**Cultural ecosystem services and human well-being in Madagascar under climate change**

**WORKSHOP TRANSCRIPT**

**Location/site:** Rural commune Mantasoa, Fokontany Mantasoa

**Date , time :** 28/08/2019 at 09:40AM

**Interviewer (initials)**:FJR + SMT, LMV

**Length of workshop:** 02h20mn

1. **FORMAL GREETINGS AND INTRODUCTION**

Official greetings by the deputy mayor of Mantasoa with introduction of the missionary

Sitraka took the floor and started the introduction

Sitraka: Hello everybody, I am Sitraka, I am a student at the University of Antananarivo, I've done studies especially on the environment, as well as the social and economic aspects of the environment. Now I give the floor to my colleagues so that she can introduce herself. Thank you everyone.

Leonnie: Thank you Sitraka, I am Leonnie, I am a student at the University of Antananarivo too, I studied social, environmental and sustainable development studies, I am also a researcher at CNRE (Centre National de Recherches sur l’Environnement), thank you then I give the floor to Felana.

Felana: Thank you Leonnie for giving me the floor, I am happy to greet all of you too, thank you for responding to our invitation, I am Felana, I am a student at the University of Antananarivo, I've been doing environmental studies, specifically on plants.

Leonnie: To continue the program that the deputy mayor mentioned earlier, our workshop today is about the effect of environmental changes on human well-being.

At beginning, you may be surprised why does she write there? but as a survey, we're asking for your permission and we inform you in advanced that we will use our answers here in Mantasoa for research in order to find solutions to improve our environment with regard to our well-being, our nourishment, our hobbies, about keeping the culture of our ancestors which is still the pride of the Malagasy people from time to time until now.

So Felana will be our secretary during our session today and Sitraka and I will discuss with you. Then, there will be some questions that we are going to ask, but we encourage all of you to participate and to give us more information about this topic. So we ask for your active participation, feel free to speak, and if there is something that you don’t understand then don’t hesitate to ask. So thanks in advance.

(There were some new people coming, so we welcome them to take place)

Sitraka: To continue what Leonnie said, so at the beginning we said that it is better to know each other, about us it’s already done but for your part, who are you? What are your responsibilities? And where do you live? So we start with deputy mayor.

Deputy mayor: Mme Inah, deputy mayor of Mantasoa, I come from Mantasoa, I live in Ambohimatakatra Mantasoa.

Sitraka and Leonnie : Thank you!

Man: Zafimahandry Joelison Rolland, Soavinjia Fokontany . I am a SLC of the commune

Sitraka : Ok, thank you

Man : Jean Francois Bruno, Randriamahefa Jean Francois Bruno, member of SLC, leader of disabled people, live in Ambohitrahazo, Mantasoa Fokontany

Sitraka and Leonnie : Thank you!

Man : Mario, Mantasoa forestry officer, our office and our home are in the same house, it is near the lake

Sitraka and Leonnie : Thank you!

Woman: Iarilandy, from Mantasoa, craftsman member in Mantasoa

Sitraka : Thank you Mrs Landy

Man: Andriamanantena Jean Charles, local development officer of the municipality

Sitraka : Thank you Mr Charles

Man : Ranarivelo, SLC member, employee at the Fokontany office

Sitraka: Thank you Sir!

Man: Ralaivelo, President of the communal council of Mantasoa, lives close to the hospital, Mantasoa Fokontany

Sitraka: Thank you Dear Mr. Counsellor

Leonnie: Thank you

Man: Hery represents Dico

Sitraka : What is Dico?

Man: You are not a representant, you are Hery

Felana and Leonnie : Hello! (there is new coming)

Sitraka : But what does Dico means?

Man: Dico is a name of person, and he can’t come so Hery came instead.

Sitraka : Okay, nice to meet you then and welcome

Felana : I think that it is an association

Sitraka: Madam!

Madam: I am Ratsimba Valérie

Woman: We introduce our self so it’s madam Iony’s turn

Sitraka: Nice to meet you

Woman: I am Madame Iony, in charge of the economic desk of the municipality of Mantasoa

Leonnie: Coming! (another person is coming)

Sitraka: Nice to meet you and thank you all. Have a sit! Madam…

Woman: Madam Claudine, water manager here in Mantasoa

Sitraka : Nice to meet you, thank you

Leonnie : Thank you

Sitraka: We are going to repeat for late people! I am Sitraka, she is Felana, she is Leonnie, so we are all a student, we have done studies on the environment generally, but with specialization in social, population and plant issues. We will gather here all the information from your point of view and the way you see the environment in Mantasoa and its surroundings. So, shall we start?

It’s better to remind you at the beginning as Leonnie said that we will take notes and some photos too. As it is an important exchange with local population, it is better to have something which remains like notes, thus we always remember that we did a workshop in Mantasoa. Also, we inform you that we may take pictures of you during this workshop; we need to insert them in the report later. So, all of that is the reason of why we‘re taking notes and photos. So we ended on the presentation then we will start our workshop so I give the floor to Leonnie.

1. **WORKSHOP IN GENERAL (DISCUSSION)**

Leonnie : Thank you Sitraka!

