**R10 - Interview Universidad de Caldas - 11-7-2022**

**Hello. Good morning,**

Hello

**How are you?**

Fine, thank you.

**More than an interview with question-answer, we do it more enjoyable. I have this guide and in reality, it is more like a conversation, that way it is easier, and we will begin with a presentation of yours. Who are you? What sector are you related to? What have you researched? Or why are you related to that sector.**

My name is [name]. I’m a lecturer at the Calda’s University but I’m also working in a research project in Ecopetrol regarding the field of energetic transition. Why did I link myself to them? Pretty much because of my profile. I’m a chemical engineer. I am PhD… Well, a Master also in chemical engineer but a PhD in engineering, on the field of industry and organization. So it is more on a topic related to supply chains, optimization, simulations. And my PhD dissertation was related, precisely, to this field you are working on. The field of residues used for biofuels, but all of the chain design, optimization but focused on the area of installations optimization. That was the end. Currently, my research track is related to the PhD, therefore with the field of process optimization and simulation that are related to the field of bioenergy or energy. In Ecopetrol, we are specifically working on the field of CO2 capture in chains… For the capture in… Storing and recovery of crude with CO2. The other track we are working on is on the field of hydrogen. So we are working on the topic of hydrogen production, the commercialization, too, starting also from different biomasses. We are working on these different topics, in the group I am in, for energetic transition.

**Wow. Tons of experience. Tell us a little about the knowledge you have on the cocoa and coffee sector in the region. Pereida, Marisales…**

Well, my PhD thesis was specific on the topic of coffee residues. I was working with mucilage and the grounds, the coffee grounds. Let’s say that I, obviously, had to do research on how these residues are generated, how are they utilized. This research was done about 10 years ago, because I already graduated a while ago. But after that PhD I stayed linked in a project with the national (University) that was related to the field, so I sort of have the knowledge on the residues from coffee. On how they are utilized here in Colombia, how some are already being utilized but how others are not because the way they are generated, because of the grain. The lack of traceability given to the process… Anyway, let’s say I have worked with that. The topic of cocoa, only now, with Felix, we are working with cocoa and coffee for the extraction of oils in a small project we have with him. And, well, I don’t know about cocoa that much but I’m following that track with him, on the utilization for the extraction of oils. From cocoa and also coffee. But right now we started with cocoa.

**From your experience, tell us a little about what is your perspective with the current situation of cocoa in the region. Either as a crop or… For context.**

Well, in Colombia, everyone is migrating from coffee to specialty coffee. I also realized from the news that… Well, since my thesis, too, I came to realize that this is no longer the coffee growing region in Colombia. In reality, coffee is being produced in many different parts within Colombia. Precisely, because of the topic of… and the same is happening with cocoa, too, because of the topic of… what is this thing about the crops?

**Monocultures?**

No.

**The change from illegal crops to… Well, yeah…**

Yeah. The change from illegal crops to legal ones. So, because of this matter, Colombia has begun to grow cocoa and coffee at different areas so that we are no longer the important triangle for coffee production but still, we have been migrating towards the field of specialty coffee. The same with cocoa. The topic of plots traceability… And this has made that the residues be more selective. For them to have better process. But it is still minor. I see it like that. There is still a lot to be able to utilize the large number of residues that are needed for the production of biofuels.

**Ok. You are going ahead of me but that’s fine. I’m going for the challenges in the current system. What are the current challenges on the current system for coffee and cocoa, specifically.**

Well, there are many. The challenges… First let’s talk about the logistic issues here in Colombia. Here in Colombia, the logistic issue is around transportation. There is no transport since we have a delay of approximately 30 years. Therefore, the logistic issues make the handling of residues and the chain in general, very complicated in the Colombian scene. That is one of the main factors that, in my opinion, put a break on the utilization of residues. The second issue is around the management of traceability given in plots. Let’s say that the national coffee growers’ federation have made efforts to maintain traceability at the plots, on the crops, on the coffee produced there, but, obviously, the residues subject has stayed behind in that management. The same way in which there is traceability for the beans, there should also be traceability for the residues, for the amount of water being used for the extraction, for the mucilage. There are different types of machines and, obviously, some use more water than other. There are some plots where way more water is being wasted compared to others. And there are others that are more tracible, more, let’s say, environmentally friendly. So, on the area of the beans, the country is very advanced for the country. It generates beans of good quality but the field of residues has stayed behind. So, within these challenges that the chain has to fully integrate that, there is culture missing. Organizational culture or culture around the area of residues management. Not only around coffee but for any bio or agro-industrial residues. Because we don’t have it. We don’t know it. We don’t know how to utilize it. Not even at home, we know how to utilize the residues. Even less a person that works on the agricultural sector, a farmer. They don’t know all the advantages that can be generated from that. The benefits. We don’t have the proper machinery, proper equipment, for that extraction. I know it for coffee. I know, too, that for the cocoa fermentation traceability is missing. Equipments that, I don’t know, allow to handle temperatures, that allow… yeah, to have proper traceability. That’s it regarding the area of the plots and the handling of the residues. Now, on the next link which would be the transformation of these residues… In Colombia the field of finding a company that really is capable of producing these biofuels from these residues is hard, precisely because there are no… that machinery, precisely, that allows for the economic viability of that plant. The profitability, how should we call it? For them to be profitable processes. So that they can get a benefit. So that is the… Let’s say, that the transformation of these residues as such, is… for the field of biofuels, right? Because right now it is being used for the field of cosmetics and the field of oils. Those are much smaller industries but for the field of biofuels it has to be bigger companies or companies that set up processes on each plot, for the production of biofuels, but it should be centralized and I don’t see that political or entrepreneur interest towards that transformation. And for the area of commercialization, the last link in the chain, once the fuel is there, I’ve also realized that it is very driven by political interests and it should be regulated by the national laws. Because if it doesn’t have an incentive the business falls. There has to be more clarity on the norms and the laws. And more incentives for this to happen.

