

Lessons of the Loess Plateau

50 minutes

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[00:00:04.96] [WATER RUNNING]

[00:00:17.36] [NON-ENGLISH SINGING]

[00:00:35.22] People on China's Loess Plateau were among the earliest adopters of settled agriculture, approximately 10,000 years ago. They worked hard and over time, created one of the most accomplished civilizations the world has ever seen. But their history also illustrates the impact that human beings have had on the Earth.

[00:01:12.31] Degradation of the land has led to biodiversity loss, fresh water stress, food insecurity, long-entrenched poverty, and even climate change. Their descendants' efforts to restore the environment are now revealing solutions to many of the fundamental problems that our world face.

[00:01:41.88] Attention must be paid because in many ways, for China and for the world, ensuring a sustainable future will depend on how well we learn the lessons of the Loess Plateau.

[00:02:16.45] High up in the Tibetan Plateau in what is now China's Qinghai province, a river once known as the Mother River, begins.

[00:02:32.72] The river runs from west to east, south of the vast Mongolian Steppe. It was here, along this river that several tribes emerged.

[00:02:45.85] One tribe was extraordinarily successful. This is the birthplace of the Han race-- the ethnic group to which the majority of Chinese people belong.

[00:03:01.28] Stretching over 640,000 square kilometers and encompassing parts of seven different Chinese provinces, the Loess Plateau is approximately the size of France.

[00:03:15.56] The plateau gets its name from its most abundant feature-- loess is a sedimentary soil that was created by glaciers moving in the high Himalayas and deposited by wind on the plateau below over geologic time. In places, the loess deposits can be hundreds of meters thick.

[00:03:41.42] When there is normal vegetation cover providing organic matter in the soil, loess is very fertile. And if you dig in certain parts of it, you're sure to strike history.

[00:03:57.90] [MUSIC PLAYING]

[00:04:09.95] The plateau at one time must have been a wonderfully nurturing place. This forest is in Sichuan, just to the southwest of the Loess Plateau. This grassland is part of the Mongolian Steppe to the Northeast of the Loess Plateau.

[00:04:31.82] These ecosystems were once contiguous and it was a pristine mixed forest and grassland ecosystem that gave rise to the most populous ethnic group on the planet.

[00:04:49.59] There is evidence that humans and their ancestors have lived on the Loess Plateau for a million and a half years. Many believe that the plateau is second only to Mesopotamia, in the spontaneous development of agriculture.

[00:05:10.04] For many millennia, the Loess Plateau was the center of power and affluence in ancient China. The Han, the Qin and the Tang dynasties were all based here. But as the civilization grew, so did the demand for natural resources.

[00:05:30.87] At the same time as the art, the architecture, and great wealth was being amassed, the seeds of destruction were being sown in the deforestation of the land and the continuous use of destructive agricultural practices.

[00:05:47.67] [GONG]

[00:05:58.48] Eventually, the forests were gone.

[00:06:03.53] When the people began to cultivate the hillsides, the productivity began to decline. They responded to this by relying more and more on herding sheep and goats in large numbers with disastrous results.

[00:06:25.21] By 1,000 years ago, the wealthy and powerful had long since left this area, ending an era in Chinese history.

[00:06:51.88] In 1995, when we began our documentation of the Loess Plateau, we found a landscape that was virtually denuded of vegetation. Enormous gullies that ran thick with eroded soils when it rained had earned the plateau the dubious honor of being the most eroded place on Earth.

[00:07:18.23] Over time, we learned that the fundamental ecological systems on which life depends had collapsed, leaving millions of people in a cycle of poverty and ecologic destruction that passed from generation to generation.

[00:07:37.37] [NON-ENGLISH SINGING]

[00:09:10.25] Shaanxi province is right in the heart of the Loess Plateau and Hojaigou is typical of remote villages there. Life here, for as long as anyone can remember, has been one of suffering and poverty.

[00:09:24.89] Liu Deng Fu's life has often reflected that suffering. When Liu was young, his family fled famine in the north to settle in Hojaigou. His father hoped that food would be more plentiful in this remote place.

[00:09:42.22] [NON-ENGLISH SPEECH]

[00:09:56.90] Within a few years after the family arrived, his mother and his little brother both died.

[00:10:06.40] [NON-ENGLISH SPEECH]

[00:10:07.64]

[00:10:28.87] When Zhang Fang married into the village as a young bride, she first lived in a traditional cave dwelling.

