Farmers battle extreme weather in Andaman islands

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Hi, I'm Rakesh Kamal, Production lead of Suno India and host of Climate Emergency. This week we have a special episode all the way from Andaman reported by Sharada Balasubramanian.

Sharada Balasubramanian (Host): I landed in Port Blair, just when cyclone Amphan was to make a landfall in Andaman Islands. There was Light Rain and slowly cloud stones became darker and thicker. I looked at my phone. There was a weak signal on my BSNL number. It was then I got to know that most mobile networks do not work here. Forget the internet, talking to people wasn't going to be easy. I wasn't prepared for this. How would they coordinate with the people? In search of a stronger signal I went down and called the scientist I was supposed to meet. And I'm stuck in saying hello for a long time. Hello, I'm Sharda and environmental and development journalists and I'm doing this podcast for Suno India. The Travel support for Andaman Islands came from a way of bengal grant. I traveled to Andaman to look at how Island farmers here adapted to climate change and extreme weather through various solutions from scientists. So when I finally got through to the scientist, all I could hear in broken words is I'll be there in 15 minutes. It was about 2:30pm. I looked out of the window. The wind was blowing very fast, and it was strong too. The scientists said that we could have a look at the farm and the landscape here before we could start interviewing farmers the subsequent day. As we drove along to Chaudhary Panchayat in South Andaman, I could see water everywhere. After looking at a few farmlands, which were all a few meters from the sea. The scientists said, I think it's not safe to be here now. We should leave now. I Looked at the sea behind me. It was in complete fury and swelling up right across the farmland. The road was not very high from the scene, and it was a scary sight to look at the sea water rising to the road. We traveled across the undulating terrain and the tribe was paced up as a water level was quickly rising everywhere. The rains battered heavily, and the vehicle was shaking in strong wind. I was only hoping the vehicle could not be swept by the storm. It was the first time I witnessed the landfall of a cyclonic storm. And just then a thought struck. How are the local people coping with such extreme weather conditions and the cyclone hadn't sunk and settled yet. All night. I could only hear the rain outside my window. The next morning, walking in slush. I saw fallen banana trees that after Cyclone farmers said there was nothing they could do about it.

Suddhir Datta, a farmer, grows vegetables and has coconut and coconut plantations in his family and he also has poultry in his farm. After the 2004 tsunami, this land was barren and uncultivable for almost six years. This farm was barely 10 meters from the sea. And during the tsunami, his entire farmland and home was under water. He recounts his experience with cyclones and Andaman Islands.

“Aaj jo hai cyclone hua, Cyclone aane se ghar wagerah sab ujad deta hai. Ped wagerah hila deta hai, ped ki jado mai paani jaane se ped wagerah sab sad jaate hai. Yeh dikkat hai.”

Dr. Murugan, senior scientist from Central Island Agricultural Research Institute, also known as Carrie has been working in the islands for over 15 years on protecting natural resources like land and water. He's also been working with Island farmers in overcoming environmental and climate change challenges and helping them pursue smart farming. From an ecological approach, Dr. Murugan, could you please tell us about the environmental and climate change issues in Andaman Islands after the tsunami? How does it impact the farmers here?