**There is a question that arises… Well, you give us the challenges that present themselves and all of these challenges originate on the practices and, let’s not get too ahead on the field of already setting up a refinery and the actions on the political and legal aspects… but, all of these practices already have a challenge you identified in the plots. What would be the goal of these practices at the plots?**

Well, firstly, there is a goal which would be environmental. Right? Because the topic of residues handling will be linked to the environmental area. If you manage a residue and utilize it you are obviously impacting on the environmental field throughout the chain. You are giving it a value. Let’s say that environmental issue is very linked to handling little water, right? So that the mucilage extraction, well, the bean separation is the most efficiently possible and the most environmentally possible, so that there is not such a waste of resources. And in addition, for us to be able to actually use the residue. Because if we wash the coffee that much and if we do such a huge extraction, our residue is too washed and we won’t be able to use it the way it should be, right? So, that is one. Secondly, the storage of these residues in the plots is also an issue that has to be looked into, on how to do it. We haven’t standardized how many days, how many hours we can leave those residues there. We haven’t standardized the humidity we can receive it with or how much we have to dry it to handle it as a residue afterwards. And that makes it be… That is also an opportunity. And improvement opportunity. And well, the storage and I think that probably a pre-process, right? How is that called? A… A pre-treatment of that… a pre-treatment of that residue, that allows to give it a longer life to introduce it into the transport line. Or to be able to transport it in a cheaper and more adequate way.

**Now we go into a topic called sustainability. Once again, talking about the coffee and cocoa sectors, what are the major challenges at the region level, Pereida, Armenia and Marisales, what are the major challenges related to the sustainability of these sectors?**

Well… Regarding only of the residue handling or of the coffee line?

**Broad, broad.**

Broad? Sustainability, well… Firstly… The thing is we really are behind on the matter of transport. That is something that makes it hard. The other thing is the weather. We never prepare for natural disasters, on matters of weather. Nothing. We are a tropical country and we think we always will have the perfect weather but when the rain comes and damages the crops or when the sun comes and damages the crops, we are not prepared to handle the weather. Because we thing we will always be at a median condition and that everything will work out. I think that there is an issue, that in order to be able to have a sustainable business, we would have to handle. To have better roads, transportation means, that are able to reach the plots and, in addition, the issue of improving the… I’m sorry. The what? The… I forgot the word…

**Roads? Transport of the products?**

Well, anyways. One thing is the transportation but for it to be sustainable I think that we also have in include… we also have to include that the government really incentives the coffee growers, right? To give them… Not that much that they… I’m not for those policies where everything is given but for it to have a way to make sure the farmer possesses the sufficient money to generate his product. To give them guarantees. Sufficient guarantees to allow him to generate his products for a good price and such. And in addition, these chains, both cocoa and coffee, are very dependable of the US dollar. So the sustainability issue is also reflected on the economical market. And as such, of course, we are not that represented or strong in the market with our coin. And so, to survive there is a… a… an uncertainty. The subject of the dollar in the chain, hits hard on sustainability. When the dollar is very high, the business is sustainable and we are very happy. But when it is not, we die. So, also for the government incentives, to be closed to the economical market and to sustain the chain when there are lows. Well, I don’t know. I don’t know. It is a very economical topic.

**Continuing on that same line, from your experience and the university… From your experience and what you know from the university. What do you know on projects performed on the sustainability of the sector?**

To be sustainable… Well, I know a lot projects from Carlos Ariel. I don’t know if you interviewed him, from the National (University). It is a very strong group. We, Josselin and I came from that group.

**Carlos Cardona?**

Carlos Arial Cardona. Yes. He… He has done several projects with the residue’s chains and its sustainability. But, well, I don’t know how to extract from there, the results. I don’t know. Well, I think…

**Then, tell us about what type of activities were sought to impact on sustainability.**

Well, firstly, it was on very social matters. The matter of going to plots and implement some processes, let’s call them, of grouping, at a small scale. And of production at the small scale, for biofuels. So, we have a very beautiful project, called Arcano. And in that project, we went to small schools and plots from the coffee growing regions where we installed small biofuels plants and we worked on the topic of training them on the use of those plants and laboratories. However, what happens in Colombia? We, from the UN, were donated equipment and the Caldas’ government also provided money for this equipment… What happens around that? They come with the equipment, they train the people, but if there is not someone constantly there to manage that, that knows and yeah, that cares for that project, then it gets lost. It stays as an item in a school, as an item in a plot. You see? So, for it to be sustainable we have to make a chain. But this chain has to make sure that the person or the group of people are really interested on that, and on produce that biofuel through those means. On making use of those residues. So one part is the social part. The part of going, training and getting someone who really cares and really gets involved in the field of residues and their utilization. That has been one of the projects that Prof. Cardona has had in the coffee region. And the second one is on the field of… which I have seen more on the regional level. And it is a grouping of different types of company to make a more integral usage. But they are not big companies. They are small scale businesses. So, for that use of residues to be sustainable, some coffee farmers close to each other, start gathering and then there is a traceability with smaller group. They are not too big companies but at the end they have a goal of getting some utilization. For example from the trims or from the mucilage. In Antioquia they are doing that a lot.

**What other experiences have you had with projects related with bioenergy?**

With bioenergy? Aside from my thesis, my work with the national (university) has been on the generation of energy from residues. That has always been work on the group. I don’t know. But something like I had just told you? No.

**Now, what challenges and opportunities do you see around bioenergy projects?**

Well, for them to no remain at just that. For them to not remain just as PhD, Masters or other researches. For them to not remain just as research is a challenge. For example, I was very happy when I was able to take my expertise to the Ecopetrol company, because I think that one way or the other, I am contributing with something, a small sand grain, towards the energetic transformation of the country. Because it is a company that drives that sector, right? But when we do research, before working there, I didn’t have any practical experience. Here in Colombia it is not like in Europe where you connect with the companies to do internships or the researches are more practical. Here it is hard. So, I think that is a big challenge in this country. To put these researches into practice. For them to reach a sector where they can become something applied. And the second thing is, there are some researches that are very specific. For example, how to ferment cocoa. Cocoa fermenting techniques. Done. And they might work to make use of these residues, but they don’t complement each other. Meaning that it stopped at the research on the fermentation when we still have all of this other area. The residue in very general terms would be pretty much characterized, and so we would be able to also make use of it. Because we have made a fermentation process traceability. But then the research stops there and it is not taken to the next level, to be a more complete one. For it to not only be cocoa fermentation but to also… I understand that all researches are small but what happens there? Research groups don’t do a complete line. Let’s say one group is strong on fermentation so I’m going to look for another group strong on residues handling so that we can do alliances with universities or groups, strong ones, for us to then say “Done. You do the fermentation part and I do the residues part”. In Colombia you move through the sector and you realize one professor works on one thing and the other on something else but the tracks are very separated from one another. There is no cohesion. The Universities need to get united. Researches, companies. To be able to do broader research and that would also be a challenge for our country. For it to be able to bring different sectors and different researches so that it is possible to generate a more general result.

