**SMALL-SCALE BIOGAS DIGESTERS AS DEVELOPMENT AID: TALES OF HUBRIS AND FAILURE**

**Site ID: 05**

**Date: 3rd June, 2021**

**Interviewer:** Okay, where did the digester originate?

**Interviewee:** It was designed by a certain Tanzanian, and it was constructed by the same person.

**Interviewer:** He came alone or with a team?

**Interviewee:** He came alone, and he found people here who assisted him with the work. But, he basically did everything by himself. The other people were simply supporting him. For instance, He was laying the bricks; the people were simply passing him the bricks. So, basically he supervised the work and he was also on the forefront doing the work.

**Interviewer:** Who funded it?

**Interviewee:** I believe it was Kondanani, but I’m really sure about that. The director is better placed to answer this one.

**Interviewer:** What was Kondanani`s role?

**Interviewer:** As for me, I was also involved in the construction work. Then after construction, the Tanzanian guy trained us how the system works to produce gas.

**Interviewer:** Was it a donation or something that Kondanani paid?

**Interviewee:** I don’t really know. I just saw the person building the digester. So, I don’t know what type of agreement was there.

**Interviewer:** What happens here at Kondanani?

**Interviewee:** It’s an orphanage - There is a hospital, and we produce cheese.

**Interviewer:** How did you know about biogas?

**Interviewee:** Honestly, I came to know about biogas after the Tanzanian guy came to build our digester. I learnt more about biogas during that time – we were told that the best manure for biogas is pig manure. It’s better than cattle manure.

**Interviewer:** How or why is pig manure better than cattle manure?

**Interviewee:** He said pigs eat almost everything – not just grass, that’s why its manure is very good for biogas.

**Interviewer:** What is your scope of work on this biogas?

**Interviewee:** I clean and collect manure from the barn; I prepare feedstock by removing debris from manure with a rake. Then I mix feedstock before feeding it into the digester.

**Interviewer:** What were your expectations on biogas?

**Interviewee:** We expected change in terms of waste management. Initially, we were just disposing of waste anyhow - we were disposing of waste in the banana plantation within premises. But, when biogas was installed, it improved cleanliness on the premise as waste is better contained in the digester. Also, it has helped us to reduce workload as it easier and nearer to dispose of water in the digester than disposing of waste at the banana site. Also, we expected to reduce work of preparing wood fuel.

**Interviewer:** Okay, what were you told to expect from the installer?

**Interviewee:** We were not told to expect anything, but people who work at the kitchen were told to expect more as biogas would replace use of firewood. This was very welcoming because people working at the kitchen were really struggling to source firewood for cooking. On our part, it only helped us by reducing the workload as waste is disposed of closer to the khola.

**Interviewer:** You touched on training, what kind of training were you given by the installers?

**Interviewee:** After installation, we were told that when feeding the digester feedstock should be free from debris to avoid blockages. Secondly, we were told to add sufficient water to avoid blockages as well. And also were told how to detect gas leakages within the system.

**Interviewer:** How were you told to detect leakages?

**Interviewee:** He said when we see that there is little or no gas pressure at the stove we should know that its gas leakage. He also said when there is a leakage effluent at the outlet doesn’t build up.

**Interviewer:** How many were trained?

**Interviewee:** We were about 5 people. And from that group I’m the only one remaining. So, I’m responsible for training other people on biogas as well when they are starting work.

**Interviewer:** How prepared to run operate the reactor did you feel you were?

**Interviewee:** At first we thought it was difficult thing to operate. But after the training we felt confident, and to say the trust, most of the things are not difficult to follow and implement. And after training, the installer stayed for some time to monitor how it was performing, and everyone was convinced that it was running well.

**Interviewer:** Why did you think it’s a difficult thing to operate at the beginning?

**Interviewee:** You know when you have a new thing you always feel uncomfortable. Also, we felt nervous about working around gas as you know people say it’s dangerous to work with and around gas. We had no option but to work as we couldn’t do anything. But with time, we got used to the idea and we realised that it wasn’t as scary as we thought as compared to LPG gas.

**Interviewer:** So you feared gas…….

**Interviewee:** Yes, we heard stories that a number of people have died in the process of cooking using gas. One thing though, the installer emphasised that we need to take extra care when handling manure.

**Interviewer:** Okay, how? Why?

**Interviewee:** We were told to wear personal protective equipment like groves, masks because the system produces strong odours at the outlet which may result into respiratory diseases.