As we see on this board, the workshop will be divided into four parts. The first one is related to environment in general, then the change, after that the effect of the change, and at last the miscellaneous. So we are going to discover all of these subjects. The first subject or the first question, that we are asking your active involvement to explain or to say what we think in general, so the first is what parts of nature are most important for you in Mantasoa? So, the most important for your food, for your culture, for your income etc. Then what do you think are the most important here in Mantasoa? Excuse me, for your hobbies too

So the discussion is open. You can stand up or sit down.

Man: The most important about nature here in the Mantasoa Commune is the forest and in addition water

Sitraka : Alright, the forest, the water.

Can you see my notes, is my handwriting small? (Sitraka is writing what people say on the board)

The forest, the water, here in Mantasoa, about the forest, how large it is been since then? how it is now ? how about the forest here in Mantasoa, has the area increased or decreased or was there no change?

Woman: Generally, there was a loss, reforestation should be encouraged

Sitraka : Hmmm! Reforestation is needed

Leonnie : Where in Mantasoa can we still find massive forest? And how about the water as he mentionned …?

Man: Generally, the forest occupies a large area, but there are no more large-diameter trees, we can just see small-diameter trees

Sitraka : Hmmm

Felana : About the forest?

Woman: There are still primary forests

Felana : Ok

Sitraka : Is there any more forest?

Woman : Yes, in Ambohimatakatra part, we can still find. And if I'm not wrong, in the other side of the lake we can find too?

Man: These are secondary forests in the other side of the lake

Felana : Yes, what I want to ask is if we said forest, is it the primary forest or its *Eucalyptus* and *Pinus*?

Man: Now it’s *Eucalyptus* and *Pinus*

Man: Yes, *Eucalyptus* and *Pinus* in general

Felana : Eucalyptus and Pinus

Is there any way to know when it start to be *Eucalyptus* and *Pinus* or at beginning it‘s already *Eucalyptus* and *Pinus* and just in Ambohimatakatra we find primary forest?

Man: During the period of colonization that the *Eucalyptus* and *Pinus* plantation began, with the apparition of the locomotive

Felana : Hmmm

Leonnie : How important is this forest and water to our life in Mantasoa? I insist on our theme because when we talk about the importance we always immediately think of our nutrition and earnings but the culture is also important for us Malagasy people, the hobbies, all is important for our well-being, so how important are this forest and water to life in Mantasoa, now?

Man: If we talk about forest and the economy, logging is a source of income for the population in Mantasoa.

And the water help for subsistence and it's very important for tourism as well.

Felana : Do the people of Mantasoa use the lake for entertainment? Or it's just for the tourists?

Man: Sorry, May I speak

Sitraka, Leonnie, Felana : Of course

Man: About the water, for hobbies and tourism, now I am blind, but before I was a sport leader on this lake, concerning boats or swimming, all the hings what we can do with water, because there used to be a nautical club center here in Mantasoa, there was a club in 1965 to 1975. So the main hobbies on this lake were swimming, boat race… the village was undertaking a great development at that time. Even fuel stations existed for nautical activities, with different companies, but this is no longer the case today. So, these are the hobbies we had before in relation to the water importance

At this time, people also need the lake for fishing; there were parts where you could practice fishing and parts just for picnic, nowdays it is not like that, everyone does what they want. That’s all about the water.

Sitraka: Thank you

Man: Apart from this, there are also other families on the other side of the lake. They use boat transport every Tuesdays and Fridays to get here to Mantasoa.

Leonnie and Felana : Thank you

Sitraka: About this crossing every Tuesday and Friday, is there any reason or ….

Man: Yes, to bring in the crops

Man : For the market

Man: They brought the farming product for sale. People in Moramanga section and Mantasoa are in touched in terms of trades like banana, pigs…

Sitraka: Till now?

Audience: Yes

Man: Yesterday they were here and you'll see them again on Friday.

Sitraka: Those products…they are parts of the environment, so could you mention the diversities of the products. Apart from banana as Mr François stated before, do they bring more crops or?

Man: There's a lot of them, bananas, pineapple, cassava, pistachio...

Man: Agricultural products

Man: Chickens, rabbits, pigs...

Woman: Depending on the season, if it's bean season, they bring beans, taro season, therefore taro

Man : Even gingers

Sitraka: So, they bring livestock and farming products for sale

Audience: Yes

Man: Yes farming and cattle products

Man: Even forest products also cross this lake.

Man : Transport

Felana: This way of transportation, you've used it before and it's up to now? And has there been no problem since then or have you noticed any changes?

Man: No, there is no problem; the only change is that before the boats were manual now they are powered.

Leonnie et Sitraka: There was an evolution

Man: But there are still manual boats and it is the passengers who choose between the two.

Felana : In the past, you could fish in the lake with a well-defined spot for fishing and swimming. Now you can fish wherever you want. So what other changes have you noticed on fishing? Is it going better or worse?

Leonnie and Sitraka: Come on in (there are new coming people)

Man: Nowadays, about the uses of the water, before we used it for tourism, but now it doesn’t work so there is no parcel limitation. Only those part of the ACIPENCER which is delimited, so it’s only them who use it. Other than this, everyone uses it the way they want.