**To whom would you assign the reason for the disconnection between research, research groups and actors? I won’t name the actors yet.**

Why does it happen?

**Or what do you consider is the reason? Why?**

Well, look. Now that I was in Toulouse, checking out different international-level research you see that happening. It always happens. Even at the international level it happens, that you see strong groups but many other groups are missing. It always happens that research disconnects from certain aspects. But here in Colombia, what happens the most, let’s say, is that the Science and Technology Ministry, is worrying only now for the calls to involve the three entities, meaning companies, university and government. So, the calls, the last ones, started to pop up including the actors. This allows for the research to be more applied and, in addition, you can gain from the business side, from the governmental side and from the academic side. Therefore, let’s say, that one reason it hasn’t happened yet. But it is starting to improve.

**They are working on it. Ok. For the next part, I’m going to introduce this. As Diana mentioned at the beginning, Siban and Susan, two PhD candidates have a large project, the macro-project is called clean-shipping, on the use of residues for the production on biofuels. Siban is a chemical engineer, too, is the person in charge of all the technical aspects and Susan is an anthropologist and is in charge of the human aspects. She was not able to be here today. So this is a first map, where they call the project as Biohub, a win-win where the main local actors, that we will limit or we will call as agricultural producers. The coffee and cocoa producers, without forgetting that there are other crops that also have interesting residues. And refiners of these products, as such. The idea is for the residues produced from farming to be taken to a biorefinery where, by means of a thermochemical process, they are processed, sorry for the redundancy, and they generate 4 elements or 4 essential elements. Water, carbon, gas and crude. Where that thermochemical process requires of water, so the water is recycled in this process. The gas serves for energy. The carbon serves to improve soils and even in water treatment or energy. The gas is for energy and the crude, which is the main player in this project would go to another refinery where it would be transformed into biofuel, specifically in the case of this project, for the maritime sector.**

What type of fuel?

**(To Siban) What kind of biofuel?**

**(Siban) It is a biodiesel, which resembles a heavy fuel oil.**

**It is kind of a biodiesel.**

Ok. But… But what type of biofuel? What kind of fuel?

**(To Siban) Specifically.**

**(Siban) HFO. Heavy fuel oil.**

Oh, so heavy? Heavy fuel oil. But… Kerosene or what is the…

**(Siban) Actually the fraction is called heavy fuel oil. That is all it is called. It is HFO or merengue oil. That is… Yeah, this is like kerosene. So you have, in the distillation, in the top fraction you get kerosene, you have naphtha and then, in the bottom, you get HFO. It is a whole family of all the residual oil.**

Ok.

(**Siban) yeah, in the marine sector they just call it heavy fuel oil because anything that comes below this bottom fraction can be used in the marine sector. That’s predominantly biodiesel.**

Oh, ok. Thank you. Ready.

**Where was I?**

For the maritime industry.

**Ah, right. For the maritime industry.**

The thing is, why did I ask you that? Because Ecopetrol is interested in changing the type of fuel used in the maritime industry. So, let’s say they said “We no longer want this fuel because it contaminates too much”. It is the fuel oil number 6, for them, for their company. And so they said “No. We want research”, well, we were working on that topic, to see how we could modify that fuel because they won’t produce it anymore. They don’t want to produce it anymore. It is very, very polluting. That’s why I asked the question, on what is the fuel that you plan to generate for this industry, specifically.

**Ok. I got lost. Did you finish? Because, actually, we are going there. So, within this win-win, there is a promotion of regional development on the improvement of soils, on the, let’s say that one of the main issues in the sector are the intermediaries. So, there are still intermediaries but this project allows for the farmers to improve… Meaning that if they receive a better salary, the whole chain improves for them. And, well, understanding that the residues being used are the organic residues, without denying that urban residues could also be used, considering what you just said about how at home we don’t know how to separate the residues. And for this process very clean residues are required. With this being said, and considering you are very well connected to this track, there are three elements: challenges, benefits and harms. For the development of a project like this one. What would you consider them to be?**

Oh, wait. Benefits and what?

**Benefits, challenges and harms. Benefits, harms…**

Well, first, benefits. First the positive stuff.

**Of course.**

The benefits on the environmental aspect. We have to close cycles. That is a closed cycle, that allows to… of course, with the corresponding emissions but I see that the bio carbon and the gas being produced here go back into the chain, right? It makes it a cleaner process and environmentally, that is a benefit. Another benefit, well, for the local communities, with the use of residues for the production of bioenergy is something that for them would be very beneficial. It will improve a lot, their life, their impact regarding family, work… regarding different options, not being only on the beans and their commercialization, which as I mentioned, is too linked with the dollar. And if it goes down, well, they still have the residues, they have another way to make business, and it is not the same always. For them, that could be very beneficial. And for the production of biofuels in Colombia, it would be to diversify the use of the fossil fuels we have, which are very polluting. Of course, this considers less emissions and improving the overall environmental aspects of the country. And the energetic one. Anyway.

