**R13 - interview CENICAFE - 4-8-2022**

*CENICAFE is the research organization of FEDECAFE. It was difficult to schedule a meeting with them, they did not reply, asked a of information from us, CV, information about the project. They had to ask permission from their headquarters. In the end, it was possible to schedule a meeting, once we returned to the Netherlands. This interview is conducted online after we returned from the field.*

Position: Director of scientific and technological research Cenicafe

**Could you please start with an introduction?**

I have been working here at the direction of CENICAFE for almost 6 years now, and I have to tell you that almost every month I have visitors that are interested in coffee residues. It is easy to understand. We have about 800.000 hectares of coffee in Colombia, basically for every kilo of coffee we produce, we generate 4 kilos of residues. So the volumes that we are talking about are huge. So I have people here from Ecopetrol, which is the main company that produces oil in Colombia. But also from many other places because that mass looks very interesting for many people. And recently I have asked the person working in coffee residues about the different options that you have to use residues. For us, it is not a problem for the farmer, because we can take that mass of residues and do a transformation in the farm to produce for example fertilizers for small coffee plants right. But when you look at the list, you can find that you can make food, fibres, of course some sort of ethanol or any other different sources of energy.

But all the time when the companies come here and you look at the details, as I hope you did Siva, is that we have this production distributed in the whole country. So if you have a map of Colombia, you can see that we have coffee at the Caribbean sea, and then you go down to Ecuador which is our neighbour in the South and you see that we have coffee at the three mountain ranges that we have here in Colombia. So we have 800.000 hectares, but they ate hugely distributed in the country. And usually, the farms are not really close to a main road or a main town, sometimes you need a lot of time to reach the farms. That is how people like to cultivate coffee, because when you harvest coffee at your farm, you keep the coffee there and you can wait one week, two weeks, three weeks for the opportunity to go to the town to sell your coffee. It is not like cultivation of oranges or avocado that when you harvest it, you need to sell it as fast as you can. So, that is one thing. The second point is, coffee cultivation in Colombia is very different from other countries because Colombia is a rainy country. It is not only because we have La Nina at this point, a climate event that is raising the temperature and increases the rainy season, but normally it rains all the time. What it means to the plants is that in Mexico or Brazil, the coffee harvest is really concentrated in one month or six weeks, something like that. When you come to Colombia, you can find coffee the whole year round. In some parts in the North of Colombia, the harvest is more concentrated, but here in the coffee region, you can harvest coffee whole year round. We have an expert in Sierra Nevada close to the Caribbean sea. And you harvest all the coffee in 2 weeks, but when you go down you can harvest whole year round. And when you check the numbers of how many coffee we export, it is basically one million bags, which is really good for people who like fresh coffee, because Colombia is producing fresh coffee the whole year through. That doesn’t happen in Mexico, costa Rica, Brazil, because of the climate.

So what it means if you have a project around residues, you should know that 95% of the coffee farmers in Colombia have about 1 hectare in coffee each. One and a half. So you are not able to produce a lot of residues, you produce just a little at each farm. And when you distribute that through the year, you just produce a little in January, in February another little bit. So that makes it complicated when you are thinking about using residues. It is complicated to imagine how are you going to move those residues from the farm, in a place that is really far from the town, and you will mostly carry water, into a biorefinery. Second, you need to knock on the door of every little farmer to collect residue every week. You have no way of keeping that at the farm, because once you have harvested it from the tree, there is a process that it starts to degrade very quickly. The charge of microorganisms in a ripe fruit is huge, and at these tropical temperatures. It will degrade very quickly. What I see here in Colombia is that it is very difficult to collect that mass and provide it in a very continuous way, in a way that it can work in producing something. So that is the main problem that we have here when we think about having a higher value for coffee residues.

That is the story that I tell everybody, because I hear people asking me, they want to use enzymes, they want to use things from coffee residues, but when you think about how it is going to work, the day to day supply of the residues, then you start to find these problems.

