**R12 - Interview BIOS - 14-7-2022**

**Firstly, good morning. To start this interview, let’s begin with an introduction. Tell us what organization do you belong to? What is your role in this organization? And what activities do you carry on?**

Well, it is my pleasure. My name is [name]. I am a PhD in chemical sciences. I currently work with BIOS doing a postdoc, specifically on computational chemistry, and I support on varied activities such as projects execution. We are developing, specifically within BIOS projects, a project on bio-prospecting which is about utilizing different techniques, such as molecular docking, to do virtual screening and to be able to develop pharmaceuticals from different plants. That’s it.

**Ready. In this project, well, we are going to talk about the Cocola project, in particular. I think you were in it and based on your experience, tell us a little about what you know on the current situation or context around cocoa.**

Well, about the Cocola project, I can’t provide too much information because I am not involved in the Cocola project. But I am involved in the Luker project, which will be developed… Its development will begin this year. I am part of the project for quality control of cocoa. To develop an electronic tongue, sort of an electrochemical sensor. With cocoa, we have also been trying to analyze the cob, the waste. The cocoa peel as a residue because it causes big environmental issues such as soil and air contamination and, as I was telling you, about that peel… The most important residue that cocoa currently has is the peel, with a 70 or 80%. It is very high. Therefore, we are trying to find a way to remediate, to implement a project to use those peels in different sectors. It could be in construction because the peels are hard, because it has lignocellulose and everything, it could be used for the production of biofuels or we also thought about metal absorption. You know, cadmium is the one that is affecting cocoa crops the most. The idea is to take advantage of the… bioprospecting, because it is bioprospecting. To use the peel to create a new adsorbent… A new material that could be used to adsorb heavy metals. We were thinking of it as a hybrid thing, together with the peels and another synthetic component.

**Based on what you know on the current cocoa context, what do you think are the biggest challenges and problems, problematic around cocoa farming, currently?**

Well… It has been identified in cocoa exportation that the current cocoa quality control is not standardized. That is a problem that is… Well, yeah, currently the quality is measure by hands, by testing. That’s why there is a need for an electronic tongue because there is no process standardization. Neither with fertilization, neither with waste management. There are important problems. The problem is also cultivation when, sometimes, you can’t identify the… Regionally, here in Colombia, cocoa has different taste. Therefore, methods standardization and identification of crops is a current problematic.

**Now, I will ask on the… we will get into the context…**

**(Someone else talking in the background)**

**I will get into the sustainability topic. Ok? What is your perception, from BIOS, from your experience and knowledge, what are the challenges related to sustainability within the cocoa sector?**

With sustainability there is another problematic I haven’t mentioned yet around the environmental field. The environmental field, around the contaminants and waste generated during the chocolate manufacturing. Well, the idea was to achieve sustainability at chocolate farms, like by creating composting plants, where this composting could help to fertilize the cocoa crops or by making a fertilizing starting from the peels, too. That was also thought about. That circular environmental economy within companies doesn’t have an own consciousness yet, at least in Colombia. There is no environmental consciousness. You simply throw everything like… And that is precisely, the source of the cadmium issue, of the heavy metals, because there is no control or regulation for waste management, for polluting components.

**Tell us, from BIOS as an organization, about the projects being developed that are aiming to the sustainability of the cocoa sector.**

Well, in BIOS we are thinking of projects… We mostly work on the biotechnological and bio-prospecting field, bioprocess development, to avoid contamination or to identify how to make use of the biological components with crops, with seeds. We visualize all of the cob, as such, the leaves, the plant, to identify what could be used to generate pharmaceuticals, to make use of the Colombian biodiversity and of the cocoa beans. What are we aiming to? We have developed many joint projects to support companies, to create support between companies, to support the cocoa sector. To look, from the data science field, how to evaluate the plausible routes in the ecosystem. When is it convenient for them to sow? Around what time… And all of that is possible thanks to data science. That is BIOS contribution. To look into virtual screen, which is computational chemistry, to find faster ways to develop drugs or important metabolites. There is the bioinformatics are which look into metabolites, too, that could affect the cvrops DNA. If there is a sequencing of each one of them, we can identify which ones are from the Caldas region or from other regions, and it becomes easier to identify if there is a contamination with different plagues. We are trying to also look genetically, into the DNA, at each crop. We have a thousand projects. I am not involved in that many but this is some of what I know about BIOS is doing. Supporting from the systems area, with the infrastructure we have. We adapt to the companies.