**Challenges?**

The challenges. We have been mentioning some. Firstly, with local communities, the cultural management, the management of the training they require because it is not a matter of telling them “do”. Look, the… the coffee farmers, the… The coffee company in Colombia, how is it called? The Colombian coffee federation. It has been years. It has been years covering the subject on how to handle the crops, on the seasons, the trimming, on everything they have to do with the crops and overall. And the training coverage they have provided is brutal. It is very strong, very extensive. I know people there and I know that they take to the plots all of the knowledge. I mean, a very, very good training. They take technicians, they take a lot of people with them and yet, here, let’s say, the subject of trimming, the overall handling, is not the adequate one. I would say that training is something fundamental for them. Fundamental. It is a big challenge. On the topic of the biofuel producers, we have already mentioned it, the government incentives are very important because this production is not a profitable production. It is very expensive, because of the pre-treatment these residues require. And well, the residue separation too, but mainly the pre-treatment. And this causes that without governmental incentives for it to be very unviable. And another challenge is on being able to close cycles. For it to really take advantage of that co-generated energy. For it to really be… this water treatment, for it to be small. For the design of this company as such, this transformation process, for it to really be an environmentally sustainable one. That really is a challenge. Technologies are still a challenge. Right? For it to really be closed or as closed as possible, and for it to really spend as little residues as possible. And to close this conversation, the challenge would also be to determine if the biofuel will really… will really generate the required energy for maritime movement. To have the required characteristics needed in the sector. There I am ignorant but to make sure that the fuel is the adequate one to reach that chain.

**And regarding harms?**

Regarding harms, well, we… whenever we create a biofuels project we thing it is the same as always. The same as always. We try to take advantage of the residues for the production of biofuels and either there are no sufficient amounts of residues, we can’t transport it, we don’t know how to handle it. This is the strain on the production, because of the transport, because of x, because of any. They remain as paper dreams.

**Ok. On that train of thought, from the university, would you be able to identify a role that you and the university could play in this new value chain?**

A role? As university, of course. As university we are taking advantage of… or well, researching on the production technologies, right? For biofuels. We are looking into the field of… I have a PhD student; I haven’t told you about it but… I ate it. Almost finishing the interview. But the PhD student is doing something very similar to what Siban is doing, in the Tolima region, but on the field of rice production residues. What relates to Tolima. For that, we did a tool. In the region, this amount is produced and it is good to produce this type of biofuel. Something like that. So, I think something like that would play an important role here. We know that this is a coffee and cocoa growing region, we are transforming our crops into that. Therefore, the type of biofuels that are being taken all the way to the maritime sector could be another one. It could be, for example, bioethanol or other type of biofuel that could be taken to other chain links. So, I think that also would be something good to look into from research. Your techniques, if you really can see here the production of other types of energy. We are also looking into that form here, what type of bio residue is capable of generating what type of biofuel. And the other thing, is everything around the CO2 chain, which I mentioned art the beginning. For us the CO2 chain is very important, at the biomass utilization level. And around biofuels. So, yeah, right now, with our research, we would be strong actors that work with the subject of life cycle.

**What benefits would it have for the university and for the region to participate in this value chain?**

What benefits? Well, for us, research. For us research and the connections. Right? Because there are many cute projects in Europe aiming to this. On the management of communities, social management. We have very little information on that in Colombia. Very little, at the social level. Regarding that management. So, for us, it would be beautiful to get involved in a project like this one. When we could… When we could fit on the management of the communities, on the social management, because we have many techniques. We know very technical stuff on the residues and, well, how to get there and making it true, no. We don’t know that. As chemical engineers we don’t know it. From anywhere in the world, with a very anthropological and social training.

**Actually, that is one of the… That is the next question and it is, what impedes the university from developing a project like this one.**

Yeah, that. I think it is that. I mean, there is no… Like I said before, there is no collaboration of different areas. For this you also need a person that knows of agricultural matters, right? An agro-industrial engineer or on the agricultural field. You need someone who manages communities, someone who handles the economic aspects. These macro-projects being carried out in Europe don’t… I mean, we don’t do them here as the interaction of different actors and professions and such. So I think that is very important.

**I will show you… We are at that… In this… At this point.**

Sorry, could we stop for a moment?

**END PART I**

**Done. So, here I have two grids where you can see the actors that Susan and Siban identified to interact in the coffee and cocoa sectors, where there is interest and power. They can have low power and low interest. Low interest and high interest. First question. Do you consider that in these grids there are missing actors? Who are missing and why?**

National government, regional, municipality, technology, refinery, Fedecafé \*reads in whisper\* coffee growers and Cenicafé. In the municipality, what does it include?

**Government.**

But only city hall or also…

**Yes, municipal government. Here it reads, national government, regional government and municipal government.**

The thing is, for example, I… I don’t know how they are called now; they changed their name. The UMATAs.

**The UMATAs? They still exist?**

These are included there?

**They are not there. They could… They are not there. This is interpreted only as government.**

Ok, that is something that could… Because they play an important role connecting this regional interest and the municipality to the municipal actors. I think they changed their name. Didn’t they change the name?

**Well, I understand they are still called UMATAs.**

Ok. And… Well, wait… \*re-reads grid\* Within the cooperatives, they also include associations and others that are not cooperatives? Because there are smaller coffee farmers. Are they included within these cooperatives?

**Yes.**

Yes? Ok. In the environmental aspect, what would be the actors that could regulate that aspect?

**That would be a good question. Do you consider these regulators are missing? For the environmental aspect?**

Yes. Let’s say that the national government generates a law. The regional government implements it in the region but who is the entity that could exhort control on the municipality, on the cocoa growers, on the cooperatives? At the environmental aspect.

**CARDER?**

Yeah, something like that. Like…

**Like the CARDER? It is north or south?**

That. I think it would be important to stablish something regarding the environmental aspect. Because, look, like I was telling you. This is not only about it having an impact. This will have an impact on the chain and it must be measurable. We must know how to measure it. To measure the environmental aspect. \*Re-reads the grid\*. No, I can’t think of anything else. It would be those. And over here… I think they are the same ones.

**Yes.**

\*Re-reads grid\* Well, and companies. You don’t care about companies such as chocolate production and such? For you to have residues from companies? Not that part? Only agro-industrial residues?

**Actually, as such it is about the sector. Not only the residue production but the coffee and cocoa sectors. And how does it look further away, from a broader lens. Meaning, “This is how the coffee sector moves”. Those are the actors…**

But then the companies are missing.

**They are missing… Why?**

The coffee producing companies… I don’t know. A Juan Valdés, for example.