For example for ethanol, you spend more gas to collect the residues than the ethanol that you produce with these. So the math doesn’t work in that case. So I keep telling this all the time. Because people think that we have large plantations, like in palm trees, there it is large plantations with just 1 owner, but here it is different. It is not to disappoint you, but you need to land into the reality that we have here. It doesn’t mean that it wouldn’t work, but you need to take this into account. It could mean that you will have a biorefinery, not only on coffee residues but also other crops, like for example plantains and other crops that you can probably use for that. You need to open you view, that the biorefinery must handle also other sources of residues in order to keep running.

There is something that we have here in Colombia that we call Centrales de beneficio, central locations where the processes happen instead of the farmer does this process, they bring the cherry to the central location to do the process in a central way. That is one thing that you can say that is wonderful because farmers bring the fruits, I can remove the grains from the pods, and I can produce the grains on the one side and the pods on the other side. But again, we have a problem with these central locations is that they work really well in some parts of the year, in the weeks where the harvest is big during the year. But in some months of the year, and sometimes very little or nothing. I know some places where they have to literary close and seal it because there is no coffee coming in. So for me the problem is not the chemical part, it is the logistics and the mechanics of how to handle and make that work. That would be my point. I don’t know if you have any questions now, but I hope I was clear on that part.

**S: Yes, actually you have already told a lot of things, some of the things I realized when I was in the field, the coffee is really distributed and scattered so logistics is going to be the biggest challenge. And the harvest is spread over the year, not 1 specific season or month. I was thinking about this centralized facility where farmers can bring, but then we also visited a lot of farms, we saw that many farmers not only have coffee, but also cocoa, plantains, sugarcane or even some maize. So then we really thought, we have to change the approach, if we can combine it with other residues than the logistics can be viable because you handle a bigger volume. But you already addressed a lot of key challenges. Now that you say that almost every month is coming that is interested in doing a project with biomass. You are telling everyone the challenges and reality. That is something we wanted to learn and why we did the field visit. We saw the challenges, but we also saw some opportunities. Because of these associations who organize the smallholders, maybe that is a way to organize these people and help scheduling this biomass collection and combine it with other residues as well. That is something we though as well.**

Siva, can I add something. Because one of the things here is, what can we do from the side of research in order to allow the farmers to collect the residues of coffee and do some little processing in the farm to stop the degradation or reduce the amount of water that they add and have the opportunity to handle that the same way as they do the processing. So I collect my coffee and residues and maybe I can wait a week or 2 to transport everything in a jeep to bring it to the town. That is something that we could do, to allow them to bring it. Some process, nothing complicated, that you can perform there and use much less water and without degradation, and bring it into town. That is another thing that one can think about.

**S: That is true, that brings be to another question. It is clear that you have a lot of experience with these kind of things. So what are the projects that Cenicafe is having or did already and what were the key learnings. You shared already the key learnings, but what are the key areas focusing on valorizing the residues. Because in most of the interviews during the 6 weeks, I asked that residues are not utilized or valorized on anything. But I am pretty sure that CENICAFE as a leading research institute in the country is looking into that. So what kind of projects are running?**

I have to tell you something. For years we are looking at what kind of products you can get out of residues, and it is because of this, Cenicafe is financed by the farmers. So the farmers all the time keep asking us, what can I do with the residues to get some value out of that. And what we have seen is that you can do many different things. And I don’t have the list here, but you go from biofuels to fibers, to chemical compounds, enzymes. You can find a large list of that. But I have to tell you, today, we are not working on anything like that. The first thing is, anything that I told you already. The second thing is, the residues are not a problem for the farmer, right. What you can do is let the pulp to re-use as fertilizer and that would be it. It is not that the farmer is really looking at it as a problem and finding ways what to do with that. It is not a big deal.