**Interviewer:** I’m no biogas expert, so I’m not sure how you would come across the odours?

**Interviewee:** I get what you are saying. We don’t come across the odour when we are feeding the digester, but at the outlet where the system releases effluent as by-products. The odour is strong enough that it is felt around the digester. So, we were told by the installer to wear PPE, but it is unfortunate the organisation doesn’t provide us with proper PPE.

**Interviewer:** Did you tell your bosses that you were told to wear PPE when working on the biogas digester?

**Interviewee:** After corona they started giving us masks, so we use the masks to deal with the odour. As for other PPE, we just improvise by wearing dirty long clothes.

**Interviewer:** Why did you choose to build a digester here?

**Interviewee:** We were having problems sourcing firewood as we require huge chunks of firewood for cooking. Also, I believe they chose to build a digester to cut the cost of firewood.

**Interviewer:** I believe you started work before the digester was built…..

**Interviewee:** That’s very true

**Interviewer:** Okay, how did you meet your energy needs before the intervention? (I.e. cook)

**Interviewee:** We were using firewood but we were having problems because the director was against the use of trees as firewood. And when one was catch cutting trees by the director their salary was cut. And I believe that’s why she decided to build a digester here.

**Interviewer:** That is interesting. So, where were you expected to source energy for cooking?

**Interviewee:** We didn’t understand what she was up to – that’s why she brought the digester.

**Interviewer:** On the same, what was your Kondanani energy plan because I’m thinking, if she was against people cutting tree there was some sort of energy plan in place

**Interviewee:** I didn’t really understand because we had to cook food, and we could only cook with firewood. But, she was very much angry when huge amount of wood was cut.

**Interviewer:** How did you manage your manure waste?

**Interviewee:** We had banana fields close to the dam, so we used to dispose of manure in the banana fields as fertilizer. We used to field children the same bananas as fruit after meal.

**Interviewer:** Don’t you think the coming of the digester negatively impacted your banana production?

**Interviewee:** We bought the land together with the banana fields from Press Corporation, so the banana field wasn’t part of Kondanani’s plan. Our plan was to use the banana field to build houses and a football field as you can know see.

**Interviewer:** How did the system work after commissioning?

**Interviewee:** At first, it was working perfectly well – better than now because we had so much cattle and pigs then. That time we had 150 pigs and 40 cattle so manure wasn’t a problem.

**Interviewer:** How long were you using it?

**Interviewee:** It was working from 6 AM – 6 PM – 12 hours. That time we were able to feed the digester daily with ample feedstock.

**Interviewer:** How long do you use it now?

**Interviewee:** They still use it from 6AM - 6PM. However, the number of people has reduced as compared to back then. Nonetheless, they still use it 3 times a day from 6 AM – 6 PM.

**Interviewer:** I don’t really know. Maybe 300 or 200 now we are 100 or 150.

**Interviewee:** How much gas does it produce?

**Interviewer:** To be honest, I don’t know. I think to know the actually amount of gas it produce we need to have measuring equipment, and unfortunately we don’t have. However, we are able to detect the amount of feedstock in the digester by observing gas production at the stove. If the stove is burning with low pressure, we know the digester needs feeding to enhance gas production. Also when there is low or no feedstock in the digester, the flame is always blue and low.

**Interviewer:** Used you use the gas for cooking, how else did you use the gas?

**Interviewee:** There was nothing else – we were only using it for cooking.

**Interviewer:** Okay, what are the operation requirements?

**Interviewee:** We only need manure and water. And when you mix them you need to stir well to get a smooth feed.

**Interviewer:** Okay, how much waste is needed?

**Interviewee:** We need 20 wheelbarrows of manure. However, we are able to get only 15 wheelbarrows of manure. So, to compensate the deficit we add more water.

**Interviewer:** 15 full wheelbarrows?

**Interviewee:** Yes.

**Interviewer:** How much water do you add?

**Interviewee:** We were told to add 7 drum of 200 Litres. But, now we don’t put 7 drums as we have a tap just on the digester. So, we use the tap these days. And to know that we have added adequate water, we see water an overflow at the outlet.