**(Siban) But what kind of residues do they produce?**

**Maybe the coffee grounds?**

**(Siban) Yes. Coffee grounds. True. But the amount of volume is so less, compared to that and compared to other residues that are on the fields. Coffee grounds is less in Colombia. I mean, that’s a good thing. Producer of coffee and producer of chocolate is not being included because we thought the residues generated from them would be way less, compared to others generated in the field. Because cocoa powder is… Yeah, that’s a lot of unintelligible but also the pulps is really unintelligible, in terms of coffee. But spent coffee grounds is less. But do you really think those actors could be really good sources of feedstock in terms of residues?**

I mean, the raw materials that could be used for this type… But he says that the companies produce too little.

**Yes. That it would be too little.**

But companies don’t produce too little but instead, they also use those residues within the company. For example, the coffee grounds. It is used for energy generation for the companies. When I was doing research on the coffee grounds, they use the coffee grounds to co-generate (energy).

**(Siban) Yeah, actually that is interesting because for Hexstill, for the technology which we are considering, this is really good. Because it is rich in organics, rich in humidity. This is one of the best feedstocks. But we were wondering how much availability would be there. Because these are distributed, right? So, collection… It is not that at one place you generate a lot of tons or something. This is super spread in big cities. In one city there could be a hundred different coffee.**

**(Interviewer to Alexandra) He sees logistic difficulties on the amounts that could be produced. It is really good as raw material but…**

It has a very good calorific power, the coffee grounds.

**(Siban) Yes, that’s true it has a lot of calorific content but the logistics or the very efforts to make the logistics it takes to collect versus the quantity which you will collect... Yeah, it is not the tradeoff will not be balancing. Even if it is a very good feed with high energy content, it will still fail because you are doing a lot of… Spending a lot of energy for transportation. It will not unintelligible. So, that a bit unintelligible.** **This could be an interesting feedstock in Brazil. Because in Brazil, companies produce… big, big companies produce the coffee brew and then sell the coffee brew. As pre-drying or freeze drying. So that could be one particular location to get this feedstock. But here, getting it all from… It could be possible but we have to thing on how much they use, how much… This is more like an… unintelligible. So… yeah, what is your opinion on that? Is it worth looking? Compared to these things. The quantity, the logistics. You think it is interesting? Does it make sense? Because the idea of this project is… Is not only an academic exercise. We don’t want to just perform, you know? All the techno-economic analysis unintelligible. Is not just a document. We want to make something out of it, like a roadmap or something. So that it could be realized somewhere. Here or in Spain. It could be realized. It could be taken to the next level. So if it is not realistic this would be just an academic exercise and we don’t want that. That’s the purpose why we actually didn’t focus on spent coffee grounds. So do you really think that it would make sense to include this thing?**

No. No, no, no. I think what you say is true. The coffee grounds in Colombia are…

**Is too little.**

It is not that it is too little but the use it is being given for the production… For the same co-generation for the plants… So they don’t realize that it has a calorific power like the one from carbon, I think. That is what we were told when we went to ask about the coffee grounds. They told us “No, it burns better”. So we are using it to co-generate energy in our plant. What we have is too little. It is exactly what we need. We don’t have coffee ground residues. So, what you tell me is true. And they are not interested because they are already giving it some value within the company. That is sufficient to not use it. So it wouldn’t be too adequate. Additionally, there are not too many companies that produce too large amounts of coffee grounds. And at the municipal level we don’t have any culture… I mean, we drink a lot of coffee but all of the coffee shops there are… There is not a culture to collect those coffee grounds. It is simple discarded through warter an that’s it. And yeah, we are a coffee growing coffee country and we drink a lot of coffee, so it is strange that we don’t have that consciousness for the use of that residue.

**Ok. Then, to continue, what actors would be missing here? You might consider are missing there.**

No, well… I thought of the companies because the companies also have other types of residues. There are companies that might have these peels… the coffee threshing.

**The “cisco”.**

The “cisco”. Maybe… Sometimes companies might have not only residues… Maybe not providers of raw materials, of residues but they could be an actor in the chain.

**Ok. Now, regarding the positions versus power and interest. The positions that the actors have here, do you consider they are ok or would you move, considering the actual context, them? And if you were to move them, where would you put them and why?**

Well, the national government has power but it also has interest so we could move it. I don’t know if for this type of bioenergy, because right now is the hydrogen, right? So we are in trans-generated hydrogen and zero emissions trends. But well, this energetic transition subject is still of high interest for the government. We could move it to the side. Let me see. The academy has high interest and low power. Well, Cenicafé is a strong company. I think I would put with power towards the middle. Did you already have an interview with Cenicafé?

**Not yet.**

But are you going to go?

**We don’t have an interview yet. We should have gone today but they did not respond to the…**

Do you have any contact? I have a friend working in Cenicafé.

A close friend. In case…

**(Siban) She has a friend or something?**

**Yeah, working there.**

In research.

**In research.**

**(Siban) In research? Ok. Perfect, if you can. Thank you.**

If you need, I can talk with her. Because it is very… Don’t leave without talking with Cenicafé.

**(To Siban) We have to. Have to. Emphasis.**

I don’t think cooperatives have that much power. I would say. It is lower. And coffee growers… The coffee growers I would put them over here. With a medium power and a medium interest. They are not that interested about changing their practices. They have a medium interest. You have to incentivize them to get them more towards here. And well, on this side, let’s see. Oh, I don’t know what power these companies could have. Have you already had interviews over here?

**With Cenicacao? Yes, and also with some cocoa growers.**

I don’t know if their power might be medium. And maritime industry… I would move them this one a little. Towards more interest. They might not have a fuel anymore, and they might be more interested in diversifying the fuel they use. Yes. I see it. That would be it.

**Now, from these actors, with whom, from your position at the university, have you had relationships and how have these relationships been?**

Well, on the transport sector, I haven’t. None. And although we have had some approaching, we haven’t done any sort of stable relationship, yet. I have with the coffee farmers. Also with Cenicafé. We have worked on some projects with them. Fedecafé. Cooperatives, too. Regional governments. Like I mentioned, we had a large project here. I even think that Posada also worked there. That’s it. No more. And with refineries… Last semester we were working on a project but we weren’t able to work with them because it didn’t work out.