Sitraka: And here, are there any taboos relate to the water or something like that? Is there some part of the water, there is taboos, for example something can’t pass through there? Something that we are not allowed doing with the water? Like a culture here in Mantasoa for example? Is there something like that? Even in the forest, is there something like that?...

Man: About taboos, some are respected and some are not. But about taboos in general, relate to the lake of Mantasoa, you can't wash red cloth in it .It is one of them. The other one is you can't throw Zebu excrement in it. Other water, such as rivers, we can't bring the boats in there. And the same as before, you can't wash red cloth.

Woman: Clothes with red color

Audience: No, tissues made with silk, not tissues in red color.

Sitraka and Felana : Okay

Man : Before there is silkworm farm

Man : The reason for these taboos is related to the culture which prevent crocodiles to enter in the lake and the river in Mantasoa

Leonnie: Is there still a silkworm farm in Mantasoa?

Audience: There is no more

Leonnie : Why there's no longer this silkworm farm?

Man: The succeeding generations are not interested in.

Man: There was no transfer of knowledge.

Man: The presence of tissue from factories, and it’s relate to the price, silk are made by hand so it is expensive than tissues from factories.

Leonnie: Women don’t talk too much

Mantasoa's really famous before in terms of fish production so how is it now, is this still the case?

Man : No, not anymore

Man: There's this new company for farming fish so there was a decrease.

Felana: The decrease start with it?

Men: No, it’s before that

Man: Mantasoa fish has since very famous, but the problem is that Mantasoa produced fish but that was not enough

Man : Yes, it is not enough

Man: Yes we can say that it is nothing compare to the water area. Apart from this there was the company ACIPENCER that they said, it's got nothing to do with it, I don’t know about that. But what I find out is that the characteristics of this lake are not good for fish. Because the water is a little too cold then fish just survive. So later, they introduced a new fish called “Black Basy” which support the climat . The climat in Mantasoa is really very cold.

Man: The first fish in large amounts here in Mantasoa were the “marakely” but there is none left. It is one of the best.

Leonnie : I have a question relate to that, you said: before there was “Marakely” and “ Taro “ here in Mantasoa, you also said that : the water is so cold then fish may be can’t support it. So was it related to climate change? Did you notice that in a while? Like it is a little warm before and now it is really cold or it is always like that?

Man: Now it is really cold. Here is the story about the fish “Marakely”. In 1944, they're finished building the dam, there was verification in 1963 so they punctured the whole lake. So everybody caught all the fish (carp, ...) even with big trucks. The military trucks transported the fish. When JIRAMA (the water and electricity company of Madagascar) finish fixing all, they're refilling the lake. So almost the native fish are gone. They still left “trondro gasy”. Until now we can find “trondro gasy “but in small numbers. So if they didn’t empty the lake, we still have a lot of fish because a fisher could have 8 baskets for one day.

Sitraka: Is that now there really isn't any?

Men : There are, but only in very small quantities and small size.

Man: Now one fisher just has 2 to 5 kg per day using all the different types of fishing nets.

Felana: After emptying the lac, were they still able to get that good fish production?

Men: Yes!

Man: But now with all these different methods of fishing, there's what no longer follows the norms, such as fishing nets with small mesh, …. So the tiny fish are disturbed very early. Moreover the fish adapt to these fishing methods and are no longer trapped by them.

Men : Yeah, they're used to it.

Man : Even the children are starting to fish in the rice fields so there are no more of them.

Man: Also, I think that the problem is from our side, it’s our fault, because people used nets like the veils of mosquito to fish, so even small fish are caught, and then there are no more fish that will grow to have descendants. Afterwards, we claim that there are no fish anymore, however we were the cause

Man: Before, the forest guards check the fishing nets and during the laying season, everyone brings their fishing nets back to the forest guard’s office. If there are still people who insist on fishing, they are arrested and taken to court.

Man: Until now the fishery shutting during the laying season is maintained but I find some lack of responsibility for the people who do the follow-ups.

Man: But, there was also climate change, because there was a really dry moment, if we talk about the rice fields that had fish during that time, for two months there was no water that caused a decrease in the quantity of fish. Even the Mantasoa River and Lake are experiencing a decline. That was not the case before.

Sitraka: You said that there was climate change, so is there any time of drought; if yes, when was it? during which month?

Man: Now it's the beginning of the dry season, the water level will reduce until December.

Man: In the past, the rainy season used to start at the end of October, now it's December.

Felana: That period still existed in the past? Had you always water?

Man: Yes, there was; we can manage it well according to the needs of the population.

Man: Before, as usual there's always a dry season and a rainy season, but I don't know if you've noticed that the water from above doesn't fall down here anymore.

Man: What I know about this water is that it's used to run the JIRAMA factory (Madagascar's water and electricity company) in Mandraka. So during the rainy season, the Mandraka dam turns with the wild water and we block the Mantasoa dam so that we can also accumulate water, then during the dry season, Antananarivo needs water for their rice field, so we open the Mantasoa dam to run Mandraka. But at the moment, it is the water from Mantasoa that makes the Mandraka dam run all the year. There is no more water storage time. So the management method is no longer the same as before.

