

## Hope in a Changing Climate

### 24 minutes

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[00:00:06.47] [MUSIC PLAYING]

[00:00:36.36] This is China's Loess Plateau. Until recently, this was one of the poorest regions in the country, a land renowned for floods, mudslides, and famine. But with the fanfare comes the hope of change for the better. My name is John D. Liu. I've been documenting the changes on the plateau for 15 years.

[00:01:04.57] I first came here in 1995 to film an ambitious project, where local people were constructing a new landscape on a vast scale, transforming a barren land into a green and fertile one. The project certainly changed my life, convincing me to become a soil scientist.

[00:01:31.51] The lessons I've learned in the last few years have made me realize that many of the human tragedies that we regularly witness around the world-- the floods, mudslides, droughts, and famines are not inevitable. Here on the Loess Plateau, I've witnessed that people can lift themselves out of poverty. They can radically improve their environment and by doing so, reduce the threat of climate change.

[00:02:01.78] [MUSIC PLAYING]

[00:02:17.56] When I first came to the Loess Plateau, I was astounded by the degree of poverty and degradation. And I wondered, how could the Chinese people, the largest ethnic group on the planet, and my father's, and my own ancestors come from a place that was this barren?

[00:02:37.62] China's Loess Plateau is a region that stretches for 640,000 square kilometers across north central China. Unspoiled valleys in neighboring Sichuan show us how it might once have looked. It's the sort of natural abundance that is necessary to support an emerging civilization.

[00:02:59.61] How could a landscape with such potential have been reduced to this? When Chinese scientists and civil engineers began to survey the area, they realized that several thousand years of agricultural exploitation had denuded the hills and valleys of vegetation.

[00:03:24.37] The relentless grazing of domestic animals on the slopes meant that there was no chance for young trees and shrubs to grow. The rainfall no longer seeped into the earth, but simply washed down the hillsides, taking the soil with it. Over millennia, this progressively destroyed the region's fertility.

[00:04:02.38] When this happens over an area as extensive as the plateau, millions of tons of silt are swept down into the Yellow River, which gets its name from the color of the fine, loose soil. The mounting quantities of silt clog up the river, impeding its flow, contributing to the floods

that give the river another name, China's Sorrow, in some areas creating floating mud mattresses that attract passing tourists.

[00:04:38.45] A local problem becomes a national problem. In the dry season, the light, unprotected soil is swept up in the winds, causing the dust storms that are blown over China's cities and beyond its borders. On the plateau, the researchers realized that progressive degradation of the environment trapped the local population into a life of subsistence farming. It's a process that has occurred throughout the world.

[00:05:09.65] But poor agricultural communities find themselves overusing their land in order to survive, depleting its fertility and further impoverishing themselves. One thing that became apparent early on is the connection between damaged environments and human poverty.

[00:05:30.78] In many parts of the world, there's been a vicious cycle. Continuous use of the land has led to subsistence agriculture. And generation by generation, this has further degraded the soils. The vital question we have to ask is, can this destructive process be reversed?

[00:05:51.10] 15 years ago, Chinese and international experts were confident it could be. They decided that to prevent further erosion, it was necessary to cease farming on certain key areas to allow the trees and shrubs to grow back. But this could not happen without the consent of the farmers themselves. They took some persuading.

[00:06:22.15] Of course, a lot of people didn't understand the project. They weren't thinking in the long term.

[00:06:33.20] They want us to plant trees everywhere, even in the good land. What about the next generation? They can't eat trees.

[00:06:56.39] What eventually convinced the local people was the assurance that they would have tenure of their land, that they would directly benefit from the effort they invested in the new project.

[00:07:15.81] The goal was to give a hat to the hilltops, give a belt to the hills as well as shoes at the base. The hats meant that the top of these hills had to be replanted with trees. The belts meant that terraces had to be built to be used for crop planting and also for trees. The shoes were the dams which we had to build, so that the hills could grow back to life, and our economy as well as our lives could improve.