[00:10:37.86] [NON-ENGLISH SPEECH]

[00:10:51.51] Every day, Zhang Fang had to work in the fields from early in the morning till late at night and then, she still had to care for the animals and look after her children.

[00:11:04.30] [NON-ENGLISH SPEECH]

[00:11:33.19] The early 1960s in the Loess Plateau was a desperate time. Millions suffered. Li Shou Fu's family also came to the area in the hopes of a better life.

[00:11:47.34] [NON-ENGLISH SPEECH]

[00:12:07.07] Year after year, floods and droughts destroyed the crops and with them, they Li family's hopes.

[00:12:14.28] [NON-ENGLISH SPEECH]

[00:12:44.01] Exactly what causes a place that was once bountiful to become so degraded?

[00:12:52.10] What has happened here is that originally, you had a complete vegetation cover with a fully intact hydro cycle. All the rainfall that fell down stayed where it was initially. It slowly infiltrated into the ground, was absorbed by the root system, went into the groundwater, and eventually, drained into the Yellow River over a long period of time-- hundreds of days between a rainfall event and by the time the water ended up in the Yellow River.

[00:13:15.59] As the vegetation cover was removed gradually, the runoff increased dramatically-- every century, every decade-- to the point now when it rains, 95% of the water immediately is lost to the environment where it's coming down. Immediately it runs off in the gully, takes a lot of the topsoil with it, and ends up in the Yellow River.

[00:13:39.35] So you have a situation where literally, 95% of the water is gone and this is the reason why this area is so dry. Why the rainfall has been decreased. Why the vegetation cover can hardly be sustained right now because everything is so dried up.

[00:13:58.53] These are the conditions in which huge dust storms for affecting vast areas-- as these satellite images show. The consequences of this are felt by everyone.

[00:14:18.56] The storms cause disruptions for cities like Beijing and contribute to climate change by allowing sunlight to penetrate, but trapping the heat.

[00:14:33.71] There is also massive impact to the river system downstream. On average, 1.6 billion tons of sediment clog the river from degraded lands. The phenomenon is sufficiently strange that it even attracts tourists.

[00:14:56.96] But for the millions of people living in the Yellow River Basin, the sedimentation is more a source of fear than curiosity.

[00:15:08.75] What started as a tiny trickle when settled agriculture began, over time increased until it became a raging torrent. Over 1,500 times in recorded Chinese history, the Yellow River has breached its banks, flooding the plain, and leaving destruction and suffering in its wake.

[00:15:37.44] When the river flooded in the rainy season without normal infiltration, it often meant that there was drought in the rest of the year. And with drought came famine.

[00:15:59.98] This cycle of flooding, drought, and famine on the Loess Plateau became well-known as China's Sorrow.

[00:16:18.61] In order to address these problems, a team of Chinese and foreign experts was assembled in the mid-1990s, to design and implement the Loess Plateau Watershed Rehabilitation Project.

[00:16:34.07] Now when we came to this place in the Loess Plateau the first time, we were all really shocked. We thought, oh, my god. How can anybody try to rehabilitate an area that is so huge and so fundamentally destroyed ecologically?

[00:16:53.51] And the truth is, we spent two years working with the local people, with the farmers, with the local officials, with the experts in the various fields of hydrology, [INAUDIBLE] water conservation, forestry, agricultural, environment-- try to understand what it would take to do something like this. And after two years, we still didn't have many answers. The World Bank didn't have the answer. And the local people didn't have the answer.

[00:17:18.48] And we spent another year and a half talking to the farmers in the villages, trying to understand what they had done in the past 20 or 30 years that was successful. And it was really interesting-- not much was there to show because the current practices at that time were just not sustainable at all.

[00:17:43.52] Perhaps, the most destructive practice was the unrestricted herding of goats and sheep.

[00:17:50.24] For decades and centuries, this area has been heavily grazed by sheep and goats. There was no management structure. People just when out, increased their animal numbers, and grazed whatever grass they could find. And when they wanted to do it.

[00:18:05.68] And it got to a point-- in the beginning, this was not a big issue because there was a lot of area around, but by the time the population density was high and the animal numbers were so large, all of a sudden, you had this turning point where the vegetation began to disappear. Even if you graze hard in the beginning, it doesn't mean the vegetation disappears.