Man: Yes that is true, I don't know the management contract between JIRAMA and the commune but before, 3 months out of 12 that Mantasoa feeds Mandraka, and now it's 12 months out of 12. That's why the water level has dropped so much too.

Man: The reduction of precipitation is one of the reasons, then, the forest loss. In addition, our current forest is a type of forest that draws water but not to produce, which is the case of the Eucalyptus forest. I don't really know the researchers involved but in general a foot of Eucalyptus draws up to 400 l of water per day. Moreover, it’s the spring water in the mountains that feeds the water of Mantasoa while the mountains are covered by Eucalyptus, so the water no longer reaches the lake.

Men : We agree

Man: There is rain, but it is no longer in the eastern part but in the western part, so it's not any longer in the Mantasoa part.

Man: I do not disagree but I am not convinced that it is deforestation which causes no longer rainfall, I am sorry.

Sitraka and Felana: What’s your argument then? That’s the reason why we are here.

Man: Because you said the forest is gone so there's no more rain, but it's the rain that creates the forest. Because we say that there is no forest in a certain area so there is any rain, but wherever there is rain, there are always plants growing.

Man: About the disappearance of the forest that causes the absence of rain, according to the researchers, there is underground water, and this is drawn by the tree or the forest, then the evaporation of the trees creates the clouds to get the rain.

Man: I understand

Man: So when there are no more roots to draw groundwater, there is no more rising water, so the rainfall decreases.

Men: The so-called water cycle

Man: In another case, for example, there is no rain in our area, then whatever we're going to plant even trees, there would be no rain when it's in the dry season. We have this way of saying that there's a lot of rain in the East, so you're saying it's because of the presence of the forest? No, it's the abundance of rain that promotes plant growth in this region. And it goes back to the water cycle you said. In the case of the southern part of our island, about two months a year they have rain, but during that rainy period the grass turns green.

Léonnie: The person in charge of the forest wants to say something as we’re talking about the forest lately then we'll give him the floor.

Man: The first thing I'd like to say is about fishing, but it's an interesting discussion, so everybody wants to speak. Before there was the MAEP (Ministry of Agriculture, Livestock and Fisheries), but currently they are separate. At that time, forestry officers can swear oaths in court and can carry out investigations and deferrals on these fields, i.e. on fishing, forest and nature... Thus, at that time the forest rangers could control the fishermen who did not follow the laws. However, after the separation of the Ministry of the Environment from the MAEP, forest rangers are no longer concerned with fishing, only the forest. Fishery officers are the ones who follow up on fisheries offences.

About the forest, the other man said that Eucalyptus trees draw a lot of water, I confirm. We took the initiative to go to Antananarivo to speak to the senior officer at the Ministry, and we've made an awareness campaign to stop planting eucalyptus and pine trees.

Sitraka: Have you ever done any reforestation campaign in Mantasoa, and if so, what species of trees were planted?

Man: There wasn't yet a massive reforestation campaign, but it was still a family reforestation. They planted Eucalyptus, but even if there was a reforestation organized by the ministry, it was still Eucalyptus. At the moment there is no more space to plant other species of trees. All the land is occupied by Eucalyptus and Pinus.

Man: But I find that compared to the exploitation of the forest and the source of income of the population in Mantasoa, the plantation of Eucalyptus and Pine is more practical and I'm sorry about the ones you said that planting Eucalyptus is wrong but planting Eucalyptus isn't too much of a problem.

Man: Commercially, Eucalyptus is short cycle, so let’s say in 3 years you can make money.

Man: In terms of income, Eucalyptus is interesting, but for an environmental point of view, they are not good.

Man: I've also noticed that Pines are spreading very fast, we have a lot of wildlings because their seeds can flurry far.

Man: Yes, we say it has an economic interest, but if we look closely, that interest is still very low. Because in my opinion, we cut down Eucalyptus trees every 5 years, for a hectare, we can earn an average of 1,000,000 Ar and I would like to point out that the size of the trees is no longer large at present. In this way, we earn 200,000 Ar per year on a 1 ha plot of land. It doesn't really carry much for me. We have to think about planting other trees for example fruit trees, persimmons, peach, orange, ...which grow well in Mantasoa. A persimmon fruit sells for 200 ar, a persimmon plant yields a minimum of 200 fruits, so calculate what you earn from a tree in a year. Then in 1ha, how many persimmons can we plant? We can plant 600 feet in 1 ha. So 200 ar x 200 = 40,000 ar, 40,000 ar x 600 feet which we will earn for 1 ha.

In the southern region, there was a history with the tamarinds. They cut the tamarinds tree to make firewood and charcoal. Why didn't they think to use the fruit to make juice instead of cutting down the tree?

That's my personal observation.

Woman: I would like to talk a little bit about drinkable water, currently we sensitize people to better manage water, because in 100 years or 50 years, it will be difficult to distribute water. At the moment, we don't really see it yet, we just say it's because of the Eucalyptus. But I have observed that for about 2 months, August, September, October, the water level in the water tank has been dropping. Besides, we share it with the rice paddy owners, so it's even smaller. More specifically, water for domestic use is threatened.