Dr. Murugan: In Andaman & Nicobar Islands after the tsunami there are different situations created. one we have a waterlogged condition. Second, you have salinity, these are two The biggest problems we are facing in the coastal area. In addition to that, during the summer season, you will find a shortage of water because you think you have rainfall, good rain and a good amount of rainfall of 3000 millimeter until December 15. The southwest monsoon and northeast monsoon after December 15 that is mostly after January, January, February, March and April this Fourmonth, we have shortage of rain. In addition, we have high evapotranspiration in Santa Monica Burnham because it is close to the equator. So once the islands are close to the equator because of sun rays falling exactly on overhead, you will have high evapotranspiration and you can see their land here. It is unrelated terrain. So, there are three factor which affects or decides the water availability one you have rainfall is less second you have high you have evapotranspiration, third you have high gravitational force because of terrain and because of this three reason, these islands are first water shortage for agriculture during the dry season that is starting from January February March sorry January February March and April and opposite to this. What happens from January June to December we have two monsoon seasons. We have plenty of rainfall. So from June to December we have southwest monsoon as well as Northeast monsoon. These two monsoon bring copious amounts of rainfall of more than 3000 millimeters so we have water logging during the season if you have a high tide because which occurs two times In a month, then you will have a spring tide also. So the dam has a lot of sea water inside the coastal areas. So, because of this one water logging under the sea water intrusion, you will have a salinity as well as sea water, water logging problem too and on the other hand during summer season you will have a dry condition. So, this is a typical problem we face normally. It never occurs in a mainland condition. Either you will have dryness or you'll have a water log here. You have dryness . You have wetland water logging as well as salinity. So, these three problems we have to tackle. apart from this your land availability is very limited. So, you cannot expand the land Unlimited, because we here forest all forest, most of all the forests almost are reserved for you cannot enter into the forest area. So you have only 50,000 hectare available for agriculture. So within this 50,000 hectare you have to increase the productivity and also the production so the options like efficient use of resources like water and land. So one one of the best things we found was based on our research

experience, and also had things happening elsewhere in the coastal areas of the world. We found that land jumping is one of the best methods you can go about and control the conditions.

Sharada: Dr. Murrugan, how different are the issues in Andaman Islands in comparison to say farming in mainland India, what are the solutions that could be best suited locally to Andaman Islands, considering the host of issues the island is facing?
Dr. Murugan: So, land surveying is nothing but you can see the pond what how you will see in India and elsewhere simply you will make a bund of one meter two meter, then they cut according to the requirement even you can go for three meter four meter also people go but in the coastal areas, you have again a limitation. So if you are cutting a pond of two meter three meter, I'm inverting the coastal sea water inside. So I have to be very careful not to cut the pond more than where you have a marine sediment. So once you encounter the marine sediment more than if you do it, then the salinity will increase the salt to invite the seawater into the agricultural land. So, you cannot do it. So, you ought to make a careful assessment of land shape mean to the terrain as well as the depth of the marine sediment.

Sharada: Could you please elaborate more on the land shaping method? What are the challenges in implementing this design of the islands? What are the various factors that are considered when you look at a solution like a land shipping method?
Dr. Murugan: Then you have to consider the farmer's land available to you also. So, some farmers may be having one acre, some farmers may be two acre. So, this is also there, So considering all these factors you have to have a brilliant one or two solutions to the farmers need also socio economic factors to consider one is you have a natural factor another is socio economic factor. Considering these two, we have devised different land shaping methods. One you have a broad bed and furrow system. And second you have a three day farming system then you have a Pond. You have a normal pond but this our landscaping we change the configuration of the bund as well as slope what we give so, that is called a broader dikes So, pond with a broader dikes So, that they can go for cultivation. So, all these three major landscapings are what I told me is a broadbanded furrow system farm pond with the broader dikes three day forming system, then you have a bird bird system. So, all these different landscaping methods are suitable for different farming situations. So, one of the best options we will select is for the farmer to implement it. So, once you choose the method, it is a land shaping method. So, you have to recreate the condition it is not just like Cut & fill the matter just like what we are putting a pipeline then we are cutting and filling So, that cannot be done here because in the bottom layer soil it may be saturated with the salty condition or it may be sulfur or some other toxic aluminum will be there. So, how do we create as such. So, cut the first motion top layer then you fill it then bottom layers to go to the bottom accordingly. Our We will make a plan for earthwork, then we will cut and fill methods. We'll do it as such we will recreate it, so that the amount of water required and also time required to reclaim the land will be very minimal. So, that is the design we make; second conservation is clay conduct and sand conduct. So, based on the clay and sand

conduct to give a slope so, if your land is more clay, you need to give more slope, if our land having more sandy, conditions are more than 40-50% sand is there less clay is there, then you have to give more slope, so that the structure is more stable. So, stability is more important at least the structures would last for four to five years, so that it is random relative to the farmer. So accordingly we have devised different methods and bund conditions also we decide whether we will do one is one slope or one is to 0.5 , positive slope or sometimes we will go one is to 1.5 percentage slope also. So depends on your conditions of the soil. So once we will go discuss with the farmer the field condition we will make a sample Surveys Soil Survey, then we will determine what is the depth we can go about it or is the bottom layers, then the proximity to the sea. So, all these based on the condition will decide what depth you can go on each and every condition. So, once you go about it, then the earthwork will be done, we will cut and fill methods, the same conditions are such that we will recreate the layers of soil there and will not be disturbed as such you will create. Then after making a fundraising at least we will raise one meter