**The context or the environment of BIOS is 100% technological, right? Yeah, sure, you analyze the crops but the context is technological. How do you do the link to the farmer, with the producer, understand that…**

Well, precisely, we do boards, meetings, and we also visit the entrepreneurs and explain to them what it is that we can do. We are interested and we focus on the needs they might have. On what that are missing to be able to speed up their companies’ processes. We offer that service and well… it is important for you to the cocoa to not get damaged at certain temperatures and therefore we can look into the processes. Precisely, the electronic tongue came to be because we heard the inconvenient, they have by not having a standardized quality control. The human factor is uncalibrated, the equipment, if it is acidic or not. Chemically or electrochemically we can see how the cocoa is being degraded or not. How it changes it quality, around different chemical compounds. We try to look into the problematics and we look, whitin everything we do, for a solution to that problematic.

**The network you have, or the links you have, are more towards entrepreneurs and big producers or do you also have links with small producers?**

No, with small… The ones who have a link with small producers are the big companies such as Luker. They aim us towards the farmers or the common people but us, directly, don’t. Actually, we participate in a biotechnology board. That is also why we get to know much about the current needs, especially in the Caldas sector but to reach to the farmer… Not us.

**Ok. From BIOS and from your experience, have you been linked or do you know projects on bioenergy?**

From BIOS, no. But based on my personal experience, I do. Actually, I worked with pyrolysis with yucca peels for biofuels. So, based on lignocellulose pyrolysis, we analyzed all the thing so that, starting with the peels… That is also why we thought about cocoa peels, that it could be useful for biofuels. I do know of the energetic field because my PhD thesis was based on creating catalyzers for combusting cells, that work as the link between hydrogen and oxygen, producing energy and generates water. But that wasn’t based on biological processes, we synthetized it. Ok? But on biofuels, that one, the yucca thing. I do have experience in bioenergy, in energetic transformation.

**From… Now, from your personal experience and from BIOS, what challenges and opportunities do you identify in the bioenergy for the cocoa sector?**

What challenges are around bioenergy? The efficiency. Energetic efficiency is hard to achieve. For example… Yes, yes. What slows it down the most is to transform that energy efficiently and to achieve a good proportion of… Energetic transformation is hard and, for example, from bio, around bio-things, that efficiency is between a 10 and 20%. Therefore, to achieve it, is complicated and, well, when you work with, when you handle biological things, you can also harm the ecosystem so there is also an environmental aspect to it. It is hard for you to… Well, we are going to create… Well, if we are creating it from waste, then cool because waste produce CO2 and it is a natural process. But if we find a plant capable of producing energy, how do we work with that plant, because there are many protected things. There are kind of…

**And about opportunities?**

About opportunities… Currently, in Colombia we are still very… We are in our way but we are still at the basics around those things. So, there are basic scientific research. To reach the production stage… for example, currently, the one running the energetic system in Colombia is Ecopetrol and they still haven’t… The already started with energetic conversion but still… The crude field is still very important. And therefore, it is complicated for the scientific sector to reach the entrepreneur around that topic, at least in Colombia. At the world level they might me more advanced.

**Let me show you the first part of Siban and Susan’s proposal. The project, the macroproject is called Clean shipping and this part of the project is called Biohubs, where the big proposal is a win-win. They will link local farming communities with the fuels producers, or let’s call them industry, and this area is understood as the Colombian countryside where there are many cocoa and coffee producers, small producers, that generate residues from their cultivation. These residues would move on to the big proposal, which is a biorefinery, in which, by means of…**

**(Siban) Hydrothermal liquefaction**

**Hydrothermal liquefaction**

**(Siban) It also like a wet pyrolysis**

**Something like a…**

Pyrolysis…

**A pyrolysis but wet. Ok? Then, through this process, four elements would be obtained and they are water, carbon, gas and a crude. The water and the gas are needed for this process so they would be re-used. The carbon could be used to improve soils, to generate energy or for water treatment, and the crude, finally, would continue its way to a refinery and this element would be transformed in a biofuel for the maritime industry. This is the current big proposals in which the biomass is obtained from the agro-sector, understanding that urban residues could be used but they would be required to be clean residues, no plastics and none of that. And this would have an impact in the regional development with the soil improvement, management, technological and knowledge transfer, infrastructure, education and employment, meaning that the regional development grows. This is the big proposal Susan and Siban have. That being said, what would be the challenges, benefits and harms that you identify or see, when developing a project like this one.**

Honestly, the project is amazing. Benefits, there are many for the community, for the environment, on the evolution and energetic transition that is really needed globally. But, well, conflicts might be that, as I was telling you earlier, in Colombia there are areas which are taken care of, protected, and when you want to implement these kinds of things you have to ask for legal permits that for some companies it stops them to develop plants of that kind. Because these permits and well, the water… But ok, you could perform a full study on the area you could implement it in and to be able to say, “well, this will be beneficial…”, and to present a beneficial project, for the community. The income, too. I don’t know what income you have.

