have about 50% of the bush being part of the feed, but All in all, it's just a way of actually producing feed for their animals when they don't have any grazing material available on the arrangements. But like now when it rains, we have more grasses so they feed the animals with grasses and then they feed less with bushes. So the bush base feed cannot be fed as supplement. Yeah, yeah. But when during that time, they want to feed animals solely with that the feed, so that's where the differences come in. So sometimes it's fed as a supplement, but the terms of terms of drought, it's fed to animal as the primary feed stuff. So that's how it is, but we have now project here that are kind of running the funded project. Porsche is also part of that project and we have another project coming in starting actually this year. It was launched last year, December. Project which you also look at the livelihood of farmers and also as a component of bush of it. So it's between various consortium Germany, one university in Germany, Northwest University in South Africa, the Botswana university of agriculture which is in Botswana, University of Namibia and then the univerity of science and technology, which is NAST here also in the. So briefly, that's what we are looking at.

I1

**And so if I understand correctly, the main purpose is to produce the animal feed and not so much the range lands restoration.**

P1

Yeah, basically it's a way of restoring degraded range lands as well because it looks much into that because we have bush encroachment in the country, which is already a problem and it occupies about 45 hectare, the whole area it's infested with bush. But not only one specific species, we have a variety of them, but they also does that now we have and the crosize area is one of them. And we have also tubularia salisia here we have scenario Maricia Mera which is central to the investing in the Highland Savannah. That is where now window is as well and we have Raigoza magazine in the South. We have mupane cause for mupane in the northern part of the country and some parts are also covered by Macharia reficience. So those are the most common ones that are actually encroaching our arrangements. But what is happening now? When farmers realize they have this problem, so instead of just carrying the bush to the ground they now find a way of actual harvesting it. Like I said, only small branches, which is of much of broom stick size and then half of the rest. So it's actually now being processed of put into a small machine or bigger machine but some farmers have big machines that they already purchased, and they do that on daily basis and then they just see harvested and then like milk it and then they dry it after drying it. That's when they sort of mix it with the either molasses and some also add now corns. So because you're trying to look at the provision of protein and then energy as well for the animal. But in head in hand, it also a way of controlling bushes and restoring degraded regions.

I1

**But yeah, you only use the smaller branches?**

P1

Only use small branches. The bigger branches I actually used as poles because they it's actually very challenging process so they become small poles which they use for fencing so the rest they haven't changed. The rest are actually processed into either charcoal or biochar.

P2

Substrate for mushrooms.

P1

Yeah, substrate for mushrooms and all that.

P2

Building materials.

P1

Yes building materials as well. And talking of biochar, so when some of these bush material is processed into biochar because it's used now as a way of fertilizing soils that are actually depleted of nutrients. So they actually get added to the soil and then improve the soil fertility and in addition, biochar is also added to animal feed. So you added to animal feed because it sort of binds the turnings when it binds the turnings it actually enables or either nutrients that is in the bush to be accessed by an animal. So it does not just pass out animal and the digestive system, so it gets absorbed into the animal's body and then that's how it gets sort of get dissociated with the feed and then becomes part of the animals and instead of just it being released out of the animal's body through. Yeah. Through feces.

I2

**And how many farmers are doing the bush to feed, do you think?**

P1

A number of quite so many farmers like that. Yeah, 2019-2020. They've been doing that. It's just that later on when we had COVID coming in it, we could not trace quite tracing quite well but we have been attending workshops or trainings where farmers are invited and also become part of the very training and they get this knowledge, so the debushing advisory services has been going to various regions, visiting farmers and then also actually enticing them on how bush can be processed or harvested and also what equipment to be used and the timing is so very important because the bush, it becomes more highly nutritious when it's green because It's actually processed when it has leaves and twigs. So what is when is leaves and twigs plus pots that is now during summer. But during winter, you there's a nutrient variation because when it gets into winter, obviously there's less leaves available and you have more of a stemmy part of weight and less twigs. So that actually now sort of they use the nutrients that can be provided to an animal, but it's highly nutritious during the summer season.