Sharada: They try growing vegetables a few months after the tsunami, but due to high salinity nothing grew. There was some flowering but after that the plant withered away. But during heavy Cyclone water just cashed in, and he was forced to stack his hands on top of each other just so that he could save them. Can you stop the water from entering? He asks, though there are early warning systems. There is no point if we just know about it a few days in advance. The last thing we could do is put a blanket over the crop and cover them up.

"Khara Paani jaisa mere ghar k aage jo samundar hai. Toh khara paani toh automatically aayega. Jaise Humara zameen bhukamp mai jo hai dabb gaya aur samundra ka jo level hai, high tide hai woh 1 meter height hai toh uska paani automatically enter krega hi."

Sharada: Despite an average rainfall of 3000 millimeter annually, why do farmers suffer water shortage in summer? How do you formulate your land shaping method systematically when rainfall is becoming unpredictable in Andaman Islands?

Dr. Murugan: For that area if you have a terrain, you will take a peak amount of rainfall based on the historic record on the previous record, say particular you know single day you have maximum in andaman and record rainfall is around 15 to 20 centimeters in a single day which occurs in August and September. Based on this will estimate that What is the depth of flow of water. So, if the depth of flow of water during peak hour of rainfall is three three feet, if a particular terrain then we will devise it at least for four feet height of bund should be there, so that the crop is saved. So, this is the final criteria we will consider to raise the bund. So, if three feet of water is there, then you need at least four feet bund raised, so that the calf will not suffer waterlogged conditions. So, based on this we will raise the bund. So, once the bund iss raise the next a rainy season immediate rainy season, we will allow the water to percolate, the water goes down then it will Leach all the salts, soluble salts, salinity, whatever is other toxic substance like aluminum, sulphur and iron all these things get

leached out to the water. Then after this once the rainfall is over, we will have a pipeline to remove the water from the forest because as I said, all these landscaping you will have a water storage structure as well as raised bund So, this water will be removed in the next day or consecutive season we will remove the excess water during dry season and we will remove it out so that all the toxic substances will go out, then the next season again we will store the water at that time the quality of water will drastically improve. So, this water will be used for irrigating the crops. So, you are addressing two issues one during peak rainfall season you are through the bund you can raise the crop then you are harvesting the rainwater storing it and second thing initially you are leaching the toxic substances subsequently you are using the land for cultivation. The major advantage is water will be used not only for irrigation, but for fish culture, so that is very much in demand. So, farmers' income will be diversified. So, this is what we call agriculture activity diversification so that the stability and sustainability will be more so, this is why we use the water so we harvest the rainwater utilized for irrigation as well as gopher fish culture.

Sharada: Farmers in the pouring system as a more popular method of lunch In Andaman Islands, all the farmers that I spoke to were cultivating vegetables, as most of them were close to the sea and could not risk growing Paddy. The salinity went up and down and Paddy cannot grow in saline water. Many farmers reap the benefits of land shaping technique by growing vegetables and wearing fish. Tapan Mondal, a farmer set up the proper inference system for harvesting rainwater, and to grow vegetables through carry. This farm stands lush green today, there was radish spinach, brinjal bottle gourd chili, cabbage and two ponds full of water. There were tiny fishes swimming in the pond as when he talked about his changed farmland, post tsunami and now.

“Tsunami k baad kuch falta hi nahi tha aur apna zameen liya toh humlogo ka babu pehle teen bed bna k diya waha baigan ka fasal kiya toh accha munafa hua , humne dekha aisi zameen toh humesha kar nahi sakta barish hai. Toh apna poora zameen hum bed banaya dedh 2 lakh kharcha krke poora bed bnake hum sabji shuru kiya kyunki humko isme nafa hai humesha hum kar sakta baarish mai bhi dhoop mai bhi kyunki isme humko fayda hai, hum kar sakta. “

Dr. Murugan could you tell us about what will happen if farming is done on a land without any intervention in comparison to shaping the land for better income of farmers, what are the farming patterns and the crop plans farmers can follow to ensure sustainable income and water availability?