[00:18:26.18] But if you overdo it, all of a sudden, you begin to really lose it. You lose the vegetation because the goats get to the point where they pull the grass out with its roots. And in many of the project areas, the vegetation cover was down to 10% where previously, this was a forest, natural grassland in a completely intact ecosystem.

[00:18:52.93] To undertake something so complex and so massive, requires very careful planning. The planning team evaluated the plateau from both a macro and micro perspective.

[00:19:11.13] The macro perspective was achieved by using geographical information systems to map the entire plateau and by giving each watershed an unique address. The micro perspective was acquired by participatory assessment that was then compiled into databases to learn exactly what the local people understood and what had worked in communities that had more success in protecting their environment.

[00:19:48.48] And over three or four years, we designed together with the local people-- it was a very active involvement-- a package which you can apply in a small watershed, which on the one hand, helps the farmers to improve their incomes and their lives. And on the other hand, restores the ecological environment.

[00:20:12.20] Gradually, principles began to emerge. In the hilly land, the experts determined that any slope over 25 degrees was unsuitable for agriculture because whatever could be produced on this land would be worth less than ecosystem function that had been lost.

[00:20:33.80] [NON-ENGLISH SPEECH]

[00:20:36.44] This led the authorities to designate areas where farming was forbidden. Where the land was allowed to return to a more natural state. Combining this principle with geographical information systems allowed for the mapping of individual fields and areas that could and should be returned to natural ecosystem function.

[00:21:05.52] However, we found some places-- we found some villages where certain things had been done successfully. And we looked carefully and we tried to understand what it would take to scale this up.

[00:21:19.38] By analyzing the few more successful villages, the team determined that several traditional practices would have to end. New policies were formulated banning tree cutting, planting on hillsides, and the free-ranging of goats and sheep.

[00:21:49.13] One thing that the project learned was that you can't just work where the conditions are good, but that you must go to the worst place.

[00:22:00.84] In the northern part of the plateau where rainfall is very low, shifting sands were a major problem that could overwhelm agricultural or natural lands. In these cases, dune stabilization was required to stop the desert from growing.

[00:22:18.60] [NON-ENGLISH SPEECH]

[00:22:19.96]

[00:22:45.24] Ensuring that the local people understood what was being proposed became an important early part of the project. This was not always easy.

[00:22:56.56] [NON-ENGLISH SPEECH]

[00:23:37.82] The leaders explain the policies and the people discussed how this would affect them.

[00:23:48.99] [NON-ENGLISH SPEECH]

[00:23:54.86] There were several sensitive issues and first among them was land use rights.

[00:24:01.88] And the first key policy I would talk about is the land use rights for the farmers. If the farmers build a terrace and they don't own that terrace, they will not take care of it. They will not invest in the terrace. And it will wash out the first time there is a major thunderstorm and it's a failure.

[00:24:17.67] So what we have done and will be focused on together over the past 10 years is getting these policies right and implementing them on the ground-- not on paper, but in the village. Village by village, every household in this project has received a long-term land use contract for every single piece that was invested in this project. Every terrace that you see, every tree planting area is contracted to a household and they are responsible for it. That is the first part of sustainability and it's an absolute keep up.

[00:24:48.11] Dividing the land affects the people's lives for years to come. It is crucial that it's done transparently.

[00:25:00.17] In the Loess Plateau, the local people themselves determine the division and entire communities participated to ensure that the land was fairly divided. Receiving land use contracts and being paid for their labor were powerful incentives.

[00:25:18.92] Once it was understood that they were the direct beneficiaries of the improved land and the new sustainable agricultural methods, the people's participation became the central part of the project.

[00:25:36.00] Every field created was contracted to individual farming families, giving them both rights and responsibilities. By bringing effective administration to remote areas, the project helped to introduce modern management systems to communities that had relied on unsustainable traditions for generations. This addition was one more step that helped the people toward a sustainable future.

[00:26:14.74] One of the most common arguments against change is that poor people are so focused on survival, they can't think about sustainability or environmental conservation. In order to help the local people make the transition, the Loess Plateau Watershed Rehabilitation Project hired them to implement new practices.

[00:26:42.18] Although historically, the people's destructive behavior had been the cause of much of the degradation, the project made their work central to restoring ecological balance. In short, the people became the solution.

[00:26:59.85] [WHISTLE]

[00:27:03.27] [MUSIC PLAYING]

[00:28:00.91] In what is undoubtedly one of the most ambitious development projects ever attempted, in a decade, the Loess Plateau Watershed Rehabilitation Project directed approximately \$500 million over an area the size of Belgium.