I1

**And the farmers that you're connected to are working with, are they commercial farmers? Mule farmers, different types of farmers?**

P1

Yeah, different types of farmers. We have a project that we are we currently have with the Oakland Jatu Conservancy actually is in it's a world of conserved. See which is you know Conju area. The Conservancy, which is in a communal area and we have been involved with these farmers from this area to train them as well on how to harvest bush and there was a student that we attached to that the area who was funded was also doing Masters who had actually to make use of animals, animals from farmers around there and feed them with the bush feed. So experimenting this trying to harvest from the farmers field and then process because we have a machine that was actually being used by the project which they have and they are running it. So it processes the feed and then milling it and they actually produce a meal and then add all other ingredients that they need to mix it with and then feed the farmers animals. And we had also another Phd student who just graduated, who was also feeding animals, particularly with the terminalia this year and Senegal maricella I think I can't remember the other two bushes at the grocery scenario, but she was also feeding it to was it? But in addition, we also have farmers who are coming or who we also involved with in terms of providing services in terms of analyzing their samples, they bring the samples here, we have the elcom machine downstairs.

P2

We analyzer and the digestibility.

P1

In the lab, is it analyzes all that, so we help them to analyze all that, and then we provide them the feedback, with the result coming from what we have analyzed, which from the sample that they provided us but like next week there's another training of farmers in the northern part of the country, in an area called Okongo Inhang when we're actually going to tell farmers again on how they can harvest bushes from the area and also process it into bush based feed, which they can feed to the. So we are involved with all the farmers in the country.

I1

**And how are those experiences so far like, what are learnings from these projects so working with farmers?**

P2

Working with the farmers, it's quite good. They are very receptive, especially during the drought. They are really eager to learn. There might be a slight language barrier depending on where you go, but we have a really eclectic group so there's always someone that can speak the language and communicate. I think the biggest drawback for the farmers is just the equipment. Like the community of Oregon Jattu, they do have the bush crusher, which is mandatory. There's no way you'd be able to feed the bush to their animals without having a means to mill them outside of that, they generally have a good attitude. Everyone's willing to learn because it's almost a situation where they cannot lose anything but really gain, because now they have feed for the animals. They have the ability to produce that feed themselves and they can also produce potential income depending on their circumstances.

I1

**And in that project, how is that organized like how sort of the feed that is produced by the community, how is that and distributed?**

P2

It kind of varies because the way the machine is used by the community is a farmer would call ahead like the community head and he would request the use of the equipment and it's in the middle of the city, so they kind of have to transport their bush from wherever it is that they harvested and bring it to the center where they can have it milled. So I mean the machine has wheels, but they are not made to actually be moving all around and okonjatu. This is a really wide area. I believe they're like 150 villages just in the area and they're pretty widespread. So delivering the machine to all of the farmers in the area wasn't particularly viable, but if they can manage to bring their bush to the central area where everyone is doing the crushing. Then they will be able to get assistance at, I think is it. $30 per 50 KG bag of bush.

I1

**So they harvest it themselves and then they bring it to the machine and then whatever the machine produces, they can take and then they can produce their feeds?**

P1

To just add on that the machine that they have is so heavy and they need the transport to actually draw it to the point where they will be harvesting and one predicament that they have is also diesel. So but now sometimes they don't have a vehicle to actually move the crusher from point where it is to where they want to harvest so this is why they have to sort of just bring over the material harvested to the machine and then they process it over there but it can be any of the farmers from any area around the villages in okonjatu. But when we were coming in with the project, we had an idea of actually harvesting more bushes and then process them and we can have some way in the community where they could do. I mean have the process feed and then they could also buy from there and then feed their animals. So the way they will also benefit from the resources that are generated by the project so that it can also be shared among the community, sort of a way of living, improving their livelihood and this is why the there was also an idea of being in the aspect of mushroom production. So using the substrate coming from the cluster buses, so some farmers have already been trained as well and they are already in production of mushroom. So like I said, it's a way of improving their livelihood and they can also generate income when they sell them to some other farmers who are not part of maybe the project and who can also not do that, but we had lead farmers who were actually involved and then they were going to serve as a model. That's where they are trained, and then the mushroom is production is established at their place and then the training is also done there. So every other farmer can come at all times and then look at what was done or how it's done. Then they can spread it out to or any other farmer who is willing to do that. They can do that. On their own but the main farmers here can always advise. So you have trainer, who will be training arenas as well, sort of a way of capacitating the community at large.

I1

**In this project, is it already running like with this stuff?**

P1

Yeah, it's already running. It actually started in 2013 and then it got funded again by the MasterCard project and then the Roof Arm project came in after as a follow up. In 2019, so This is why Porscia came in also as a massive student, they were given now different areas to look at so that's how it came into play.