**This income… Well, what they are doing is viability research**

Oh, wait, no income but the financing that will be given for the project. That is very important, too. Currently, there are projects in Colombia where you look for calls for funding towards biological projects. That does exist in Colombia. They exist in Colombia. But they have the limitation of them being evaluation projects. I know of this because I also work on topics of taxing benefits, so it is clear to me. This tax benefit given by Colombia, if you invest in science and technology and there is an environmental benefit, it is easier for them to give authorization to projects to provide funds but for that you must already have it written and structured and a part of the financing. What other problems are there? The communication with communities is important, too, because there are topics with which it is hard to reach people and you have to lower the technicality level. They won’t understand the level we use, so that social aspect might be a little of… they might not want it and there are communities here that protect the environment. But if it is presented as an environmental project, that gets a lot of attention. It is cool, I have never heard about a pyrolysis plant. I am aware of a project that is running with coffee and is already being implemented in Colombia about circular economy but they do it by recirculating the water, in order to avoid the dumping of contaminants in water. So, prior to do that, you have to do studies and analysis to the water, to the soil, to the earth, to know its current state. If it is contaminated, you could use this focus. This plant will prevent for those wastes to keep contaminating. And so DBO, DQO, the process that are impacted by pollution, we will avoid them. You have to properly present a project to be allowed to execute it, here in Colombia. For it to be functional.

**Ok. Firstly, would you be interest, from your experience and from BIOS, by being linked to BIOS, to have a role in a value chain such as this one?**

Of course. I would really be interested. That would be cool.

**Where? Or where could you impact on a value chain like this one? Or what role could you fulfill?**

Well, I have a very broad vision on this type of project because I have tried to develop proposals for coffee plants, and so I could collaborate with you around that part, around the way in which you present the project. I don’t know if you have already done that.

**They are currently working on that.**

That’s where you are. Well, I could collaborate a lot with that. Around the water analysis, too, because I am a chemist and pollutants identification, what pollutants, is pretty clear to me. I can’t do the analysis because for that you have to hire someone but I can evaluate and take care of all type of analysis that would be required to reach that… Let’s see. In the biofuels part, I could also help to look into the processes because the biofuels aspect is clear to me. BIOS could also collaborate with its network with Luker and the companies that would be important to associate with. Because in this type of projects it is important to understand each other for them to associate in order to develop the project, and BIOS has these contacts. The project could be presented as such to a company, let’s get it through Colciencias. Here we have the capacity and the knowledge to develop projects, to find funding for that type of projects, tax benefits or technologically innovative development, in which Colombia would be interested. The government makes a lot of calls to generate funding. BIOS could provide that support and my experience could also be there. Also on the water treatment, I know about the topic. On the social aspect, would require of the companies to achieve… I don’t know if someone here has a clearer view on the social aspect because there are other sectors, such as marketing, and it could be they have it clearer, the social part.

**The next question is a little broader because BIOS purpose is not radically opposite but… I’m going to make the question in a broad way and it is, what obstacles can you identify for a project like this one to not have been done yet or not be able to be done, a value chain like this one? Why hasn’t it been done yet?**

Because of many things. Economy. That’s why I was mentioning the financing aspect. For someone to want to invest in something like this, it is important to be able to sell it very nicely, right? Also the social aspect, because people is always trying to protect the natural reserves. That makes trying to install a lot of machinery, hard. Actually, the coffee company I mentioned currently has that problem, because you have to ask for environmental permits to be able to develop this kind of things. And for those permits you need to strongly support your project and sometimes they get denied but, the process itself, sort of makes it hard for companies to invest. But of course, when companies see the economical part, the incomes from the sales, they want to make a small investment to generate income while it also is sold for its environmental benefit. I don’t know what else… Investment. Investment has put a break to many things. Maybe also the consciousness. Few people have environmental consciousness

**What could damage or what could threaten the existence of a project like this one?**

What could harm it? As such, I don’t see something that harms it, I think it is a process. The water recirculation is very beneficial but it is about making people aware of it being beneficial. People when they see that there is a new company being stablished next to the water, they think it will contaminate it or that the ecosystem will get affected on the animal diversity, on the plant diversity. It is construction. Everything seen as construction is seen as something that could harm the environment. To harm the ecosystem. But, if there are preliminary study on the soil, on the community as such, I think it would be easier. Or to centralize it, to look if the water will be benefited. The water, the soil. If there are studies, I think it would be easier to go over that phase.