[00:28:21.88] The differentiation of ecological and economic land became real when investment began to flow to improve the economic land. Entire communities being paid for their labor reshaped the devastated gullies, terracing the land to provide flat fields.

[00:28:42.65] The people benefited from the income provided for their work by learning new sustainable farming methods and from owning the outputs from the newly created agricultural lands.

[00:28:59.56] While productivity and income were the main incentives for individuals, the project's impact went far beyond this. The project scale, with an active project area of 35,000 square kilometers, made it possible to affect ecosystem health.

[00:29:22.64] Over a period of a decade, the people of Hojaigou and hundreds of other communities began to see their lives transforming.

[00:29:33.97] [NON-ENGLISH SPEECH]

[00:30:10.94] Long used to hard work, the people found that when their efforts were directed toward creating a sustainable future, they were able to improve both the ecology and the economy.

[00:30:28.03] We've always looked at this as a dual objective, which has to be achieved simultaneously. You cannot achieve one without the other. And so the project had to be balanced, and that's what we have-- I think-- achieved and this is the reason why this has become so successful.

[00:30:46.69] Although for many centuries the plateau has been considered almost as a desert, the fact is that the region receives on average, between 250 and 800 millimeters of rainfall per year. Sufficient at the low end for functional grasslands and at the high end, even for climax forest ecosystems.

[00:31:13.16] An early part of the project was to build small dams that could capture and hold the rainwater during the rainy season. Without this measure, the water would have continued to run off in floods, taking yet more topsoil with it.

[00:31:30.92] As vegetation cover is restored, the entire area becomes actively part of a functional hydrological cycle. With water being absorbed and stored in plants and in organic matter in the soil, evaporation and respiration rates are then altered, increasing the humidity in the soil and in the air.

[00:32:00.01] Nature is a system with many interconnected parts. Even the lowliest grasses serve to provide ecological function. In restoring the plateau, both the grasses and trees play an important role.

[00:32:22.60] Trees and humans have co-existed since the beginning of time, but the relationship has not always been equal. The project is actively working to rebalance this and has stimulated new transplantation technologies with high survival rates and immediate ecological benefits.

[00:32:48.65] In the Loess Plateau, once vast forests were gradually removed and their loss began the process of degradation that led to the ruin for which the plateau became known. A major part of the rehabilitation is to restore the forest cover.

[00:33:14.40] [MUSIC PLAYING]

[00:34:07.48] The Loess Plateau Watershed Rehabilitation Project planted a very large number of trees. The power of nature to restore itself was apparent and awe-inspiring.

[00:34:28.86] This is Hojaigou village when we first visited. And this is the same valley 10 years later.

[00:34:48.11] The people of the Loess Plateau are proving that it is possible to rehabilitate large-scale damaged ecosystem, including returning ecosystem function that had been lost over broad areas and long periods of time.

[00:35:07.90] This is of enormous significance as it is exactly the knowledge that is needed to repair ecological damage on a planetary scale.

[00:35:29.32] This is not limited to a single village, but it's happening over a very large area. The vegetation and tree cover is returning and encouraging biodiversity. There are now many more plant and animal species on the plateau.

[00:35:56.19] The roots of the plants and the annual accumulation of decaying organic matter is helping stabilize the soil. The improved soil structure and vegetation cover helps naturally infiltrate and retain water during rainfall, reducing the threat of flooding, drought, and dust storms. And beginning to restore a more normal water cycle.

[00:36:31.87] Gradually, fertility that had been leached from the soil is returning. This, in turn, affects the ability of the land to produce crops. And significantly, all the vegetation and the soil organic matter fixes carbon, helping to offset emissions of carbon dioxide. Reducing human impact on climate change.

[00:37:02.25] The principles being demonstrated are being carefully studied and are informing policy and actions throughout China and beyond. And the benefits are not simply ecological, they're economic, as well.

[00:37:24.26] New categories of products have emerged, including fruit trees. Already a significant supplier to the large and growing domestic market, the growth trend suggests that the Loess Plateau will soon be a major global supplier.

[00:37:39.59] [MUSIC PLAYING]

[00:37:51.89] Greenhouses are extending the growing season, reducing water stress, and allowing increased vegetable production and income.

[00:38:07.43] Sedimentation storage dams are using the power of erosion to fill in the bottom of many gullies, creating flat fields suitable for grain and other annual crops.