We have been working a lot with the reduction of contamination by the coffee production. So today, we have something that we call zero contamination. You are keeping the volume of water that you use in the coffee process to very small. So we went from 40 liters per kilo of coffee to just half a liter of water per kilo. And when you reduce that amount of water, it is very easy to handle that, you don’t even have to treat that water with very complex systems. We designed something that we call green filters, and with those green filters, what we do is, you use plants, other plants that take that water that is ‘contaminated’ with coffee and they just evaporate the water. And you don’t need to treat the water, you don’t have to throw the water in the creek or something, or contaminate the soil, which in Colombia is complicated. We have been focusing on this zero contamination coffee production. But today we are not really investing in research on increasing the value of coffee residues, because of what I already told you. So, we saw that there are many options on how to increase the value of those residues, but the question is, how to make that work.

**S: Yes, you mention a lot of things about environmental foodprint and sustainability, you mention a lot of those things. That is also the goal of our study, I really appreciate that. In this case I was wondering, you said that no major projects have been done in that sense. Maybe one of the first steps is a pilot level plant in one region or department and make that as a proof of concept for other regions where it could be replicated. Do you think that is something, what is the major hindrance of developing such an ideology. Because what I see from a research point of view, we don’t lack ideas to valorize residues. But we do face some problems. What do you think are the major problems?**

For me the way to start is in one of these centrales the beneficio, centralized facility. And actually we have suggested that many times. Why don’t we start with a small pilot project, close to the same region where you have central facility, to have a little biorefinery next to that. The thing with that, and I, we haven’t carried out any of these pilot projects and I haven’t seen that either, you need to start with a certain amount of money to make that work in the beginning. And then from then on you see if economically and logistically it is going to work. To try to find one of those central facilities where coffee production is very regular throughout the year. The reason why we have this distribution is, we have a rain front that starts in the north of the country and moves down, in those 2 areas on top and down, you have the harvest concentrated in the first semester or the second semester. But here in the middle, we have no rainy seasons, and that is why you find in these areas in the middle of the country this continuous production throughout the year. You need to find a central facilities in one of these areas to actually give it a chance to process something. And the scale need to be smallscale, because the whole harvest is divived in a lot of small parts. For example, there are some association that are really interested to try new things. For example, near to Pereira there is Belen de Umbria. We actually designed for them the facility, which is really nice, it takes the water used in there, they have a lot of things. And they have been interested all the time in, what can we do. They are really open to see what they can do. So that would be a nice place to start and see if you can do something. They have a good space, good roads to reach the place, they have a good supply of coffee. I don’t know the distribution throughout the year, but at least if you sit with those guys, those are the guys that you think, we can try. Those are the places where you have to start, because probably if you go to other places, they won’t be interested, I know some of these places where people started to bring their coffee there and then after a few years, they say, I am not going to bring my coffee here. So, the supply of coffee goes down and they have trouble. So that would be one of the places that could be a good point to start with.

**S: Interesting, yes we are also focusing on these 3 regions, Caldas, Risaralda and Quindio, because they have one of the highest density of production.**

Siva, not only that, also this region has one of the good infrastructure in roads and other things that can be important. I have been in places where just trying to reach a farm is just crazy, so trying to do something else in there is going to be very hard. So those three regions are very good for that.

**S: I agree with that, I have been to farms where they said it would be very close but it took 1 and a half hours by jeep and walking, but distance is relative then. But I was just curious, we talked to a person from the Federation in Pereira, he told that there was once a plant established by the Federation to produce ethanol, but is was closed or something. He told briefly about that, a project has been initiated, but he did not have enough information to back it up what happened with that project?**

I really don’t remember that we actually set up something focused on that. We did a lot of research in the production of biogas. We have a huge facility here at Cenicafe, but right now, everything is closed, it was kind of complicated. But we learned a lot about how to make it work and everything. But again, with this working continuously throughout the year, it was impossible.

**S: And just to understand a bit better, the technologies you focused on was primarily biochemical, right? Like enzymatic fermentation technology, something like that.**

Talking about what, Siva?