[00:08:00.07] Hills and gullies were designated as ecological zones to be protected. Farmers were given financial compensation for not farming on them and keeping their livestock pinned up. When I first found Mr. Ta Fuyuan and his colleagues back in 1995, I had no idea this initiative could achieve such dramatic results.

[00:08:27.60] [MUSIC PLAYING]

[00:08:45.56] The effort that people put into converting their slopes into terraces has resulted in a marked increase in agricultural productivity. The higher yields are directly related to the return of natural vegetation in the surrounding ecological land. Now when it rains, the water no longer runs straight off the slopes.

[00:09:20.85] Trapped by the vegetation, it sinks into the ground where it is retained in the soil, taking weeks and months to gently seep down and irrigate the fields and terraces below. Restoration has occurred over an area of 35,000 square kilometers. The impact of such an enormous addition of vegetation goes far beyond the plateau itself.

[00:09:54.34] There's been a significant reduction in the soil rushing down into the Yellow River. As I've been traveling around the Loess Plateau, I've seen extensive changes-- the vegetation cover on the hillsides, on the tops of the hills, and down in the valley. Everything has changed. It's changed the lives of the people. And in fact, the people themselves have done this.

[00:10:22.32] Because they were the ones who changed their behaviors, terraced the fields, improved the soils, learned to protect the marginal areas. The changes are not simply on the hillsides. On the plains, you can see greenhouses that are filled with vegetables. This extends the growing season. It's very high-value produce.

[00:10:54.16] The abundance and variety of new produce can be seen in the local market. Follow-up studies have shown that incomes have risen threefold and scientists point to a more global benefit. Plants through photosynthesis remove carbon from the air, countering the effect of human greenhouse gas emissions on the climate.

[00:11:29.89] In terms of climate change, we can say that the project made a double contribution. Firstly, the project was successful in restoring vegetation on a large scale. So many trees and so much vegetation grew up and this definitely helped take carbon out of the atmosphere. And secondly, because the health of the Loess Plateau's ecosystem has been so much improved, the region will be better able to resist the negative impacts of climate change.

[00:12:10.67] As a result of its success, the lessons learnt from the Loess Plateau rehabilitation are now being applied all over China. But could such projects work elsewhere in less centrally controlled societies with fewer resources and different soils? Ethiopia, perhaps more than any other country, has come to symbolize the vulnerability of humankind to environmental catastrophe.

[00:12:44.35] This is a country whose problems have been increased by war and civil conflict. And now, human induced climate change is predicted to make matters worse. As on the Loess Plateau, centuries of subsistence farming practices have stripped the land of natural vegetation. The dry gullies bear the scars of flash floods. These gullies are evidence of the enormous power of runoff during the rainy season.

[00:13:17.24] Without vegetation cover on the hillsides when the rains come, the water doesn't soak into the ground, but flows away in a flood. Then it's not available for agriculture during the

rest of the year. This leads to drought and famously for Ethiopia, famine. But just as I've witnessed in China, there is hope that the situation here can be reversed.

[00:13:43.63] In just six years, Professor Legesse Negash and local villagers have transformed a severely eroded terrain by planting indigenous trees and plants. Almost miraculously, a clear flowing stream has emerged where once there was a muddy trickle. How is it that it's possible for you to get the stream to flow throughout the year?

[00:14:10.59] It is because of the vegetation cover which has been regenerating on this mountain. This water is maintained in the landscape, because as soon as rain falls on the canopy on this vegetation, that rain then infiltrated gradually into the ground, ending up with this steady flow of this river. Water is life. Without water, nobody can do anything. I'm amazed. As short as five years, six years, you get clean water like this, provided you work hard for restoring this degraded landscape.

[00:14:56.09] About 1,000 kilometers further north in the village of Abraha Atsbeha, another near miraculous phenomenon is occurring. Farmers are finding water at the bottom of their wells, despite the poor rains this year. The famine of 1984 struck the people of this valley very hard. Many migrated. Many died. Now, the people are returning. The village chairman, Gabre Giday, remembers well how life used to be.