[00:38:24.21] Sheep and goats have been a principal protein source and income generator on the plateau for generations. When free-ranging goats and sheep was banned, it was crucial to find an alternative. Pen-feeding provided this and allowed increases in animal protein without the destructive consequences to vegetation cover and soil stability.

[00:38:58.76] Incomes on the plateau have steadily risen. And the expectations of the people have, as well.

[00:39:07.85] [MUSIC PLAYING]

[00:39:16.17] Reversing many generations of decline, now on the Loess Plateau people don't think that their lives are just going to grow worse. They believe and are preparing for a better life.

[00:39:33.60] [NON-ENGLISH SPEECH]

[00:39:52.76] [NON-ENGLISH SPEECH]

[00:40:09.39] [NON-ENGLISH SPEECH]

[00:40:22.01] [NON-ENGLISH SPEECH]

[00:40:40.52] [NON-ENGLISH SPEECH]

[00:40:46.82] [NON-ENGLISH SPEECH]

[00:41:18.43] Perhaps, the greatest changes for the children of Loess Plateau. Because the cycle of poverty and ecologic destruction has been broken, they have the opportunity to build a better and more sustainable future.

[00:41:56.58] Back in Hojaigou, Liu Deng Fu has seen life come full circle.

[00:42:03.88] [NON-ENGLISH SPEECH]

[00:42:39.51] [MUSIC PLAYING]

[00:42:47.74] The improvements have meant that Liu Deng Fu has been able to provide a more stable life for his family.

[00:42:53.47] [MUSIC PLAYING]

[00:43:00.19] [NON-ENGLISH SPEECH]

[00:43:12.11] Li Shou Fu's capacity for hard work has served him well.

[00:43:17.28] [NON-ENGLISH SPEECH]

[00:43:18.55]

[00:43:30.50] Every day, he walks up the hill to his apple orchard.

[00:43:34.43] [MUSIC PLAYING]

[00:43:52.61] [NON-ENGLISH SPEECH]

[00:43:53.84]

[00:44:36.83] [MUSIC PLAYING]

[00:44:43.99] And there's a lot more food.

[00:44:54.76] Before the project, Zhang Fang lived below the poverty line. Her income was only 500 to 600 yen per year.

[00:45:02.56] [NON-ENGLISH SPEECH]

[00:45:03.97]

[00:45:40.51] Zhang Fang has earned enough to build a new house with electricity and running water. And to prepare for her new daughter-in-law's arrival.

[00:45:51.93] [MUSIC PLAYING]

[00:46:47.41] The implications of the rehabilitation of the Loess Plateau go far beyond China's borders. In many countries, there are large degraded ecosystems and millions of poor people.

[00:47:05.65] As we learned on the Loess Plateau, the reasons for both the poverty and the degradation are often, simply destructive human behavior. And wherever on Earth this happens, it will result in the loss of ecological function and the loss of fertility productivity and income for the local people.

[00:47:38.23] It will also have downstream regional impacts like flooding, mudslides, droughts, and dust storms. And it will even have global impacts like climate change.

[00:47:48.71] [MUSIC PLAYING]

[00:48:08.38] The world's population is growing by \$1 billion people every 12 years. We must face this future and we will face it, either with functioning ecosystems or with degraded ones.

[00:48:31.91] It's our choice, in part, because through the courage and hard work of the people of the Loess Plateau, we know that it's possible to rehabilitate large-scale damaged ecosystems.

[00:48:49.90] All of the people alive on the planet at this time face an unprecedented challenge. Climate change is showing how much all of us are interdependent on each other and how much our common future depends on our ability to work together and treat everyone with equality.

[00:49:15.39] Perhaps, for the first time, we can easily see that the interests of everyone on the Earth are now the same. The health and sustainability of future generations, of the wealthy throughout the world, and the poor wherever they are, will depend on functional ecosystems on a planetary scale.

[00:49:41.43] This seems to be the knowledge that determines whether civilizations survive because they ensure the sustainability of their ecosystems or they disappear because they allow their ecosystems to collapse.

[00:49:58.29] [MUSIC PLAYING]

[00:50:03.58] By applying the lessons of the Loess Plateau, it may be possible to restore many, if not all, of the places that have been historically degraded by human beings. If we accept the challenges before us and act immediately, future generations will look back on this time with affection and appreciation.

[00:50:29.87] It's our choice and the Earth's hope.

[00:50:36.97] [MUSIC PLAYING]