I1

**So now you're looking at how to expand?**

P2

How to conserve because the idea behind it is when we harvest, we have to harvest during the summer time. That's when it's going to be the most nutritious and then once we harvest it at that point, we have to conserve it cause we can't start feeding immediately. Plus, the animals aren't going to be that receptive to it because they do have grasslands. During the summer time, so we either have to make a silage which is wet feed, you don't dry it after you harvest the bush, you just pack it into a silo and the anaerobic conditions and you let it ferment for indefinite periods of time as long as it's sealed it will be fine or you could dry it and produce a mesh or make pellets even further than that.

I1

**And so you mentioned one of the challenges or learnings was the machines. What were other challenges faced in these experiences?**

P1

Yeah, not every farmer has a machine. Some do purchase a small chipping and milling machines, and then they can harvest on their own, harvest their own food materials, and then mill it on their own and then produce feeds on their own. They have provided. They have undergone a training. And the and the requirement is that whenever you produce bush feed mill, you now need to also get a sample, take it to the lab so you get analyze. So suppose sometimes you don't know what are the nutrients that are contained in there. So when you get it analyzed, you can see what is the concentation of each of the maybe minerals that are so should you have a shortfall of any of the metals, you can always supplement and that's the idea. So this is what our farmers are advised to do because the purpose is actually to feed animal with what their are nutritional requirements because you don't want to limit them to any bush. Maybe they are not getting what they are requirements are or what they require, but you are feeding them with just fibre. So because you can't feed it as it is. This is why we are calling it a bush base feed. So there is a bush, but the bush has to be mixed with other ingredients like I said, you add molasses. You can also add biochar sometimes so that you enhance it with the purpose of availing all the nutrients that are contained in the bush feed to an animal so that at least it doesn't just go to waste. So that is actually the purpose. So because when you feel it as it is. It's fabulous. So it's of no use so it should become a bush base feed. Molasses is also added to actually make it more sweet and preferred by animals cause an animal we have done now trials here. This is why we're saying it can be fed to animals. And the other lady Kamathi, who is a PhD student, is already feeding dairy cows here on campus, actually supplementing them. They have already basal feed which they get every day, but she supplements them. There is a group that she supplements. Is a group that is not supplemented. She is now weighing them as well and also looking at the milk quality. And then when it's processed, failed as you also do, I mean other tests that she surrogate in her study objectives.

I2

**For every feed you need to do a test and see what the grade is?**

P1

You need to do a test. I mean an analysis that you need to do first because you need to know what is contained in that feed.

I2

**Do all farmers have access to do this analysis?**

P1

Yes, they advice if they do not have access to doing that, they can always bring somebody, whether to the University of Namibia .That assistance is there obviously sometimes like we do help without payment. But the ministry you are required to pay a small amount for your sample because it's a way of buying some of the reagents that are used or even if the machine get worn out or broken places can be fixed using that resources.

I2

**And the machines you need special machines, right?**

P1

There's a variety of machines. Some machines you know. You have a chipper, just chipping, like grinding. When it grinds, obviously you need to now come and dry it, but there is that one that will mill it later, sort of milling it and then sort of I mean depending on the sieve sort of becoming more small particles or fine. And that they can get those small machines, but they may not have pelletizers the pelletizing machine. They may not have because that those are expensive.

I2

**Those are the most expensive ones?**

P1

But we do have it over here. We are also using it because this is a farm. So it's on the farm. It was also sponsored by the company provide the pelletizer here and we are using it to actually pelitize. Yes, ah, good these are the proper pellets. These are the materials from different bushes and these are the pellets. They are of different quality depending on how they are processed. So if you add more molasses, or sometimes we have less molasses. Yeah, they are coming from different materials. So this facial pores and these are Mara pellets, yeah, because it's also Mara seed cake that is added to the feed and these are others. This is how they're processed. Actually, they are all pelletized over here. So, but different bush materials and they have harvested different times, the harvesting time is very important because that's what determines how much regions nutrients they will have, and they're having nutritious like this time leaves there. Poles are there. And twigs I was all green. So they are very nutritious. And this is the right time to harvest. During winter, when it's dry, a little bit of a challenge because they may not have what it takes because the leaves are not there. The pots may not be there. You have sort of fibrous material which will now need to improve by adding all other ingredients.

P2

That way you'd have to use less of the bush and more of the supplement.