Dr. Murugan: Then for the Bund, if you are not doing any landscaping your land is as good as your barren land or waterlogged area. If you are raising the bund, Not one season you can grow vegetables. If you are a very intelligent farmer and are very educated and aware of the climatic condition you can go three three crops in a year. So our cropping intensity will be 300 percentage So, instead of one rice you can go for three vegetables. So, on an average in Andaman your vegetable cost will be around 50 to 100 rupees depends on the vegetable,

even if the farmer sells it for 30 to 40 rupees, it is highly lucrative for the farmer, if you are able to make three consecutive vegetable crops for short duration or long duration depends on the season. So, here you can go for cauliflower or you can go for bindi, you can go for brinjal, then you can go for chili and then short crops like Pollock, then greens then muhly that is either returning or root crops of short duration again go so our beans is very highly renewed rating it goes 100 rupees in the market during summer season. Then you have a cooker bit like snake gourd or gourd. All these gourds you can grow comfortably during the rainy season, then karela that is a bitter gourd that you can go during summer season. And other crops during the first season again growing. So, you can make a very good plan. Farmers should be aware of the cropping pattern and crop plan. So based on these you can go for three crops. So, on an average if you have a land shaping area of one hectare, only acre land, normally farmers will get 25 to 30,000 if you go for rice crop, but if you go for a land shaping method, after two years, he's going to get not less than three lakh rupees. So, including his labor, family labor charges, so around three lakh rupees, he will get the income, if you put these good investment and he's put labor he's going to get because you have a diversified agricultural business one, a barren land you are using for cultivation by landshaping, you are harvesting the water you are going for fish culture and you are going for growing crop for three season of different vegetable so that you will have a good sustainability. In addition to that if you are able to integrate animal components like poultry, duck, other animals, larger animals in some cases, we Doing research is a very good effect. We are getting the impact we are getting. That is going for the dairy unit. So, you can comfortably have two cows, you can grow in the bund and decide to slow fodder then you can sustain two cows. So, if you're putting a cow not less than one lakh rupees income you will get it. So, put together Finally, a net return of three lakh rupees is assured in Andaman condition if you go for a land shaping method. So, this is the technique we have device with then we have standardized then we have demonstrated to at least 220 farmers after this tsunami. So, now, this has been given to other Agriculture Department as our land department for upscaling and also this is one of the very good method for making your irrigation facility available to the field because in a low lying area, in Andaman condition, you have no other way of irrigating the crops, you have no bigger streams, you have no irrigation facility, you cannot go for dam you cannot go for a large check dam so only where you Utilize, every technology has to center around your rainwater harvesting. So, once you harvest the rain in different ways, then you can utilize it for the subsequent three to four months. And similarly you can go for a fish culture. So this diversified your business, then your instabilities increased. So this is what they're all about the land shaping method which we have standardized and we are upscaled for Andaman and Nicobar conditions.

Sharada: You were talking about geological changes and undermanned and the resulting impact on its landscape and ecosystem. Could you please elaborate more on that?

Dr. Murugan: In andaman during tsunami or even after the torso so it is in a highly earthquake prone zone, risk zone five it has been kept. But when an earthquake occurs in Andaman Nicobar it is mostly related to the below surface below surface are below the