**In the next part I’m going to show you this grid where Siban and Susan identify the different actors that are related to the cocoa sector and they locate them within a grid of power and interested, and how they relate. High interest, low interest, and high or low power. Power is the ability… power to make decisions. These are the actors they identified. Yet, from your perspective, what actors would you consider are missing here and why?**

For example, here, on the low are, transporters… biomass collectors, there they are missing the social part, the community. Although it doesn’t take decisions, it is important to consider it. Farmers and people… which I don’t see them here… Farmers… Yeah, smaller companies. Academia… I don’t know if in academia it is also included the research sector, I think it might. Research centers.

**Research centers, in this case, they homologated it from coffee. In coffee you have Cenicafé as a research center. Here they wrote Cenicacao to homologue it but here it should be Agrosabia.**

Oh, Agrosabia. Yeah, it is important.

**And Academia refers to a broad sense of research, research centers, etc.**

Which is basically science. Biorefineries, technological producers, the government which is very important, industry… It might have everything. Maybe, people related to the environmental sector. In Colombia there is a lot of environmental activism. So people who are involved or that know a lot of the environmental field might be important for the development. And of course, it is a big step from here to here, with the government. Protests and everything related to the environment. Because if people involved with the environmental field understand everything well enough it is easier to reach both sectors, acting as an intermediary between everyone.

**Now, regarding the power versus interest positions, meaning the power national government has versus its interest and, like that, all of the positions… what do you think of these positions? Are they well located? They are not well located? Which ones would you move and why?**

No, I think it is correct. Yes. For me they are correctly located.

**They are correctly located? Now, currently, to which of these sectors are you related and to which is BIOS related?**

A lot with the academia, with companies… Well, BIOS is a research center and it is well related around here. Also with governments, the municipalities. We are related with them because we do a lot of joint projects, with the town halls. We are well related. Not so much with this sector here. Providers… Yeah, mostly with these two.

**Ok. Now, the next part are specific questions which Siban will make.**

**(Siban) I don’t know if she already answered this question. In this project, do you see… Can BIOS participate in this project? You already asked the question? What expertise can BIOS offer in this project?**

**What experience can BIOS provide for the development of project like this one?**

BIOS…

**(Siban) Or you.**

Well, BIOS, who has me, with their experience… Well, that, the experience on the development of projects, the formulation of the project as such. A little on the communication area, between companies, as an intermediary. We try to always look a joint road. BIOS offers bioinformatic analysis but maybe… Are you aiming to the long or short term?

**As such… No, it is not about the term but if the project was ready, in this hypothetical scenario, what experience could you provide, specifically BIOS, to this project? Meaning for you to say “we can participate on this, and this, and this…” and why.**

Yes, mostly on that. With the generation of projects and searching for funding. That is how BIOS could collaborate. Or also with the experience they have performing cocoa analysis and everything. With the previous work they have done with companies, they could also look for something stronger that could give to the government and for them to say “well, they are working with and involving companies in the scientific sector”. To have a clear perspective on the cocoa context. There has already been analysis on the contamination generated, for example from the peels. We already have that data and they could improve the data generation because BIOS has a lot of experience on data generation and that might be useful. To present the full project with all of the data around pollution for them to be able to visualize it and improve the viability of obtaining those permits. There are thousands of studies and thousands of data sets that could be performed for the project to be complete. And the project elaboration and presentation, well, we know a lot about that.

**(Siban) Does BIOS also have experience with permits and policies?**

How did he say?

**If BIOS has experience related to permits and policies.**

Yes, yes. It does.

**(Siban) What kind of policies?**

**What kind of policies? What kind of permits?**

Well, constantly, since we are working with biological stuff and you always have to ask for genetical resources to use things from the soil, there is a genetical diversity to which BIOS has the permit to do research with. For example the cocoa peel. We have the permit and the authorization. You have to ask for that and BIOS has the permit to be able to work and to inspect, to recollect both animals or plants. We have those permits. We have that authorization, to interact with nature.