Sitraka: Craftsmen, how did you come up with all of this?

Woman: The reduction in water has also an impact on raw materials. For example the plants called "Rindra or zozoro" (Cyperus) that grow at the water's edge become very hard when there is not enough water, i.e. it becomes difficult to handle them to make mats,...

Sitraka: So we need water in economics, crafts sections and for everything we do

Audience: Water is very useful, water is life.

Sitraka: So the solution will be a reforestation, but not Eucalyptus and Pine from what we've discussed so far.

Man and Sitraka: But the problem is that there is no more land for reforestation, all is occupied by Eucalyptus and Pine.

Man: Lands are already shared by family; there is no longer a vast area for reforestation.

Sitraka: As I understand it, the land in Mantasoa's already split up by families.

Man: Yes, lands are either governmentally or privately owned.

Man: I ask you, I'm not yet convinced, we're going to plant trees but the rain that will water it does not exist. For example, the current reforestation project will be on Andakana, Mahitsy, Ambohidratrimo, on the RN4 (national road 4), it's a big reforestation project by hectare, but this region is dry, when I was a student, we did a reforestation on this area. It was in 2012 and I came back in 2018 but the tree growth is very slow because it is dry. But the land is vast, about 500 hectares.

Man: Was there no water on the hilltops? Because I had done a fish farm internship too in that area, there was water on the hilltops, and there are even people who do fish farming. Not like in Mantasoa but ....

Just a remark, the decrease in water and rainfall in Mantasoa is not due to the deforestation that we are doing here, our deforestation rate is minimal compared to the destruction of the east coast of Madagascar and I find that it is this destruction of the east coast that is causing the decrease in rainfall in Mantasoa. So it's not just a problem in Mantasoa.

Man: But the impact of the rain in Mantasoa, the western part will benefit.

Man: Before, my father reforested these Eucalyptus trees, at that time there were no Eucalyptus trees in Mantasoa. Only grasses covered all the mountains we see around us and there was always water flowing even during the dry period. There were water sources in the mountains. However, the reforestation of the Eucalyptus trees developed and occupied all the mountains and it is afterwards that its sources of water dried up. So it's because of the Eucalyptus, moreover the Eucalyptus are currently about 1m near the rice fields. The production of the rice fields is no longer satisfactory, because the Eucalyptus plants draw water, and their leaves that fall to the ground prevent the growth of other plants.

Man: Then there is no problem if we consider the principle that Eucalyptus draw water, then they transfer it to the atmosphere, and continue the water cycle. And I think that it should have been a solution because the Eucalyptus would be a reservoir of water.

Man: In fact, it is not a problem for Madagascar, it’s only for Mantasoa. In the western part, it's not a problem. The existence of Eucalyptus here in Mantasoa, for example, is beneficial for other parts.

Man: Then it is good because who else help other person is like helping God.

Man: I don't know, but what I'm saying is, me first and everyone else after. If I was thinking about others, I still don't know how I'm gonna deal with mine? If we look closely, economically speaking, the rice fields near the Eucalyptus trees are no longer productive. What would then be the production in Mantasoa? The water level in our lake is starting to drop, our crops are having problems with water. And according to our water manager in Mantasoa, even the water for drinking is already critical.

Woman: Consequently Mantasoa will be in famine but not the south of Madagascar.

Man: Well, Mantasoa extends on about ten Km2 however approximately 80 to 90% of these surfaces are occupied by Eucalyptus. We can no longer eradicate the Eucalyptus because the more we cut them down the more they increase in number. We must therefore looking for another solutions.

Man: Yes, that's the reason for the discussion, development is not done in a day, but we have to start, if we ask when is it going to end? we say we're not going to start because we won't be able to do it. But it's the beginning that's important, so we start to restore the environment. Then don't think about how soon we're going to eradicate this Eucalyptus plantation.

Man: There are always problems, but there is also a solution to every problem.

Man: What is it then; suggest me a convincing solution to this Eucalyptus which is not good for us.

Woman: It's because of this problem in Mantasoa that we have a weather center of our own to restore agriculture in Mantasoa facing this climate change and all these other changes here. It is in collaboration with the Ministry of Health, the Ministry of Agriculture, the Ministry of Tourism and the Ministry of Fisheries, because there is an impact on the health of the population and on our source of income… It was after an observation of all these entities in our village that they decided to set up this meteorological center so that we could see other solutions for agriculture, for example by growing rice on land but no longer in the rice fields in the face of drought. So this is one of the solutions to restore our source of income, we have to change our habits. As we all know in 2017, we had a great drought, our lake dried up and the Ikopa river had a very low level, so there is no more water for JIRAMA, everyone was concerned. And it is the mayor's initiative to call on all these entities including CNRE, CNRIT, the Ministry of the Environment, the Ministry of Water, the Ministry of Agriculture and Fisheries, the ONE, .... So there was a meeting for two days here in Mantasoa about all these problems and the solutions to them. The CNRE said that we have to do research because we cannot say for free what the solutions are; it's difficult to make predictions for the future without proof.