[00:15:32.51] 10 years ago, I'd say-- even five years ago, I'll tell you what the situation was. It was absolutely terrible. The sun, the drought, the wind-- it was all dry like the desert. There was a refugee program for our village, so we had a choice-- leave the valley or do something.

[00:16:00.27] With government support, they applied the same principles as the Chinese, setting land aside for natural vegetation to return. In the ravines, they built small dams which are now fed by underground springs. And like Professor Legesse's stream, rain that fell weeks ago now slowly seeps through the subsoil, replenishing the supply of water.

[00:16:36.18] The eroded land has become fertile. It's changed for the better. In the drought, our fruit trees dried up. Now, they're coming back and we're growing even more varieties. These are the real benefits we see. We have food security and our children can go to school. Our lives have improved. We no longer need to beg the government for aid, thanks to the changes that we have made. Even wild animals which disappeared are returning, even the leopards.

[00:17:21.33] These villagers are now better able to withstand the impact of climate change. With international assistance, their achievement could be repeated across the country. The benefits, as Professor Legesse points out, would spread far beyond Ethiopia's borders.

[00:17:38.49] The most important issue for Africa-- and I consider this Africa's [21st ?] burning issue is restoration, no matter what we do. We might be good at rocket science, I mean if we are nuclear science. But the environment restoring this huge, vast landscape-- in our degraded landscape-- is critical for Africa, particularly for Ethiopia. Half of Ethiopia is mountain, and this mountain system is degraded.

[00:18:13.09] And this degradation of this huge landscape, huge mountain chain of Ethiopia is critical not only for Ethiopia, but also for the entire region. Consider Egypt. Look at the Sudan, where 86% of the Nile flows to these countries. How can you support life in Egypt without restoring Ethiopia's mountains? So this is regional, national, and international.

[00:18:45.87] Environmental degradation is not only a problem for the dry regions of Ethiopia. It can be just as devastating for countries like Rwanda where rainfall is plentiful. This tiny country is grappling with the problem of a growing population, trying to eke out a living on a finite amount of land.

[00:19:07.95] As in China and Ethiopia, over farming on the hillsides caused serious erosion and a decline in fertility, forcing poor farmers to move into protected areas, such as the Regezi wetlands, a wildlife site of international importance. When farmers drained this marsh to try to grow more food, they not only damaged an important wetland ecosystem, they also had a significant impact three hour's drive away in Kigali, the capital city.

[00:19:40.40] The water that pours from the marsh lands is a vital source of hydro-power for Rwanda's capital. As the wetlands began to dry out, power stations below couldn't generate enough electricity. The Rwandan government rented diesel power generators to make up the shortfall. Dr. Rose Mukankomeje took me to see it.

[00:20:09.02] So what is happening here is that those generators-- we are renting them from the company. And we are [INAUDIBLE] rented them, especially when we degraded the wetland and we lost 20 megawatts for our electricity. And to run those machines, we're paying \$65,000 [INAUDIBLE] a day.

[00:20:31.58] \$65,000 a day. That's multi-millions of dollars per year.

[00:20:35.76] Yes, it is multi-million dollar. And as you must-- might know, Rwanda is not a rich country. Some of that money has been borrowed from the bank and from taxpayers.

[00:20:49.11] How does this affect the climate?

[00:20:51.42] Of course, there's machines. They are run [INAUDIBLE] diesel. And when you're buying the diesel, you are producing greenhouse gases.

[00:21:02.03] Environmentally damaging and more expensive, locals had to pay three times as much for their electricity. So government policymakers focused on how to restore the Regezi wetlands. If people were the problem, they could also be the solution.

[00:21:24.16] We had to take a careful look at what had actually been happening that damaged this system. And therefore, had to reverse that again with a human action. And this [INAUDIBLE] is important to look at how human actions can destroy or can reverse what has been destroyed, or even protect our environment.

[00:21:55.21] The government decided to help the farmers leave the wetlands and to restore the degraded slopes above them, improving their crop lands and encouraging trees and shrubs to grow back, capturing the rain.