**(Siban) Another question is, so, as you’ve seen in our project, this is a thermochemical process. Hydrothermal liquefaction is a chemical process very similar to pyrolysis, ok? But there are other routes as well like biochemical routes to produce high value chemicals. In Colombia, from your experience, which is more preferred? Thermochemical or biochemical? From industry point of view, which is more realizable? Which is more marketable? Easily. Biochemical or thermochemical?**

Could you complement the last part to me?

**From your experience, do you consider… which is more doable, which is more…**

The thermochemical.

**Thermochemical or biochemical? Or which other way? Which is easier to…**

**(Siban) Which has more interest from, I don’t know, industry or…**

**What would be more interesting to the eyes of the industry, in order to fund or support?**

Thermochemical or biochemical… I would say that biochemical. I mean, both are very, very important but that would require to evaluate from the two, which has the best efficiency. Which is the one that could rapidly achieve energetic sustainability. Which one would degrade more. Realistically, Colombia has not gotten into… There is only basic research, as I was mentioning, with pyrolysis and such. But there is not a thermal plant. We would require to investigate and do market research. With the thermal one, there is contamination issues too, because it produces CO2 and what do I know, and biochemical… To be honest, between these two chemistries I see it more on the side of biochemistry. But it would require of a study that is more… more… a more structured comparison, which I don’t have.

**(Siban) Respect to pyrolysis, she said something, right? Is it a plan… it is a study which has been done?**

**(To Siban) There are studies but it is in spanish.**

**(Siban) Ok, can she share that with us?**

**(To Siban) She is talking about it in general.**

**(Siban) Oh, in general. Ok, that’s true. Here is the question…**

**(To Siban) Or… let me ask.**

**Do you have information of those studies developed in pyrolysis? Is that information you can share with him?**

Yes. I actually have a paper on pyrolysis. I can share it with you.

**(Siban) Ok. This is a question… a futuristic question, ok? Apart from investment, ok? Because, right now you are investigating many universities, academia, universities getting different ways, different technologies, to produce different products, but there are not actual plans. There are no actual industries doing this kind of things. Right? Who has the capability to build such a plant in Colombia?**

Could you repeat the question to me, please? He goes very fast.

**You have researched about these things and on the production of different products in this context. But aside from investment, who in Colombia would have the capability to fund or to promote a project like this one.**

The government. The government. Well, the government… There are companies, maybe Ecopetrol would be interested. Ecopetrol is a big company that manages pretty much all of the energy processes in Colombia, based on biofuels… on oil. But it is of my understanding that they have already started looking into the transformation… They already started with energetic conversion and maybe a project like this one would be interesting to them. The companies could also invest a little on… I mean, there might be plausible investors. Luker… within the sector you are aiming for, right? And the government provides a lot of, around the projects, as I mentioned, royalties and benefits that are available for technological development and for the benefit of the environment. A strong and international company is Ecopetrol. Maybe Ecopetrol. It would be a very good idea to involve them. Well, and Agrosabia, which is also an important company.

**(Siban) Ok. Those were my questions. If she can share her contact in case I have more questions later, or something like that. Can you share your contact details or something in case of future…**

**He asks if you can share your contact info in case that in the future, they might need of information so they can write to you**

Of course

**She says yes. That would be very important. And if you have any question, too.**

The project is super cool but it is not clear to me if you… You are doing your PhD, right? This is part of your PhD thesis.