I2

**Yes, And do the farmers harvest every year during summer?**

P1

It all depends on them. Sometimes during summer they may be lazy because they know they have grass then looking green and I don't mind because they have resource available. The four, the four that's available. Yeah, but during drought conditions, that's when they realise, oh, they have lesser and then there is also the bush using the supplement.

P2

But the bush has already dried it.

P1

But the brush is already dry and the quality of it is actually low. So and now when was the university mandate is to actually reach out to a farmer? And then you advise them so this is why we are out next week, the whole week, doing training in ourkongo. Together with the Namibian National Farmers Union we are all going together and we are. We already have a an EU project which looks into that. So we are going as a university plus the project and the bush advisory services. They also have to be part of it. And then when we are there, we ensure that we spread the right gospel to the farmers about the bush.

I2

**The machines I presume are quite expensive. How do the farmers get the investment capital for that?**

P1

Here where we are going now there are some machines that they will be sponsored with machines. so now they will be machines being handed over to these communities and then they will make use of those machines. Yes, so it's a way of bringing resources to them. And then they already have the bushes, and then they get trained as to how they use the machines and then they can process their own feed, which they will feed to their own animals as a community. So everybody is mobilized such that they all come together and then they see this as their own equipment, that they should use and they use it sustainably such that they need to take care of it and then maintain it as well. And then they produce feed so they can produce feed in excess of the relative amount which they require, but if they produce excess they can still store it. This is why sometimes it's very much important if they have predators because they can feed this feed for a longer period and then please, you can always feed it to animal or you sell it to neighboring farmers who are from the nearby communities or villages and then they can always purchase and they can also return.

I1

**And those communities that you work with? Are they all conservancies?**

P1

Not all of them are conservancies, but the African Wild Conservancy, we just saw the proposal, and then we went together from the onset but it was an idea of actually helping them because we actually identify a site that is more bush encroached and then we realize this will work much better for them, and we help them to actually rehabilitate their region or sort of restore them and also help them to actually improve the conditions of their animals. So but most farmers are actually encouraged to do that and they all know now what is happening because in the past when you see bush you see a problem? Now people see bush as an opportunity. It's an opportunity which they can make use of, so this is a way of green gold or green diamond it's actually leaving a bell in their minds at all times.

I2

**But can you do these projects in communal areas that are not organized into like community forests or conservancies?**

P1

Like where we are going, I think they have community forests. The initiations of these ideas are coming from cancel us because they have cancelled us and they also have headwinds. Those are the ones that you meet first. And then when you talk to them, you ask them to mobilize their government members, and then you call a meeting and then you meet them as well and then you talk to them and tell them what is happening. So now when you talk to them and then they are happy because they are so receptive it most of the time because they know the conditions and they sometimes see their animals dying because they have nothing to feed on and then when they see the conditions because they can see the animals themselves, and this is why we feel it. We feel it's more important when we do these trials. We are doing it on farmers, animals. So you look at the animals in the condition in which they were before we produce a feed and then before we feed the animals, and then they also look at this same animal after it have been fed with the bush materials, which they process themselves with this, with our assistance by training them like now when they're very lucky they are provided with the machine which is the part of the fortunes situation and then they are trained, you can in that that everybody will be able to use the machine so but you can have lead farmers. Who are going to run the machine? They help others when you are away. So what we do, we do follow-ups to see whether the machine is still running and is still maintained in a good condition. And if you need any assistance, they can always with these lead farmers always inform us like we need another training, maybe some farmers that also want to be part of the project or part of the team. Then we tend to further. But we also use these farmers to be part of the training and when they are well trained, they can train others. So because you we are looking at the long term impact or effect all the farmers sustainability.

I2

**And do they need they need permits right to harvest the bush first. Yeah, they need permits first right?**

P1

Yes, they need permits. They are legal permits which they need to acquire, and they normally need to the field on the side where the bush is, or the bush have said to be effected, have to be looked at by the license officers, because they need to determine whether that area is encroached or not, because there is a norm that an area that is should be it an area will be regarded as encroached when is the much quieter than the average amount of rainfall per annum, and so it's much quieter than that. So that is, that is encouraged, and then they can apply for a permit which will, if it's on a commercial areao, it will take three months. You apply it in three months and then you use it for a certain period of time, but it also expires, but then you need to always apply so that you harvest the bushes. You can't just go and harvest because we are looking at an issue of sustainability. Otherwise, people will tend to overharvest.