[00:22:10.48] We have been supporting them by doing terraces, specifically there on the hills, where they can increase and improve the productivity. The most important thing is to have people with you on your side.

[00:22:36.99] The wetlands are now recovering. Great volumes of water once again cascade down to power the hydro stations. Carbon-free electricity is replacing the diesel generators. Electricity prices have stabilized. Restoring and preserving natural ecosystems like the Regezi wetlands benefits everyone and so much more could be achieved.

[00:23:04.39] If we had more involvement by different institutions coming in to help with our valuable resources, Rwanda could do more-- much more and benefit much more, but so in other countries if such a partnership sends support where provided.

[00:23:26.81] What the Rwandans recognized is that the marshlands are far more valuable as a natural system providing water for energy than as farmland. This principle is the same for the remaining hillsides and ravines. What we're seeing here is very interesting, because it's a line between human activity and natural systems.

[00:23:51.77] And in the human activity, we've been able to value the productivity from agriculture and give it a monetary value. But in the natural systems, we haven't been able to value the trees, the biodiversity, the water that's absorbed into the biomass and into the soils. And there's another vital service that trees and plants provide-- photosynthesis. Vegetation reduces the greenhouse effect by taking carbon dioxide out of the atmosphere.

[00:24:26.81] Climate change is better withstood with trees. Humans-- no matter how intelligent we are, no matter how capable we are with all our technologies, we are helpless in the face of climate change. We have not yet properly understood the miracles performed by trees.

[00:24:55.19] A measure of what restoring nature can do has been shown here on China's Loess Plateau, where farmers have continued to prosper, despite the worst drought in decades. Since the beginning of the project, the soil that nurtures their crops has been accumulating organic material from plants and animals.

[00:25:20.74] This holds the moisture and contains carbon. What's interesting about this is all these root materials, all this other stuff-- this is organic material. And this organic material is mixing together with the loess, the geologic soils here. And it's making a living soil.

[00:25:40.84] This is where the moisture resides. Yesterday it rained and there's still moisture in the soil. This is where the nutrients are recycled so that each generation of life emerges here. And this is where the carbon is. What's interesting about this-- they made this field. This is new.

[00:25:59.26] So they are helping to sequester carbon. Living soils like this retain on average three times more carbon than the foliage above the ground. If we were to restore the vast areas of the planet where we humans have degraded the soils, just think what an impact we would have in taking carbon out of the atmosphere.

[00:26:24.85] As much as a quarter of the world's landmass has been degraded. And much could be rehabilitated in the way we have seen on the Loess Plateau. And we've only just begun to recognize the real value of natural capital. Surely investing in the recovery of damaged environments is a cost-effective way of solving many of the problems we face today.

[00:26:50.39] Why do we not invest an equal amount, if not more, into a shovel-ready technology, so to speak, which is nature's way of sequestering and storing carbon? It is actually by investing in our ecological infrastructure and ecosystems and expanding the ability of nature to sequester and store carbon that we have the greatest opportunity to do something. And the wonderful thing is it's not only carbon sequestration.

[00:27:17.22] We're also faced with a loss of ecosystems that will affect our food security, our water security. We are losing species on an unprecedented rate. So maintaining, restoring, protecting expanding natural ecosystems has multiple benefits, immediate in terms of climate change, but also fundamental to the future of many of the services that we simply take for granted from nature.

[00:27:46.29] My hope is that the developed countries-- those most responsible for climate change-- will recognize the enormous potential of restoration. What we've seen in China, in Africa, and around the world is that it's possible to rehabilitate large-scale damaged ecosystems.

[00:28:06.68] If we can transfer the capital, the technology and empower the local people to restore their own environment, it'll have enormous benefits. Restoration can sequester carbon, reduce biodiversity loss, mitigate against flooding, drought and famine. It can ensure food security for people who are now chronically hungry. Why don't we do this on a global scale?

[00:28:31.46] [MUSIC PLAYING]