**(To Siban) Is this your thesis?**

**(Siban) Yeah. Yes.**

Oh, ok. Are you thinking of this to actually develop it soon or…

**(To Siban) Are you planning to develop it in the short term? I know, I know the answer.**

**(Siban) So, this is the pre-feasibility phase so it is more to understand the potential. Whether it is possible or not. Ok? In Colombia. In Spain, in Colombia, in Namibia… These are different. Spain is a developed country. The olive sector is well established. Every player is like… They have money. All the sector has a lot of money, you know? It’s really big, at once. It is well developed. The structure, the sector, the industry, the country. Colombia has a lot of potential but there are a lot of challenges as well, right? There are no industries here. The sector needs organization. But there is potential, there is a lot of residues. And then there is Namibia where there is nothing. It is zero in all aspect. No industry, no… Nothing. Ok? What we… My thesis is two aspects. One, whether such a kind of thing is possible based on sustainability. Like techno-economical analysis, environmentally… Or if such a value chain exists, what are the trade-off, ok? That’s one. Sort of to incorporate the social aspect into the design aspect. That is my stuff. After that, at the end of the study, we will tell whether it is possible or not. At what condition it is possible. In this field we also identify the stakeholders who can participate in this value chain, ok? Let’s say, for example, this could be Ecopetrol. This could be, I don’t know, Casa Luker or any other association can own it. This could be in Risaralda. These are different communities, right? So, we want to identify these stakeholders and we want to give them the results and then they can take if further. That’s why I asked whether BIOS could be interested in this kind of things, because you could be a local stakeholder who has the potential to take this project to the next level. You can incorporate… You can be the… how to say it? Yeah, you could be the platform of contamination to bring people and then take the lead of the project further because, at the end of the day, we are outsiders, we are foreigners, we are abroad. Local stakeholders have more… Would be more effective, because it is local people, local community. We don’t want to come and say “hey guys, do it like this”. No. It would never work. Are you understanding?**

Yes, yes.

**(Siban) Ok. So, that’s the idea. My thesis is to evaluate… design and evaluate the value chain for its feasibility in the region, in the context, in that specific, yeah, how to say it? Story. And then it is up to the local people, we just give then the idea, it is up to the local people to take it further. Yeah, that’s the thing.**

Well, now, with that, it came to my mind the aspect of the countries, well, they have different development and it could also be possible to seek for foreign investment. For whom it might be convenient to Colombia to develop such a process. And then there are also international investments when developing projects. Since Colombia is a sub-developed country, we have participated in calls where the money is aimed at these countries. You, of course, do the proposal and develop a project we see viable and beneficial for the regions, the different regions, and they help us a lot with equipment. They are always looking forward to provide support this kind of projects. So, as an international thing, it would be good.

**(Siban) There is also one thing. We would also think about or propose if such a plan exists, who has the ability to invest in such kind of project. Whether it is the government, whether it’s a public institution, whether it’s a private company, foreign investment, you know? We… So, this is also why when we talk to people here, we also ask the question “who has the ability to invest?”. You know? It could be cooperatives or federations, you know? Things like that but we are also… We will also discuss that in the study. But yeah…**

Well, you work with computational chemistry, you said, right?

**Unintelligible exchange between Siban and interviewer**

**(Siban) Not just computational. So, when you say computation, you mean like Aspen and MATLAB modeling, right? Yeah, I do that. Yeah. That’s the basic stuff.**

Oh, ok. That thing with pyrolysis was with MATLAB as well, how we did the analysis.

**(Siban) Yeah, that’s the basic. That’s the first step. The first step is Aspen modeling and then you do a lot of, yeah, you know, techno-economic analyses based on Aspen, for reactor design, and then you use SimaPro for environmental life cycle analysis. You integrate there and then, yeah, then you perform macroeconomic analyses, yeah. So, Aspen is the starting point.**

Of course, of course.

**(Siban) But our group, actually, does a lot of… We specialize in modeling.**

So, in that sense, well, BIOS can kind of provide extra support by previously analyzing, computationally, well, how feasible this biofuel process might be. Because it can be analyzed depending on the metabolites, by linking the organic profile, we call it like that. Which chemical compounds are present that might be easily, depending if it is faster through pyrolysis, if it is faster through the biochemical part, that can be seen more easily by computational work. That is what we aim for, to speed up the companies’ processes. And maybe the companies… Yes, of course, Luker would be very interested in this type of processes. So, who adds to that? The company, BIOS, with its infrastructure moves on together with the project, and the government, well, provides some money for funding, to pay staff, for infrastructure. You have to look into what companies have infrastructure, personnel, so that they can help you with the union of…

**(Siban) So, when you say infrastructure, you also include logistics and transport? Or just the facilities.**

Easiness for…

**No. When you mention infrastructure are you also including all of the logistic aspects, which would be this kind of transport and this kind of transport?**

But with BIOS or in general?

**No, no. In general.**

Yes, yes. Good.

**Well, on the 28th of July, let me tell you, there is a workshop, they are doing a workshop, which is where they will gather all of the actors which they have contact, with which they have linked, to identify many things. Common needs, common opportunities and the socialization, roughly put. So, we would like to invite you to this workshop. It is very important that you take part in it.**

Of course. Where will you do it?