P1

Yeah, and there are some protected species, so they need to know also which ones are the protected species, which they shouldn't know harvest. I mean they often have to see to it that when their testing is done is also available. Ensure those policies they have harvested. Right time and the required amount is harvested because you can't harvest an amount which is beyond what is applied for.

I2

**Do you also train the farmers on how to harvest?**

P1

Yes, we train farmers on how to harvest and this is what we're also going to do now. Like what we have done, we were just going to print it. We have a project coordinator. He's also when we have a training, so we produce some bushes which will print out and then we take the farmers, they can rate details, all the procedures and then all the processes are involved, starting from harvest, milling and drying and even going to an extent of if I mean of feeding. So, but we will now train them but they have given that. So they there are stages or steps that will be followed. But we will train them they will also be part of the of the whole process. So even when you do follow up, those are the people that you always follow up with and then to see whether everything is done according to how it was planned.

I1

And what were some difficulties that you faced in these trainings and in these community projects?

P2

I'd say the most difficult thing was just the language barrier. It was I think in terms of the difficulties it was the lowest here. I think other than that it was maybe protective gear for everyone that was working because at the time we were harvesting Senigallia mellifera, which is a thorny bush. So you'd always need to wear protective clothing. It was a bit problematic for the workers that we had you always had cause. The equipment you think it would be particularly durable, but that bush is very strong. So you would run through gloves or clothes and it’s a bit problematic I think fuel cause we would always since we were visiting different farmers in different villages. Moving around from every village because you'd have 10 kilometers between the villages, so you want to visit 5 villages in a day. It would take you a while cause you have to sit down. You have to talk to everybody, explain the project, et cetera, et cetera. Time management in that way was really difficult because in the area there's, I wouldn't say there's a central village cause there's no central community area where everyone comes to convene together so there's no way you'd be able to meet all of the farmers together at once, so you'd have to organize so a certain group of villagers that are maybe clustered together, you'd be able to meet those farmers on one day. A certain group, etc etc etc and it's a lot of planning involved because you'd have to call maybe the radio station or the chief of that village to organize a meeting with him first, and then you'd have to come back and forth from the university to the community, et cetera. That was really the main issues. But logistically, if you plan it really well. And that's like months, months in advance. It can work out really good.

P1

Yeah, maybe. Additionally, I wouldn't say it's really a problem, but you may find in some communities if you pick out some lead farmers. Others will feel why would you just pick him and not me? You understand? So because everyone wants to get involved in this because they always think the other person has been selected, maybe he was going to be paid and I'm not payed. Yeah, those minor conflict might come in, but they are not really there to actually stop the process from going on, because those problems are part of the society. You can't actually clear them out because obviously if I pick you and I don't pick him. So those are the things, but. Always tell them that, this project is yours and is here to save everyone equally. And This is why, when we are training we pick who and who obviously to be a leader or to be a lead a lead farmer but. He is just representing you. And what is whatever is he done here is done for you. All together. So that's what we tell them. But in some community you may sense such situation. Yeah, but you can hear from them on like, oh, so they are saying, why did you pick me and not the other? You know, they are. So, because there you also want everyone wants to be part of the lead team, which is not possible. Yeah, yeah. But you have some representative that are representing others, and you can always emerge a victory by carrying out what you have planned. When you do not actually involve much conflict.

I1

And how is it done? Like you picked and the person, the lead farmers do they vote or something like that?

P1

Yeah, sometimes you when you go there, you ask them to select who can you be the personality. But they are the one that are selecting them or sometimes you have either a counselor or head men, please selecting someone already. Yeah, they have the representatives. Those are the ones that are normally that you are linked to because it's a matter of them being accessible. You can always go to them or call them. You can access them because if you pick the other one, maybe he might not even have a cell phone so it's very difficult to pick that person and that person also to communicate to others on time. So you want someone that is proactive so that when you actually. Invite farmers. You realize that all farmers are informed on time as to when is the meeting or the training and at what time is taking place and at what place. So they are well informed. So those are the people that you normally pick, but they are picked by the headmen or your counselor or any other community members that knows them because like who will be able to do that because they may have a vehicle that can reach out, drive and reach out to all other people in the Community. Yeah, because otherwise if you pick this other one doesn't even have a vehicle and maybe he's an old person who may not even have the ability of walking to any other place. But the other ones can always link up with the others, and then everybody's informed on time.