**S: for the residues, the process you were focusing on primarily to valorize residues using biochemical pathways.**

Well, I would say yes, for the production of biofuel and biogas, yes certainly, some sort of fermentation processes or something like that.

**S: Interesting actually, that is clear. Ok, we learned a lot. So now I want to show you something, which is the concept we are working with in the project, I will show it. Biohub. (Diana explains the project and biohub concept).**

Can I ask you a question, what specific characteristic do the biofuels for the maritime sector have?

**S: for maritime, there is not really a quality range like road fuels or aviation. Maritime can actually absorb any quality. It will be a biodiesel.**

**D: that is one of the reasons to focus on that sector, because it doesn’t have to have that high quality, and you can mix different residues. And that is beneficial in Colombia, because we have a lot of different residues in the farm. What do you think of this concept? Do you think it is a little crazy or do you think it is possible? We are also thinking about having some little biorefineries in some places instead of one big one.**

**S: Just to make an additional point, the technology we are looking at is called hydrothermal liquefaction, on high pressure and high temperature and in the presence of water. Actually it created 4 products, a biocrude, biocarbon, biogas and water. Water and gas will be used in the plant itself. So, now, looking at the concept and also the technology, what do you think are the main challenges and opportunities?**

Just one question, when you use thermochemical transformation, what will be your source of energy to generate the temperature.

**S: we were first thinking of natural gas or electricity. These should both be available, especially in big cities like Pereira, but it can also be natural gas.**

Well no, again, it sounds like a good idea. I haven’t heard about this thermochemical process. Again, what I think is, if one wants to start with something like this, you should start to look at those central facilities because the movement of the mass is not really in the mind of the farmers, they know that they have to load the jeeps or whatever they are using with the cherry, and they have a way to handle that, to solve a big problem, which is how to collect all the biomass in the facility. Probably in some of these places in the central area of Colombia, you have a good supply of residues from coffee or from other crops, because everything here is happening throughout the whole year. We say that the reproductive parts or cycles of the plant are happening at the same time. So that would be the option to do that. In what I told you before, would fit in that model.

**S: with respect to the challenges, like you said, logistics, infrastructure and you also said investment in also a hurdle in translating idea to pilot scale. Do you see any other challenges. Do you think that if something happens, we can overcome the hurdles if we take certain steps. For example, if we build a pilot, to show it as a proof of concept, that breaks all the challenges that are present. Do you think like that?**

Well, you are posing really difficult questions. What I see is, when I tell you that for the farmers, with these central facilities, they already have their mindset to bring the material, the whole cherry over there. Normally they don’t expect anything, they just expect the coffee to be processed and just to be paid just for the coffee. That opens up the opportunity to see what you can do with it. If it works, fine, if it doesn’t also fine. It is different from a situation where a farmer is expected to get some money out of the residues. Because if he doesn’t think it is not enough money, or it is variable, he will probably say, I am not going to do all of this work. I am thinking from the farmers side. They keep asking us all the time, what can we do with the residues to get more money and that is one of the main things they are expecting. Certainly, when you work with associations, that is much better, they group all the farmers to make these central facilities work. They can say, if we don’t bring all the cherries down there, the facility is going to close. So that is what I foresee. Other than that, I don’t know what to tell you. At least in the functioning, this is a good opportunity, also because you are open to receive other sources, not only from coffee.

**S: Thanks for that, this is useful. That empowers the opinions that we got from the stakeholders from the workshop that we conducted, where we broad in all the stakeholders and discussed this in detail. One more thing we wanted to ask you. We prepared a power-interest grid, based on the different stakeholders present in the coffee sector. Just take a moment to observe the players, what do you think of the positions, are they correct, how do you see the position of Cenicafe and how is the relationship between them.**

Well looking at it, I don’t know if Ecopetrol would be part of the national government or, because they have a lot of pressure, and it is not just because we are changing president this week, probably you know that and the new president is serious about thinking how to keep extracting oil right, I have to tell you, since last year, they have been contacting us, we have an agreement with them, we are going to do really a lot of things with them. But I see that they are looking for alternative sources of energy. Not only them, but also other parties. Everyone is thinking about solar energy, but also other possibilities as well, there are opportunities out there for which these alternative sources of energy could be really interesting, I think those are also players that have some money for investment and are willing to start from trials. So I don’t know about the private sector here, but is the private sector interested in investing in other sources of energy. I don’t see it in here.