ocean surface activities happening in the Java that is a trough is a there kind of Java trough. So once there is an upcoming magma Or a plate goes down. So, there is a counter effect in the island nearby. So, you have a plate. So, once your plate goes down then somebody gets up or once the plate goes up somewhere it gets low. So, because of this rising or sudden movement a plate only gets generated splashes of water. So, this generated you tsunami waves. So, that is one source of energy: your plate moment that is called plate tectonic is the source of generation of your tsunami waves and another is somewhere your plate will go down in the fault area. So in Andaman two things have simultaneously occurred during the last two 2004 tsunami. Some plates like South Andaman are gone down, up to one meter, it has been estimated and some plates likenoth andaman, the land has raised up to one to two feet some location, so we can see clearly some area the sea water has been withdrawn from the mangroves. So this mangrove is dying because no flesh of seawater will die and other sections of plate will happen in South Andaman because of the tsunami. We got land subsidence, like in Tamil Nadu you can see the coastal area like tutuguri & Rameshwaram and other these areas in the geological time has gone down because of subsidence, then some other area which may come up to balance these things similar thing happened here also. So, because of the sub students of land a larger sea water will come inside, where there is a rise of plates, the sea water will get withdrawn. So, this will have a consequential effect on the plants as well as the flora and fauna of that particular location which have occurred during the tsunami.

Sharada: Dr. Murugan, In one of your research papers, you've said that El Nino had an impact on Andaman Islands with erratic rainfall and even led to agricultural drought and flood. Could you talk a bit more about how rainfall patterns have changed over the years and how extreme weather and climate change is threatening the island?.

Dr. Murugan: In Andaman we have observed from 2012, We are facing more shortage of water during summer season that means you are Total number of rainfall remains the same, but the number of rainy days have come down initially from 148 to 150. Now, it does come down to 140 rainy days, but that too also there is a skewness of a distribution i.e. during summer season, our rainfall has come down during rainy season and rainfall has increased, but our total remains the same. So, within 3000 that means that we are facing more extreme events. So, extreme events means a very extreme rainfall of more than 10 centimeter in a day we are different classifications IMD has done it because of these extreme events or more drought dry days or more rainy days, this effect is that is one climate change effect. And second thing is your sea level rise because of global warming. So, there are two things we are facing. One is now at present we are facing shortage of water because of decreasing rainy days during summer season, but my total rainfall remains the same. Other thing is The island has started facing or in the future, it is projected to face that is sea level rise because of global warming, sea level rise of even a per year point one millimeter will generate more sea waves and means that during cyclonic stroke are during the high tide, more water will rise and it will cover more inland area that is a coastal area. So, more sea water is going to come inside the land during the high tide. And similarly, when

there is a cyclonic storm high when there is a high wind again it will generate a sea surge. So, this Cease also comes inside. So, these will have consequences of these climate changes, that is sea level rise will have consequences and effect on the existing sea. So just under a cyclonic storm, more water we can expect to cover more area. That means that you are bringing more water inside and salinity inside that is what the effect of climate change. Another I said is plate tectonics, which is mostly geological Related phenomena. It is not much related to climate change. So, Andaman is facing two problems, one is you have a geological related problem like blade movements and another is climate related problem that is shortage of water during dry season because of less number of rainy days as well as rainfall. And the second is climate related problem is you have a sea level rise these three things put together put this island in now vulnerable position. So, this is what we are addressing through land shaping, because climate change is a slow process, you have a time to adapt and adjust only you have to work and find a way but geological things are calamity you cannot do it anything about it like your tsunami under it comes in a flash of second. So, this you cannot add up much more. Only you can take precautions and preventative methods, but climate change definitely, by technology, we can adapt to. That is what your land shaping is going to help you so you are raising the Bund at least one meter if water comes up to two feet away three feet your land is safe enough. So, this technology helps to to adapt to the changing situation same like what do you tsunami brought to the receiver similar condition you can expect when there is a sea level rise that is what this technology we call it a climate resilient technologies adapt to the drought conditions adapt to the waterlogged condition, then adjust to the sea level rise or by seawave. So this is what this landshaping is all about helps to adapt to this condition.

Sharada: Though there were systematic scientific interventions that helped farmers across the Andaman Islands, there were a few simple things that innovative farmers like Sudhir Datta did after cyclones, the brinjal plant roots would loosen up. He along with his agricultural laborers, press that foot firmly on the soil. This fixes the plant on the soil so They do not collapse. This is done in the entire farm then we witness this on the day after Cyclone. Another unique feature in Andaman farm soil is the presence of seashells. The farmers spread seashells across the farmland to remove acidity from the soil. And the scientist says that this cannot be found anywhere else.

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