Leonnie: Thank you, Madam Deputy Mayor, for this information concerning the life of the population in general. The discussion is interesting, everyone is active, we have a lot of information on the importance and change of the environment but it is better to talk a little bit about the impacts that are mostly economic so far. Are there impacts on people's well-being, positive or negative impacts, impacts on health, on food, on the social level,...we especially encourage women and girls as well as young people who don't talk too much.

Woman: There is really an impact on health, not very far from the year of the drought; rabies is very developed so there were a lot of people victims, the death of animals and men. There was also the plague in our neighboring commune, on the other side of the lake. The Ministry of Health had come to the field to do surveys and research for 10 days and it was due to the bush fire in this area that prompted the rats to reach the villages. Afterwards these infected people come to Mantasoa to visit their families and spread the plague to Mantasoa. And it was the commune of Mantasoa which took charge of the treatment of the sick, which took the initiative to prohibit the crossing of the lake at that time.

Woman: The decrease of the rainfall gives also an impact on the harvest. There is a diminution in yield.

Felana: How about the livestock?

Man: Agriculture and livestock are dependent on each other, when the yield in agriculture decreases this has a negative impact on animals, more precisely on their food.

Man: Personally, I work in fish farming, so the decrease of the rainfall and the decrease in water have an impact on the yield in fish farming.

Man: Directly, the problem here is nutritional deficiency due to climate change. This lack of food causes another production method. For example, in agriculture, people use chemicals that will have a lot of impact, as well as on health...

Man: The use of chemicals is another problem and it is bad too.

Man: They use chemicals to increase the harvest

Man: Whereas it's not good for health.

Man: On the use of chemicals, they make market garden plants grow quickly, but I also find that the current seeds are hybrids. However hybrid seeds require the use of chemicals to have a good yield. If we would like to make organic, we use compost, manure, ...and we will have other products. But if we use these with the hybrids, their growth is not good. Before when I was not yet blind, we used to grow zucchini. We make holes, we put in dried cow dung, when it's cold we sow the seeds. But with hybrid seeds this doesn't work.

Man: That might be just his observation and affirmation, but on the other hand it's not really the case. Currently, there are techniques that farmers should adopt, even if they are not going to use chemicals, they can produce as with chemicals but this new technique should be mastered.

Woman: There's a real impact on the animals. Mantasoa had dairy cows at the time of Ravalomanana (former president of the republic of Madagascar), there was also a cheese producer. There is not enough grass to feed the cows now. As a result, milk production is decreasing and so is cheese production. During the Mantasoa fair there should be cheese. However, there was no cheese because there is no milk. We ask the cow breeders, why is there no milk? There is no feed for the cattle so there is no milk. So there are impacts on shareholders, farmers, ...

Sitraka: And how is it for young people, specifically, the impact of these changes on young people's lives.

Man: We talked about the problems with livestock and others, there are also impacts on the forest because the population has money problems so they cut and sell them without reaching the exploitable size of the trees. In other words, for example, if we have to wait 5 years before cutting a tree, people cut them down after 3 years because they have no more money to live on.

Leonnie: I would like to ask you all one by one to say how do we feel about this change in the environment on our well-being? Does it make us angry, or unhappy, or is it okay?

Man: Before entering into this new discussion, you asked the youth's opinion. They haven't spoken, so I'm going to represent them. Maybe I'm not right, but from my observations, I find that climate change is having a great impact on the lives of young people. Because most young people start looking for other jobs when they leave Mantasoa and go to the city or stay here but want to do new jobs other than agriculture and livestock. Because they see what their parents are going through. For example, their parents are raising pigs but it doesn't work because there is not enough food for the pigs so they should look for money to feed the pigs. Thus, young people do not want to raise pigs or chickens even in agriculture because the land is no longer productive, hence the search for employment outside Mantasoa or to work for someone. They no longer want to be their own boss. That's how I see their impact on young people.

Man: In addition to what he said, this climate change is causing and will cause laziness, more specifically, not to do anything anymore. And even for teenagers, if they should, for example, help their parents, they don't want to do it because either it's cold or it rains or it's very hot.

Sitraka: I'll point if you don't want to share your point of view, so you, what is your opinion on this change in the environment as a young person?

Man: Same opinion as the others...

Sitraka: Give your opinion, it's good to discuss...

Man: A suggestion then is to encourage others to work and to stop practicing bushfires.

Audience: To reduce it...

We can't stop this...

Man: This is their cultivation practices, as they set fire to it before cultivating to get a good yield. And it's not every year that they set fire to it, but it's just at the beginning and it becomes their farmland. So it's a bit critical to stop it, it's not like we see on National Road 4, that we always see fire every year to get food for the oxen.

Sitraka: Our opinions are all true, the young boy said we should reduce the bush fire, Mr. François said we can't because it's a farming practice. So is bush fire a culture here in Mantasoa?

Audience: It's the people on the other side of the lake who practice that.

Mantasoa doesn't do that.

If there is in Mantasoa, it was an accident during charcoal mining...

Sitraka: Are there people making charcoal in Mantasoa?