**Interviewer:** How long does it take for you to feed the digester?

**Interviewee:** We feed 7 wheelbarrow of manure everyday if we fail to go collect other manure from our suppliers. If we are able to collect manure from them, we feed 15 wheelbarrows. To this, we open the tap from 7AM to 10 Am, and then at 1 PM we open again, because we add additional manure around that time. We were told that the digester is huge so when there is inadequate manure we should offset by adding more water. The digester is 4 meters deep with a length of 5 meters, so for gas to be produce there is a certain minimum level. So we always ensure that we reach that level by adding water to the digester regardless if we have manure or not to keep it working. Thus, if the manure and water is below that limit, you see people from the kitchen coming to say they are not getting gas at the stoves.

**Interviewer:** Okay, do you know the size of this limit?

**Interviewee:** I don’t know exactly, but it’s very deep like I said the digester is 4 meters deep and 6 meters long.

**Interviewer:** Where do you get extra manure?

**Interviewee:** We get it from the Roman Catholic Church right after the filling station. It’s about 8 - 12 km from here. We get manure after 3- 4 days because they have only about 20 cows so we want to fill the truck with manure whenever we go there. As a result, we wait for them to collect and pile manure that when we go we collect a full truck of manure. We don’t go daily because we want to collect enough manure as well as we save fuel by reducing number of trips.

**Interviewer:** how did you manage to get the Roman Catholic people on board?

**Interviewee:** I was approached and asked by the director how we could solve manure shortages. So, realised that I saw at the Roman Catholic Church they throw away manure. So I went there to ask them to be supplying us the manure. Lucky enough, they said we can be going to collect manure whenever we want to. We have been in touch with them for a month now. Before them we used to collect manure from a very far distant organisation, Kamphonje, but their cattle and pigs got diseased and died.

**Interviewer:** How did you prepare that feedstock?

**Interviewee:** we mix manure and water in a bucket, then with a rake with remove all the debris so that the feed is free from trash that can block the system. Then after a day we feed the digester with the feedstock.

**Interviewer:** Who was responsible for feeding the digester?

**Interviewee:** It is me, and my assistant. It is me who trained him about biogas as well.

**Interviewer:** Okay, what were the maintenance requirements?

**Interviewee:** It has never got broken ever since it was built. The only maintenance we do is on the inlet. There is a certain wood material which closes and opens the inlet. That thing get rotten most of the time as a result we simply replace it every now and them. The other work that has been done on the digester since it came is the introduction of a tap on the digester.

**Interviewer:** what this wooden material?

**Interviewee:** It is a wooden material with a mesh of wires which is placed on the inlet. It helps ensure that feed doesn’t get into the digester during stirring. Thus, after stirring you take out the material to allow feed to get into the digester.

**Interviewer:** Who is responsible for this task?

**Interviewee:** We have a carpenter who is responsible for making that thing. It’s not a difficult thing to do though, even myself I can do that.

**Interviewer:** Okay, Does the digester meet your needs?

**Interviewee:** (Laughs) it looks like we are able to cook as much as we like.

**Interviewer:** There are no shortcomings?

**Interviewee:** (Laughs) No.

**Interviewer:** Okay, what challenges did you encounter apart from what you have already discussed?

**Interviewee:** we work without safety boots. The problem comes in especially when we are working with pig manure because it causes the skin to itch when it comes into contact with skin. The other thing, we work without proper clothing as a result, our clothes doesn’t last long. In general, we need PPE to work safely.

**Interviewer:** You know you need proper PPE to work safely, have you tried to talk to your bosses about it?

**Interviewee:** I can’t blame our current boss because he has provided us with safety boots. But, they say it’s our duty to buy our own work suit. And as you know, we receive peanuts and we can’t afford to buy a work suit as a result we work without a work suit. But, we really need a work suit because we work in a hostile environment.

**Interviewer:** Why can’t you say the same to you bosses?

**Interviewee:** (Laughs) if you can complain like this, they will tell you that if you can’t manage to work under such conditions, then you should just resign, and when you think of the problems at home, you are forced to work without PPE.

**Interviewer:** What other challenge does it face?

**Interviewee**: We only have problems when there is no sufficient manure, as a result gas production drops. Other than that we face no challenges. The other thing is that we just need constant monitoring especially at the inlet to prevent blockages, and we always monitor the inlet to ensure that it doesn’t block.

**Interviewer:** How does this problem manifest?

**Interviewee:** When it block, when you feed the digester you see that feeds doesn’t get go inside the digester. So, we get a long stick to push and unblock the inlet. So, this happens mostly when the thing I have talked about gets damaged or when you feed the digester with dry manure.