**When you say refineries, biorefineries…**

We are talking about… This sugar one…

**The “ingenio”.**

Yes, with the “ingenio”

**Oh, with the “ingenio”. Or refinery…**

**Ok. (To Siban) Specific questions?**

**(Siban) Yeah, a lot. First of all, like he introduced, I’m a chemical engineer. I’m interested in the technical challenges in this process. So my focus is, first starts with the conceptual process design. Like you mentioned, the simulation, aspect simulation, modeling, technical-economic analysis and then going… developing the whole value chain. Arranging the logistics, infrastructure for storage, etc. And then perform environmental life cycle analysis for that and then socioeconomical analysis and the, finally, multicriteria analysis. This is part of the project.**

Only, only…

**(Siban) Yeah, yeah. Only. And then I collaborate with my colleague, Susan, who is not here, unfortunately. She looks at the social aspect. So she brings in all the values. Based on that I design this value chain. So this is my role in this project. In this project, we want to have this Biohub concept, where it is a win-win collaboration for everybody, right? So for this, we identify different stake holder and yeah, so far this is the 4th week here in Colombia, at least in the coffee area. Coffee access. And we are able to identify many stake holders like farmers, institutions, government institutions, especially academia, actually, but I was not able to identify any technology companies or… you know? Because I was told that they don’t exist. Because the biorefineries… Any biodiesel projects are only related to two things. One is sugar cane-based bioethanol or palm-based biodiesel. Which is pretty much in the north of the country, right? But I also looked into all that. Since you can already see that our focus right now is based on biofuels for maritime. To your question… So we are aiming for heavy fuel oil, for residual oil, like very low sulfur content oil. That’s the thing. Colombia has two coasts. Pacific coast and Caribbean coast. Because of our location in Pereida or the coffee access, Buenaventura is the obvious choice. Because first we want to make this, to produce and consume in Colombia. Because our target is for everybody, not just for one country. It is for the whole country. It is a global sector. So, this is the outlet. That’s why we chose Colombia as one of the… Because it is rich on… You know? It's a perfect place to grow all of the agriculture, because agriculture is really strong here, right? And we want to make this offer. That’s one. Number two, it is a very good strategic connection because after consumption in Colombia there is the Panama Canal. Panama Canal is one of the biggest ports which handles lots of ships. That makes a strategic location or strategic advantage for Colombia to be involved.**

**And also there are some policies… There were some policies when I researched that, which promote biofuels mandates. That’s why Colombia won in many other aspects. We compared different countries. Brazil, Ghana, Vietnam… The whole world. We started looking into the whole world and then we shortlisted these three. Ok? This was the set-up.**

**Now, the problem I’m facing right now is… We have enough farmers. We have found associations, cooperatives, farmers, everything. Everybody. But then, to make this thing feasible, I also need to identify stake holders from this side. Who can actually… who are actually needed to actually realize this project.**

**So I was just wondering. You said you have a project or you are doing… you have connection with Ecopetrol and they have an interesting in this kind of things. Do you think you can connect us with a person for an interview or something? Or are they really closed?**

Maybe, yes. Yes, of course. Yes, yes. I can try to speak with my advisor, I don’t know.

**Ok. Because your project, if I understood correctly, you said your PhD project was connected with…**

No, I finished my PhD but I have… Actually, I was working in a project that use the CO2. Carbon Capture and Storage.

**(Siban) Yes, CCS.**

And hydrogen suppression…

**(Siban) yeah, yeah.**

And I might talk with her or…

**(Siban) So, if I understood you correctly, Ecopetrol is actually interested in higher…**

Yeah, yeah.

**(Siban) No, not just this one. They are actually looking at CCS and hydrogen. They are looking for those alternatives. Wow. Ok. Those are pretty unintelligible. I mean, like, it is not fully common to see CCS and hydrogen. Ok. Wow.**

We are not commercializing it. Just studying it.

**They are not commercializing it, just…**

**(Siban) Just studying.**

No, actually no. Only research about it. Supply chain and how, maybe, Ecopetrol can… could. How do you say “podría”?

**Could be.**

Could be…

**Changed the fossil fuel to biofuels?**

Yes.

**(Siban) Nice. So, if it is not too much, could you connect us… Is it possible for more people to…**

Yes, of course. I write and after…

**(Siban) Ok. That’s nice.**

**We can exchange contacts for…**

**(Siban) Ok, perfect. Nice. I also recently found out that there is a federation for biocombustibles…**

Oh, yeah… No… I don’t know about the federation? I will ask if someone I know is still working there.

**Ok. From the federation? Cenicafé or…?**

No…

**(Siban) A federation for biofuels. They have a lot of actors so…**

No, but… They have sort of a main office for the fuels’ federation.

**Ok. (To Siban) There is a main office for Fedecombustibles.**

**(Siban) Ok.**

I will try to contact a friend. I have many friends, as you might realize.

**(To Siban) She will look for a contact of a friend.**

What’s his name? Eniso… Eniso… Well, that will require to move social media.

(To someone else) Maybe you have Eniso’s contact? Do you know if he got into Fedecombustibles still? Or if he… He had contacts there, people he knew and if you could tell me about that.

(Back to interviewers) It is now in a message.

**(Siban) Ok. My first question actually. These were just other question. First question is… Because you know, you are working in this aspect, appreciate this aspect… Is this project feasible here?**

That is a very hard question.

**(Siban) I know. I always ask the tough questions, I know.**

But I think so, yes. But my question would be for you. How do you think you could connect all of these actors in the chain, in Colombia?

**(To Siban) How do you connect all the actor for a new value chain?**

**(Siban) I should connect it… Ok. This does not exist.**

**Biorefineries don’t exist.**

**(Siban) this does not exist, right?**

**Either.**

**(Siban) I have no idea about these two because we didn’t have interviews with them so I cannot comment on them. This one, right now, it’s been arranged by their own company. So, let’s say, yeah, for example, Ingini, own their own fleet. So there is no separate organization but there is concept of this existing. This one does not exist but when we spoke with them… Who was that? We spoke with transport company actually. They were interested. It is not existing but they are interesting to do this kind of project.**

**(To Siban) Interamericana?**

**(Siban) Eh… Intersania?**

**(To Siban*) Interamericana de transportes.***

**(Siban) Yeah. They were located in Pereida, actually.**

Sort of biomass collectors?