**It is on the 28th at the UTP in Pereida. Technological university of Pereida. He will send you…**

Yes, that’s what I was going to ask. Via whatsapp or mail?

**Yes, it could be through mail.**

**(Siban) You are a postdoc, which university…**

Did I graduate from with my PhD?

**Where?**

From the UBA, in Buenos Aires. From the University of Buenos Aires.

**(Siban) Where?**

**(To Siban) Argentina.**

Argentina.

**(Siban) Oh, ok.**

**(To Siban) Buenos Aires, Argentina. The UBA.**

**(Siban) Buenos Aires. Ok. And what was you PhD topic about?**

**The topic of your PhD.**

It was on the energetic field. It was the energetic field.

**Oh, ok. Bioenergy or…**

No, not bio but I did work with people who was working with fuel-cells based on biological things. Actually, I did fuel-cells, I don’t know if you have… I look into catalyzers to do fuel-cells but I had the opportunity to work with biological catalyzers for fuel-cells. They would use organisms that would speed up the chemical merging processes, between oxygen with hydrogen and water to produce water and to produce energy.

**(Siban) Cool. Nice. Yeah. Thank you so much for it. Any more questions you have form me?**

**Do you have any more questions for him? And these is the last thing. What biohubs is after is coffee grounds, coffee pulp, peels, shells, what is left after the trimming of the different crops. It goes to the refinery where, in this biorefinery, the water and the gas are reused, that is why they are not separated, and the biocarbon and biochar… The biocarbon can be used for soil improvement, obtention of energy, or water treatment, and the main protagonist, being the biocrude, would be used, as a first or main intention, in the maritime industry as a biofuel or in the aeronautic industry. But with it bioproducts, films or bio-packaging, etc., could be made, aside of adhesives, plastics, textiles, fertilizers, any amount of things that could be made and it won’t be fossil crude anymore but with biocrude. That’s the big intention.**

Yes, it is super cool. Not only focusing it on the maritime area but to look for more applications for it. For example, it is of my understanding that with Cocola, a family business was sought, for people who works on the area. So women, family heads, were making use of the… I don’t know where they currently are but they were using the shells to make earrings, necklaces, and crafts. And that also impacted on the economical aspect of the society. That would also be an interesting and beautiful project. And, right now, BIOS is seeking to do, together with Casa Luker, a project with the shells. That’s why I know about it, because I am involved in it. We are trying to implement the thing I mentioned, with the cadmium. This week we are receiving shells, we also have the contact of enterprises that performs the lab analysis, and we complement it with the computational analysis. So, the idea, to obtain royalties with these projects, it is very important to collaborate between regions and between business sectors that could provide something. They see that union between different… and they kind of see an added value. They look for that added value from the collaboration of different companies and universities that might want to participate. If universities work together, around research, and marketing, and aim for alternatives, not only here but around more things, more added value. For example, about the peels, we are trying to work together with La Guajira, which is a very marginalized region. And in La Guajira, which is where Ecopetrol is, is where more royalties are granted. Actually, there, what is being used for bioenergy there are the propellers, because of the sun and they are also trying to implement solar panels. But when you look not only in Caldas, but also in a region here, a region there, there is more viability for a project like this one to be implemented. Like, well, the companies here in Caldas might have assets not only in one but… A production company in Magdalena is one of the ones that produce the most cocoa in Colombia, currently. Luker exports but they are the ones producing for… And La Guajira is… And it is beneficial for all of the communities, especially for the poorest ones in Colombia. It will work as once, or it might be that it will be faster.

**(Siban) And with Cocola, do you already know the product which you are aiming at?**

If we currently have another project?

**(Siban) No, no. In Cocola, so, they are transforming biomass into another product, right? Do they know the product already?**

**In Cocola, you have… Well, Cocola has, you mentioned… Well, does Cocola has a fabric or a result? Does Cocola have a result? Do you have a result available? Or the information on that result?**

I think so. What has been developed with Cocola is already written, available. Right now, we are trying to make another project that doesn’t overlap with them. Because there is another prjwect on biofabrics, which is the one being developed by Mariana, which is on biofabrics. That one is still being developed, ok? But what is finished, there is information on that. In fact, I believe that… Man, why didn’t I bring my phone? But it is already published, what was done with…

**(Siban) Ok, perfect.**

And you can see it and read it later. Done. It was a pleasure.

**Thank you so much.**