**Interviewer:** Has it ever stopped working before?

**Interviewee:** It has never stopped working for the past 9 years. For it to stop working there must be a puncture on the dome or a leakage along the pipes.

**Interviewer:** Has there been a day where gas wasn’t produced?

**Interviewee:** There was a day where gas leaked. We thought we did everything correct in terms of feeding the digester and adding water to the feed, but we not getting flame on the stove.

**Interviewer:** What happened after and how did you find the problem?

**Interviewee:** One of the chefs noticed a strange odour around the kitchen area. That’s when we were able to follow and detect that a pipe close to the kitchen wall was punctured due to rust, hence the smell. We removed the pipe and replaced it.

**Interviewer:** Has it ever broken that you called the installer or someone from outside?

**Interviewee:** No, it has never ever broken to that level, and since he left he has never been here again.

**Interviewer:** How long did it take to notice the problem and solves it that day it stopped working?

**Interviewee:** It was just some hours, it didn’t fail completely.

**Interviewer:** Okay, have you seen something like this (shown table of interventions)? What do you think about this kind of information and do you think it would have helped you?

**Interviewee:** I have never seen something like this. But I think such information can help to solve problems that may arise since is it describing a problem and its possible solution. Thus, the information can assist in solving problems. And if it’s possible it should have a copy.

**Interviewer:** How would you describe the current state of the digester?

**Interviewee:** In terms of perfomance I think it’s in a perfect state and it has always been like this. The only challenge I see, we have problem with manure as we don’t produce enough manure on our own.

**Interviewer:** Why are you facing manure problem?

**Interviewer:** We have lost cattle and pigs because of diseases. However, we have now bought new cattle so we will be okay.

**Interviewer:** We are going towards the end; we have about 20% remaining. You said it once stopped working for a day, that day what did you do for energy?

**Interviewee:** Like I said, it did not stop for the whole day. We were able to detect the problem the same day, later in the afternoon, that`s when we called a plumber to change the pipe. But, that afternoon, we used firewood to cook.

**Interviewer:** Sure, how do you manage waste when there is abundant waste?

**Interviewee:** We have never reach that point because the digester is so huge that we have never fed it to its full before.

**Interviewer:** we are going toward the end. How much did the reactor cost to build?

**Interviewee:** I don’t know the actual amount, but I heard 100 bags of cement was used, plus brick force wire and all that. It must be a lot of money

**Interviewer:** Who paid for it?

**Interviewee:** I believe its Kondanani, and I’m sure it was not a donation because we usually find a name of the funder on the donated items, but on this one, there is no name which makes me believe it was Kondanani’s money.

**Interviewer:** Did you or your organization have to contribute anything in kind?

**Interviewee:** I can’t know.

**Interviewer:** How much labour do you think went into building digging?

**Interviewee:** I think 10 - 12.

**Interviewer:** Masonry?

**Interviewee:** It was one person. I mean all this was built by this one man, the rest of the guys were just supporting him with other work like carrying bricks and all that.

**Interviewer:** What there any other works beside digging and masonry?

**Interviewee:** Refilling of soil which was done by the 10 labourers

**Interviewer:** I believe you were here throughout the construction process, what kinds of special items had to be imported from another country?

**Interviewee:** I didn’t here that anything was imported. And the things I saw they didn’t look like they were from outside Malawi – and I have seen them here, for example, cement, lime and the brick force wire.

**Interviewer:** Did the reactor save you money in terms of energy consumption?

**Interviewee:** Yes, because before the digester we used to buy LPG for cooking but now we don’t use it anymore, therefore, I can say it saving us money. Also, the amount of wood we were using for cooking is lesser than we were using before the digester. Of course, we still use firewood and LPG for cheese production, but it’s not as much.

**Interviewer:** We are going towards the end of our interview. We are remaining with two questions. What is your opinion of biogas?

**Interviewee:** In my opinion, biogas is a good thing because it protects the environment, and at the same time it saves money as it is cheaper than electricity and firewood. So, it’s very good.

**Interviewer:** How does it protect the environment?

**Interviewee:** It lessens the use of trees which promotes circulation of fresh air and rainfall.

**Interviewer:** Last one, if you could have designed your own waste or energy intervention, what would you have chosen instead?

**Interviewee:** I would stick with biogas because of its ability to be used as an energy source for cooing as well as a manure making product.

**Interviewer:** Thanks for the interview,

**Interviewee:** Welcome.