I1

And in these projects is it like equally male and female involved or how is it?

P1

It is male and female plus youth as well. Because that's it's a way of actually grooming young ones as well. Because we are looking at the issue of agri premiums. You want people to get involved and then they can establish their own businesses well, if they're involved into charcoal production, they will be producing charcoal and then this is where I was actually pointing out the issue of developing a hub in in the center where the charger is actually being produced on the farm and is brought or sold to help build the hub and then people can bite from the hub. So that's the initiation of the project, but it's just that the process is so slow. You know how these projects that we the idea is actually to ensure that we have a certain ability of the project meaning it has should not just end there but it should carry on. And then the committee should also have the ownership of the project taking it. Taking it over. And for the future as well.

I1

Maybe we can show you the concept that we are working on it's also a hub, it's called the Bio Hub. And the ideas that here in this this green area there are communities and farmers that provides biomass. So in this case it's the encroaching bush to a biorefinery. This one and we are investigating now a technology that can produce four different products. The main product is a bio crude or bio oil that in the end needs a little bit upgrading and then it can be used for example in the shipping sector. But it can also have other uses. A second stream is a biochar, which I think you're familiar with, and it can be used again in this area as a fertilizer or as a water purification or, well, now just learn that you can also use it for the feeds. And then there is a waste water stream and a gas stream that can be used in the facility again. **And what we try to understand here in in Namibia, how could this concept work in this context and what are the challenges faced? What are the opportunities? Yeah, what can we learn from previous similar projects? So we would like to ask you how do you see this this concept and what do you? What do you think are could be challenges?**

P2

The biomass this hub, is that where you would do the refining? So it would be on the you don't think there'd be any particular harmful byproducts or waste for the community members?

I2

I think it depends on how the factory is build.

I1

I think what for this model would be more suitable. It's like sort of multiple smaller scale hubs for example, first like wood chips are produced and then those wood chips are transported to one refinery and can then go to a different more central location.

P1

I think it may work because we have a more have similar thing. We have town this windowchow and ochacoronga then that's actually the hub for bush. Most of the bush materials are actually brought over there. I'm not sure what is happening now because this is a hub. So I'm looking at the model. It may practically work out. You know, initiations are always important. And provided they're not harmful to the environment. That's one key important aspect. It was like, you know, at ochacoronga. We had production of cement, which the Community did not like, because bushes around with sort of poisoned and they died and then there was also somehow have hazard to the human capacity because they were not given masks so much with us? Were inhaling it into their lungs, and then it was inhaling them. If all aspects are taken care of, environmental friendly and also. Human capacity and their health, I think that will be important.

P2

At what rates would you actually need to harvest to make this something that can be viable, like thinking of the cycle since the farmers would be the ones that would be harvesting for you? How much would they have to harvest to make it sustainable? And with the bush encroachment is that something that would also be sustainable for the bushes in the area.

I1

Well, it's something that we still are investigating the scale and those kinds of things. But of course at the shipping sector, that's the sector that's it's. Very big, yeah. Requires large volumes.

P2

That's where you make big money.

I1

And that's also why at least of what we understood here is that there are already some projects and already some value chains set up here, but some are all very small scales. So this could be a potential markets, but then again, there is also a risk or sort of a balance that you take out too much or that that should be considered.

P2

**If you look at it, the rate cause you the. The wood that you would use or the biomass that you would use for this hub, it wouldn't be the biomass that would be used for feeding all mushroom production cause or you would use the whole tree, the leaves, the twigs, everything?**

I1

Yeah, I think everything can be used.

I2

Yeah, the plan is or the to chip it.

P2

To chip it, yeah, Then I think we can still take out the feed. The farmers can remove the branches that they can use for feed, keep it, feed the animals, and then the rest they can go into that it. If it's fine, it could be fine. I just see potential competition in terms of different value chains cause this would take the value the biomass away from things like the production of poles, the production of building equipment, etc.

P1

Yeah, but with the bush intensity, it may still work. It can be viable practice.

P2

If we can protect the environment through the whole process, cause I think you'd need massive amounts of bush.