Audience: Yes, that’s what people do here.

Man: What I'd like to say is, Mantasoa is covered of forest belonging to people. Thus, it is the parents who exploit them and their descendants no longer have land to plant so they should migrate to find other land or look for a boss like the others said earlier. The young people are leaving Mantasoa because there's nothing more for them to do here.

Woman: Women are the one who stay in Mantasoa

Man: There was a young person who asked for the solution, I only have a small solution but as he is interested, I will tell him. Especially in the case of Eucalyptus, there is a lot of Eucalyptus, so the first solution is to start little by little: first of all, it is the rain that feeds the lake, there are also the springs coming from the mountains so, first of all we should protect these springs. I don't know how, but I'm saying it like even for example the forest around these springs should not be of Eucalyptus, then we should define how many meters around this spring should not be of Eucalyptus. Secondly, when reforesting, no longer use Eucalyptus, pines and cypresses, instead let’s plant fruit trees near the villages.

Woman: What's difficult is that people in Mantasoa don't accept trees apart from eucalyptus and pines for reforestation. For two years, the commune had a program of beautification by planting trees along the roadside. We planted the trees today, tomorrow they were gone. So we thought that the inhabitants didn't want them, maybe if we had planted Eucalyptus and pines, they didn't remove them thinking that after 5 years I could cut them down. This prompted the need for a program of great education for the inhabitants.

Audience: Yes

Man: You say education, it's not about that. I have seen you have planted maple trees; they are very expensive trees so they have passed them on to their yard.

Woman: So they dug them up for them. So that's education.

Man: In fact, she would like to say that they are not Eucalyptus and pines so people don't like them and have cut them down, on the contrary, they have removed them for them.

Woman: That's not even a good behavior.

Woman: But our village should have been beautiful with these trees.

Man: Now it's their yard which is beautiful.

Man: Concerning reforestation and Eucalyptus, in fact it has already been said that eucalyptus forests become an inheritance for the descendants. It is their grandparents who planted them, the more Eucalyptus trees are cut down, the more waste they produce, so the descendants who exploit them no longer think of planting other trees such as rosewoods because they cut them down and they will have new waste. As far as fruit trees are concerned, everyone has a choice with regard to their land, so we cannot force people to plant peaches or persimmons. Everyone has their own goal.

Man: So I propose to protect the forest but at the same time to replace it with something else.

Woman: There are also impacts for the bees.

Man: Yes, that's why I'm talking about fruit trees because it's related to other sectors like bees. At the moment, here in Mantasoa there are only Eucalyptus trees, so when the flowering period of the Eucalyptus is over there is no more flower for the bees. With fruit trees their flowering period is different.

Another solution, in relation to the forest in general in Madagascar but not only in Mantasoa. Since a long time, we have opted for trees for charcoal, why not to conduct research into plants that are a source of renewable energy.

Woman: Another solution is to respect the laws in force, such as leaving mature trees instead of cutting them all down during logging. So the people involved should fulfill their roles. So, I insist on education because people only think about themselves and not about the future. So I don't know who should do what? Because education is not done in a year, in two years, in 5 years,... And these difficult with adults even impossible but we must turn our eyes to the children. The children can do things, for example the commune has organized a recreation for children every Wednesday and with this activity they are the ones who animated the fair of Mantasoa not famous artists. Moreover, it was thought that it would have more effect if it was the children who taught their respective parents. The message got across this way because if it's other people who are going to talk to them, they're going to say who are you to tell me what to do? So we need an effort for the education of children. Moreover, if we look for solutions while we are still going to entrust them to adults with their current behaviors, we will not have any result.

Leonnie: We are coming to the end of our very interesting discussion, so I would like to ask the question I asked earlier again because we did not yet have an answer. This would therefore be our last question and we will take turns answering it. How do we feel about this change in the environment affecting our well-being? Does it makes us angry, or unhappy, is there something we can't do to avoid it or to improve the situation, or do we just ignore it, life goes on?

Woman: As a leader, I said all these ideas about education because deep down I am sad and trying to find solutions. We can't do it alone but we call on all entities to do it.

Woman: As the person responsible for water, we cannot ignore it. If there is no water, people complain, then they go and drink unsafe water and it would cause illness. But it's also a bit difficult with people's mentality. Everybody knows that water is no longer sufficient because of the change in the environment, but they are not convinced to pay for drinking water in the countryside when it is for their health. This is still linked to education for a change of mentality.

Woman: I say we can't do anything about the fog because it's related to the climate. But we suffer in the morning because it is very cold.

Man: In relation to this change of the environment, everyone is responsible for having a change in the situation because it is not a good change.

Man: Related to the question: "Is the environment good or bad for you? "it is difficult to discuss it because what is good for me is not good for the other and vice versa ... Yet it is already a threat, everyone knows that it is cold, it is hot, it doesn't work very well anymore, ... So everyone should be strong and take the initiative to disagree the destruction of the environment. We must change the mentality. Whatever you do, there will always be an impact on you and everyone will bear it. If one or two or four people realize that what they were doing is not good for the environment and decide not to do it anymore, that's one thing.