**We went to an interview with *Interamericana de transporte*, which is logistics company for transportation and they said that if it was the case, it would not be difficult to implement it. It would be possible for them to implement this project. We would have to check routes and well, we would have to prepare the logistics.**

**(Siban) I see a lot of opportunities. We didn’t have interviews with the national government as well but here they were very interested. The thing is, how do I connect? People are interested. There are ideas. I spoke with a lot of academia people who want to utilize this but in real life, there is not such value chain existing. And that is my question. I want to identify why that is. I don’t know. I can’t pull a certain pin on it. I have my options like, is it investment? Or is it capacity? Yeah, we also identified capacity building. That is needed. You have to build individual capacity. That is one reason we identified so far. Another reason is, everyone has their own model of approaching, their own vision of sustainability, of business model. Everybody is looking into different directions. So first, we have to pull them together, for a common vision, right? But these are more theoretical or… But really to make it to the next step there could be either various reason. It could be investment, it could be power, it could be politics, it could be lack of policies… It could be anything, but I don’t know what. I want to know what are the challenges. You know? If we don’t identify challenges, we cannot address how to solve them. That is why ask this question. I ask other people as well.**

I think the project is doable if you can make a complete interconnection of all the chain. That is the answer. That is why I asked you. Because, for me, the project, the projects, would be really feasible in Colombia if all the actors were to be interested.

**(Siban) So, because of different interests… I didn’t get it.**

**(To Siban) Just if all actors just connected the ideas and wills.**

**(Siban) Ok, ok. Ok. That is actually a really good one. Thank you for that. Ok. Also, respect to technology, you said you were a chemical engineer, right? So, actually, the idea is that is a big strength to this project and that is that we produce biocrude. It is not bioethanol. It is not biodiesel. It’s a crude. Which means that from a crude, you can produce anything. So we could easily connect with existing petroleum… petrochemical refinery. Let’s say, for example, I don’t know, Ecopetrol might have a refinery existing out there in a port near Buenaventura. We can just export this crude then they can upgrade it to anything they want. That is the flexibility. My question here is, would it be easy to attract… would they be interested in this kind of project? I know you say Ecopetrol is looking for such value chain or supply chain but would they be… how to say? Willing to chat and talk their opinions? Because something that I’ve learned here is that organizations are not really open about sharing information freely.**

No, it is…

**(Siban) I don’t know**

But what is the question itself?

**How could we attract and reach this type of organization to develop a project like this one? Because, for example, what happens with the cane… The “ingenios” is that they are very closed and they don’t… Information doesn’t get in. So they might have interest but it is not known if they are willing to collaborate or, well, if they are interested, to begin with. What to do to link.**

**(Siban) Ok, you cannot answer that type of question.**

No. I think that… The thing is… It is complicated. I think that the company has… When you are there, in Ecopetrol, the company has different, sort of, vice presidencies. Each vice presidency has an action plan. As if it was a university where each faculty has its action plan and every action plan seeks towards each’s need. So Pereia has one, Cartagena has another one, and such. So, I see that it is… For the company in general to be interested it would require to reach the vice presidencies. For example, Barranca is the one that exports the fuel oil number 6 for the maritime sector. If they are the ones exporting that, then they might be interested in checking this. But then Cartagena doesn’t because Cartagena is not interested in reaching that level, as to look into this type of fuels. One option could be reaching vice presidencies. For you to, before developing their action plans, creating a link with them and their action plan. So that they can get interested in looking into that type of fuels. And the other option would be to reach all the way to the top head, right? So, to the presidency of the company itself. So that from the presidency they see the potential in the change from the maritime fuel they use to change it for this type of biofuels. So I think these would be the strategies I could tell you, by knowing how things work in there. Now, if it is only a research because it is not ready yet to go for it, because you know research has different stages, then let’s say the stage is not there at letting it run. It is only research. Then it would be good to show it to the ICP, which is the Colombian Petroleum Institute, which is the one that handles all the research. Also to the vice presidency that is managing all the field of maritime fuels. To reach the groups that manages that. If it is research and you want to present research progress to get them interested. But if it is already running, then you would have to reach the action plans of those vice presidencies. More or less.

**(Siban) That’s fine because my next question is going to be more difficult. Now you know the project, you know the context, you know the stakeholders, you know the context of Colombia. What do you think should be the next step or the first step towards realizing this ideology. That’s one. The second one is, what is the biggest challenge? Practical challenge.**

**Now you know the environment. You have knowledge on the subject, you know the Colombian culture, you know the Colombian environment, well, a good part of it. What would be the first step to develop a project like this one.**

And what would be the challenges…

**And what would be the challenges?**

But I already sort of answered you.

**(To Siban) She already sort of answered you.**

**(Siban) No. That’s a normal challenge. Practical challenge. Those are two different things. Yeah. Those are two different things.**

**More regarding technical aspects.**

More about technical aspects? Well, this guy wants to… I’m not the one defending a PhD.

**(To Siban) It is not my defense, is it?**

Let’s see. From the practical aspects it would be… The challenges would be to show your research. I think that once you are done or when you reach a result from your research, for you to have an adequate space with the actors that you were able to connect with, from the ones that you have been relating with, and be able to present those results to make it more evident and to make its practicality clear. For it to take the next step towards what you want. Towards that practicality. And on the technical aspect, I think that the localization, very expert talks from their field of expertise, for me the location of these biorefineries in front of the plots and the point where you want to commercialize that fuel, is essential. It will give you the adequate logistics to make you project viable, more viable. I think location plays an important role. The macro localization, at the Colombia level, but also at the micro level. The matter on you using intermediary points for the storage of that biomass that arrives to the biorefinery, it should all be strategically localized.