**S: No that is true, we envisioned them here as either providers of technology or biorefineries, but external private sector companies are not present, that is true. Thanks for that.**

I think other than that, everyone is there.

**S: and with respect to their position regarding power and interest? Here, power is, how to say, the drivers or ability to make decision. Do you think that is also correctly distributed?**

Well, the only one that I see weird is the platforms of communication. Do they really have that power? I can see they can communicate their interests to governments and things like that. Maybe you guys are right, today the power of internet is really big.

**S: Here, the platform of communication is not that, it is like an association, a cluster where everyone is focused on promoting valorization of biomass, or promote bioenergy. Or reduce impact of environmental impact. Like a group of organizations and people brought under an umbrella, but in our understanding we were not able find such a platform present in Colombia. But that is what we mean by that. Some platform that brings all the actors together.**

I don’t see any more things, I don’t have more comments.

**S: And the position of Cenicafe is also correct?**

Yes well I would say, just to be clear, Cenicafe is part of Fedecafe, so for me it is really hard to say the federation is going here and cenicafe is going in another way. We are set up to do what the farmers ask us to do. I would just put them together under one label of fedecafe.

**S: And as Cenicafe, with who do you have many engagement?**

Well before that, one thing that I have to mention is, our main goal is to be really productive, because our business is to produce coffee right. And I must say that it is very secondary to deal with these other things. We have interest in that yes, but we don’t have the power or the drive to really do something with the residues of coffee. I would put Fedecafe in the place where Cenicafe is. We are interested because the farmers are keep asking this of us, but we don’t have the power to do something major in that direction. That would be my comment. And again, what would be the question?

**S: who do you interact with the most, in terms of connections and interactions?**

We have projects, most of the cenicafe’s research is funded by the farmers, so we are kind of autonomous on that, but many private companies are working with us, doing evaluation of products. We have some research with universities, but I would put that in a second place. It is mostly private companies that are working with us. And sometimes we are doing projects with the government, for example the US or in Colombia, the UK, but it is not our major fund. But those would be the three main entities that we make interactions with. Private companies, governments and in the third place I would put universities.

**S: Thanks for that. I think that were my main thinks. Before I ask my last 2 questions, do you have any questions for us?**

Finally, the goal of the project is to set up a pilot project right?

**S: The goal of the project is to understand the context and do like a pre-feasibility study to create an inclusive value chain. We are doing PhD’s, so we have limited time, but what we are doing in our PhD, we want to understand how a biohub can be build in such a context taking into consideration all the stakeholders involved. In my case, not just an idea, if we have the process, we do some assessments like techno-economic analysis and LCA and things like that. After that, we identified and brought stakeholders together, and they can build on our work, as a pre-feasibility study. And then they can take it further, that is the idea.**

Ok, sure

**S: Ok, then I ask my 2 questions. I heard that Ecopetrol as an entity has a lot of interest. And is it possible to introduce us to someone that we can also interview, because they can play an important role.**

Yes, what I can do is, I will look through my email, I was talking with the person in charge of alternative energy in Ecopetrol. So I can send you the contact and you can start from that.

**S: that would be great, thank you very much. And 2, and the results of the project of Cenicafe, is that publicly available, or was that with private companies?**

I think that we have been publishing that on the webpage. You have to register, and it will be in Spanish. We are not holding anything back.

**S: Thank you so much for your time and the contact with Ecopetrol.**