Man: Climate change is not good. For example, for us young people, we can no longer make suggestions for things to do because for example it is sunny today so I will do this thing tomorrow, but tomorrow the weather has changed and we couldn't do it. So we can no longer plan, if you ask someone what they are going to do tomorrow, they will tell you, it depends on the weather tomorrow.

Man: Climate change is not good for me, or environmental change. In scientific terms, there's climate change, climate variability, which are all different that we're not going to talk too much about. I've been working in Mantasoa for 3 years, there was a lot going on but this year I found out that almost every month I'm still getting sick because of climate change. What would be my share of responsibility? We can't avoid it completely, but rather reduce it. In relation to our position therefore, there is the presidential policy of reforesting Madagascar again. It is our part to achieve the reforestation quotas every year by district, by region. Furthermore, when we talk about the environment, it is always about the forest.

Woman: Climate change or environmental change is not good for me, yet it was because of us, so what we need to change is the mentality.

Man: When we learned the consecrated lesson, we were told that man is formed by mind, body and spirit. When we talk about climate change, this has effects on these 3 constituents of man. It doesn't only affect the body but also the mind. So it has negative effects on the well-being of man. According to the opinion of others, it is us humans who have caused this climate change so we should not be angry because we get what we have seeded. However, we will have to be sad because our descendants will no longer live as they should. In the future the impact of this change will be very serious. Right now we are short of water but we can still live one more day without water. But it is not just water or the forest, it is the entire environment. For example, if there is no air for one minute we would all be dead. So everyone should make efforts, and among these efforts to make everyone aware of the negative impact of climate change. Nothing that there are people who are not aware that there is climate change; they think it is coming from God. Yet the climate calendar has changed so much and it is blaming God when it is because of people and everyone is responsible. No one can say that I didn't do anything. Just one candy cover put on the ground already has an impact on this earth...All plastic things, we have to take action on them or find other alternatives. When we were kids, there were paper baskets, not plastic bags. And it's still us...

Man: As a farmer and stockbreeder, I feel sad about climate change because it really has a negative impact on my livelihood. Regarding the responsibility for climate change it is not just the people but all the responsible people up to the president of the republic should get involved in education for a change of mentality.

Man: I am sad about the negative impact of environmental change and climate change. I used to see the abundance of water, fish and the beauty of the environment, but this is no longer the case. Before, everyone was wise, we respected each other, but now everyone does what they want. Now there is no turning back. We are now aware that we need a leader to teach people, to change their mentality because it was our mistakes. If we manage to change the mentality maybe we could have things back to the way they were before.

Man: Everyone should have a responsibility as a citizen. Our ancestors lived with the plants and took care of them. Our ancestors respected the water sources, they cleaned them and they will not have water problems. But our generation doesn't respect that anymore. So, we no longer know which plants grow at what times and accentuated by climate change that changes the cultural schedule.

Man: Even though the change has disrupted people's lives, I'm not angry about it. However, it may or may not make me sad. I said "Maybe" because it's not just me who suffers from it, but everyone else does, so if others can bear it, why not me?

Man: I'm the last one so I'm the one who finishes, who concludes, ... and I'm a little bit clever because everybody has already given their ideas. For me, it makes me sad, it makes me angry, but it makes me to overcome. I'm sad because it's not us in 2019 who caused all this, but the people before us. So, it was the previous generations who have done all of this and it's us who suffered the consequences so it makes me really sad. This sadness is related to the subject of health, we have become fragile people because of this climate change. Also, I said it makes me angry, like I said before, young people have become lazy, he's always looking for excuses to do nothing (there's no water, the earth is hard, ...) and I don't like that because we could always find something to do. In relation to the effort, I insist on what the lady said earlier. In 2017 we had a drought. As I said, we need to manage the water because now we have to supply Mandraka 12 months out of 12. We know that the water flow for Mandraka is at least 5 m3/s, 300 m3/min and JIRAMA has already calculated that we need 150 million m3 from Mantasoa every year. That's huge. So the people in charge should do something about this. I'm still annoyed because the area in the city is polluted, so they're moving away from the countryside and coming here to the countryside. Mantasoa is also a tourist town, there are tourists and students who go on study trips but after they pass through they leave tons of rubbish. So, if you came here to pollute, stay at home.

Sitraka: Thank you for all your ideas, I hope you have understood the purpose of what we are trying to achieve. And now I'll give the speech to Leonnie to end our discussion.

1. **FINAL SPEECH**

Leonnie: I would also like to thank you very much. Thank you for coming. You all came, the adults, the young people and the elderly. Moreover, we have results from our discussion that will help us to find solutions for our development and our environment as well as for future generations. And I say again that your ideas are very important and will help us in our work and we promise that we will report on the results of our research later. Finally, we ask you to take a picture of the whole group as a souvenir and afterwards there will be a coffee break. Thanks again!

Woman: We are the one who supposed to thank you, it gives hope to see young people seeking good for the people. I also thank all the participants. As a leader, I am happy because we are not alone but everyone feels responsible. I am sorry for those who couldn’t come. That is all we have been able to do today and we thank you in advanced for the report that you are going to submit.