P1

if it's environmentally friendly, it can be fine so that you don't have over harvesting of bushes, you know. I know for some farmers. May take it in such a way that. They want to make a living out of the bushes. So they just, they will either harvest without permit, just with an idea of having more bushes and then take it to the refinery project, I mean hub. And at the end, you realize that inland is getting, the eco system is actually not there. Not viable anymore because it's no longer functioning because it's it is sort of a clear land area like for cultivation. Which some farmers really like because they want to use more grasses. And that's not a savanna type of environment, because you would like to have, like, bush thinned out, but you still have some trees here and there provide shade and even some birds might have their nests in the trees, but if that is the well planned and then looked after, I think it can be a viable exercise, yeah.

I1

**And how do you think that can be prevented? Like that it is over exploited?**

P1

I think the Minister of Environment and Tourism. And forests and tourism, that's the custodian of Managing or forest areas and even the issuing of permits. They're involved in that, so if they were informed about it, I think it will play a good roll because they will be having ability of following up or even going to the sites of farms that have, I mean where the bush is being harvested. And then they will now know at that stage, This is the amount of bush that was supposed to harvested here. And this is how the area looks like does it look overutilize of overharvested or not? So because they will go to the ground and then monitor situations, so if they are involved otherwise farmer will harvest just clear everything.

P2

Yeah, especially in communal areas. Because they don't own the land. It's just for everybody. They just hack everything down. But I think maybe if you had a liaison with the ministry. And there would be a way to crosscheck what farmers are harvesting, where they are harvesting from, and then you could also do background checks to ensure they got the wood from where they say they got it from and it also checks with the apply or the permits that they've received from the ministry and then. I think it would be particularly well managed. It just has to have a lot of cross checking.

P1

Do you still have a place where you want to set it up.

I1

No not yet we are investigating also the right location.

P1

Yeah, because I think it has been an area that is heavily invested with bushes. And even farmers have to harvest them they just harvest

I1

Last week we were in ochivarongo

P1

That's a heavy encroached area Because you have farmers doing all that, this and that. Passing all sort of control measures. Be it rolling over the bushes because. They are faced with the challenge.

I1

And do you think this can fit in your hub ID? You're also explaining about the hub that you're working on?

I2

Could this? Yes.

P2

Yeah, it can cause the hub or the hub in or conjunctive that was designed. It also had a means of producing biochar. Now if everything can be incorporated in there because it was the production of animal feed, the production of biochar, the production of the poles and the mushrooms as well. So yes, everything in that hub. So I think if you just enlarge the size everything can be accommodated. I think it's a good idea. **Energy generation, with biochar though. How do you do that?**

I1

I think you can burn it and yeah.

P1

But I think that is already also happening in power, Nampower does that.

P2

**Is that not the charcoal biochar?**

I2

Yeah, I think you can also burn it.

P1

Yeah, you can also burn it.

I1

**And in your experience with the feed, if you only add biochar that then enough nutritions?**

P2

No you always need to add supplements. Molasses, maize some also add the moral oatcakes.

P2

Yes, you did protein suplament. Senegalese mellifera has a protein content of about. If it's low, it's 10 to 15, right. So that's somewhat OK but. It's mainly in the leaves and bush feed is mainly the wood out unfortunately, so you always have to supplement. It's never going to get the full range of nutrients that it requires.

I1

**And finally, we would like to understand the different stakeholders that will be involved in in a hub or in a value chain like this. And we would like to understand their position and also their relationship between them. And we've made this power interest grids, so and this axis you see the power and here the interest. So if we think that the stakeholder has high power and high interest, we put them here. But if we think they have lower power but high interest there here. Well, that's just how it's how it works and we would like to ask you to, yeah, to take a look at it and also see what do you think of these positions, do you agree or should we change something? And are there maybe stakeholders missing?**

P2

When you say power, this is power in terms of ability to make decisions and influence okay.

Speaker 4

I think it is okay.

P1

The national the government itself has more high power and interest. And you know most of the encroached areas are actually for farmers and also be interested because they will have their region restored in terms of grass biomass.

P2

Especially the commercial farmers.

Speaker 4

I think it's a good one.

P1

okay

Speaker 4

Yeah. No it is.

I1

And do you think that there are stakeholders missing? Do you think that our stakeholders missing that we didn't include here, but do you think they are important?

P2

I mean, you could like all of the. Other bush provide like N big all of the dust debushing Advisory Association and that's also under academia. I suppose they're all kind of training services.

I1

**And where would you put them?**

P2

We're generally in the same area we have high interest, but not quite a lot of deciding power. But you know we can spread the information, yeah.

I1

Well, thank you very much and do you. Have more questions?

I2

Can't think of any other at the moment.

I1

Thank you so much.