**(Siban) Ok, ok. I think I understood. My next question is, I don’t know if you will have an answer for it but I’m just asking. How do you… Ok. Let’s say, for example, would it really be useful if we have local people, because the idea is to have local people, local universities and things, is it… would it be better or would it be more effective if the idea was coming from institutions like us, which is a foreign country. How would it… how would the idea be seen? Which would have more effect? Things pushed by local universities or if it comes from the outside universities?**

**(To Alexandra) Do you consider that the project, for the people, for the producers, it would be better perceived if it came from national institutions such as universities, etc. or from them? From foreigners? For example, the TU Delft university.**

**(Siban) One second, all my questions, just to be clear, all my questions are voluntary stuff. You can choose not to answer. That is really important. You can choose not to answer. Just letting you know.**

No, don’t worry. I think that… The thing is that in Colombia we are into exporting… Into importing technology, importing… It is very funny. Colombia has really good brains, such as your professor, and like many people I know, but we really like to import. So if big project comes and tells us “Hi, we come from the Delft University and we come with the United Nations, with the UN, and I don’t know with who else” then we say “Oh, look, so cool”. Then we pay attention. “Oh, we come from the Caldas university with a very nice project and blah, blah, blah”, “Hmm, sure”. I think that we are a lot about letting ourselves get impressed, that’s the word, by everything related to foreigners. So I think that, possibly, possibly, I don’t know to what extent, you might have more options when you are outside that you won’t have when you are right here. To impact with this type of projects. It is… I think that would be my opinion but that is very personal.

**(Siban) Ok, ok. I understood. Next question is, the technology we are looking is, yeah, like Daniel mentioned, is a thermochemical process. It is a hydrothermal liquefaction. That is the process. It is called wet hydrolysis. Do you know any research group, here in Colombia, who works on such technology?**

**The technology being used here is called hydrothermal liquefaction, which is like a wet pyrolysis. Are there research group that work on that field or something related?**

No. Not that I know. Not that I know.

**(Siban) My second question is…**

Make it the last one.

**(Siban) Yeah, yeah. It is always like that. I’m always like that. Because the thing is, this concept of Biohub is not dependent on the choice of technology or the product. This can change. This can be a biochemical process. I can produce other high-value products. I don’t know, cosmetics, pharmaceuticals. It could be anything. Biopolymers. It could be a lot of different things. This is not fixed. This can be changed as well. Here is my question. In general, in Colombia, which has more attention? Is it more chemical? Is it biotechnology or is it more chemical?**

No. I think that… There are two perspectives. If you see it from the academic side, it would be more about biochemical. Biotechnological. But if you see it from the industrial side, we are still very attached to the chemical field. From the entrepreneurship side in Colombia, the chemical field is still very strong. These would be the two.

**(Siban) Ok. So which… So, the more I understand which means the percent, like eco petrol, eco diesel, should make one change. That should be the first one. Would be changing from petro... petro… I mean, chemical to biobased stuff. So in that sense, it would really, really helpful if you can, yeah, find a contact with somebody in Ecopetrol. Yeah, someone who can share with us the information. It would be really useful for this project. Yeah, so… yeah. Those were my questions.**

Thank you.

**(Siban) Do you have any question for me or interest for the project or anything. I don’t know.**

No.

**(Siban) No? Ok. Then, do you see any… Do you see any point of collaboration? Do you see any room for collaboration?**

Well, if I have any…

**Do you see any point for collaboration?**

Some point to collaborate in? Yes.

**(Siban) I’m interested.**

Yeah, well, firstly, the interviews, right? First the interview with you, with Ecopetrol or Fedecombustible or other actors that could be useful for you.

**But in the project, itself.**

But in the project, itself, it would be… I work on the field of chains, chain optimization, right? The locations field. If you get to need that, well, that field, I could. Or I don’t know how we could arrange it. If only with software or I don’t know, how will you be doing it. Optimization, simulation.

**(Siban) Ok, that would be interesting.**

And also, well, like I mentioned, I have a PhD student that could… Who is doing something similar but with…

**Rice.**

With the Tolima department. That is another department. They have… It is a rice growing region so they have a big amount of rice residues. He is doing simulations for the utilization of those residues. He is doing a chain model to evaluate the viability of that chain, itself. But he is not doing it with all of the actors, such as here, but with mathematical models. Optimization and mathematical models. So if you are interested, he could also show you his thesis, his research work, and you could take elements that are useful for you.

**(Siban) That would be interesting. Yeah. Sure.**

This is the last part. Coffee grounds, peels, the trims, pulp, shells and “cisco”. Biorefineries, and finally what they seek, which you already know on the topic way more than other so I won’t have to explain much. The crude, which is what is being pursuit at the end. The carbon, which we had already seen here, and gas, water… Gas and water are re-used. Finally, the idea, as I said, the main protagonist is the biocrude, which the particular interest in the maritime industry but as we said, it could be used basically in whatever you want. The crude itself, which would be biocrude.

I think that this is a beautiful and complete research. I hope that you are able to achieve it. To finish it on time because the issue with PhD’s is time, right?

**(Siban) I’m already at the last one.**

**(To Siban) The PhD most important factor is time.**

**(Siban) I know. I know. Yeah… I know. It is a… It is a, yeah. It is a nightmare. It still two and a half years but let’s see. It is short. We’ll get there. Yeah. Those are the questions. The workshop?**

**Ok, to finalize, on the 28th of July, there will be a workshop where, all the people with whom we have interacted with interviews, we want them to participate. This is an invitation for you to take part in it. In that workshop these actors will start to interact, somehow.**

Exactly.

**Some. Some of them, will interact. They will present some results. They will also present the project, not so generally, like right now but, in more detail. Therefore, participating is important.**

Ok.

**(Siban) Actually, the thing you mentioned, that is also the idea of the workshop. So, we identified that. We identified at least one member from all the stakeholders. Now we want to bring them together, in the same room, pitch this… Yes, pitch this and then discuss what should be done to do this. And what are the challenges so everybody knows of each of these aspects. Let’s say, for example, I don’t know, if Ecopetrol is coming they can understand what is the problem of coffee farmers, what is the problem of governments. The government can understand what is the issue of academia or what is the… So, you know? It is a knowledge exchange and transfer. So we identify the points which we can work. So that is the purpose of the workshop. We think that would be a first step. After the workshop, we can create a platform of something that can take it further. So, yeah, that’s the thing.**

**(To Alexandra) Either way, we will send the information. A flyer is being made; it will be shared with you. I think Dianita is… If you want too exchange contacts.**

I had sent it via email. I had sent you an email.

**(To Siban) An email.**

**(Siban) Yeah. Yeah, yeah.**

**He will share his… you can share your…**