Research Progress of Soil and Water Conservation in Pisha Stone Area of Yellow River

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Abstract. Ecological degradation and serious soil erosion in the sandstone area of the Yellow River Basin have resulted in a large number of manpower and material resources during the decades-long governance process, and various governance measures have been developed. This article introduces the erosive sandstone area and the existing erosive sandstone erosion control technology, analyzes the methods, materials, and treatment effects of the slope top-slope surface-ditch, and then focuses on the ecology of the Ordos Plateau volcanic sandstone area undertaken by the Yellow River Hydraulic Research Institute. Comprehensively consider the governance technology project, and on the basis of this project, it is envisaged to introduce the concept of buffer zone, in order to provide more research ideas for sandstone governance.

1. Introduction

The Yellow River, the mother river of the Chinese, originates from the Bayankela mountain in Qinghai province and flows through 9 provinces of Qinghai, Sichuan, Gansu, Ningxia, Inner Mongolia, Shaanxi, Shanxi, Henan and Shandong. The river is also known as the world sandiest river because it carries a lot of sediment with it as it flows through the loess plateau in the middle. The main source of coarse sediment in the Yellow River is the sandstone area of 16,700 km² in the shann-shann-mongolia border area, which is centered on banner in ordos city, Inner Mongolia. Among them, nearly 100 million tons of coarse quicksand are deposited in the lower reaches of the lower Yellow River, which not only significantly reduces the channel's flood discharge capacity, but also poses a great threat to the lives and property of people on both sides of the lower Yellow River. Therefore, how to harness the soft sandstone area and effectively solve the serious problem of soil erosion in the area is the focus of the study on the control of the Yellow River and the elimination of the threat to the downstream people. For this reason, different methods and techniques have been developed in the treatment of sandstone area for decades. The following will introduce the sandstone area and its treatment measures.
The soft sandstone area is a special rock in the Ordos plateau of China, with a total area of 16,700 km². It is concentrated in the Inner Mongolia autonomous region of the Ordos city of Dongsheng district, Jungeer Banner, Jincheng Banner, Dalat Banner, Hangjin Banner, in Shaanxi Province of Shenniu, Fugu County, Shanxi Province of Hequ, Baode County, Inner Mongolia of Qinghe County sporadically. Due to the perennial wind, water, and gravity erosion in the northwest, there are three types of areas, covering soil, covered sand, and exposed sandstone, in which the area covered by soil accounts for 50.2%, and the area covered by sand and exposed sand accounts for 22.2% and 27.6% respectively. The soil erosion in the covered area was dominated by water erosion, and water erosion, wind erosion, and gravity erosion occurred alternately. The gai sand area is a sandstone area formed by the influence of wind and sand in Kubuqi Desert and Maowusu Sandy Land. The exposed areas are mostly hillock hills with high gully density, large and exposed bedrock area, very low vegetation coverage, soil erosion is mainly water erosion, and serious compound erosion. Why is the erosion of such a large soft sandstone area so serious? From the geographical environment, the soft sandstone is concentrated in the north of the loess plateau. In northwest China, the wind is strong, the drought is abnormal, the environment is bad, and the vegetation is difficult to grow. In addition, the rainfall space and time distribution is uneven and the heavy rain in summer is continuous, plus due to the lack of vegetation protection, long-term water erosion, resulting in ground disintegration and serious soil erosion. Look from the rock structure, arsenic sandstone rock forming minerals are quartz, feldspar, calcite and montmorillonite, etc., and property stability of quartz content is low, the water is easy to the expansion of the montmorillonite and weathering of feldspar content is higher, water erosion and weathering erosion makes arsenic sandstone easily happened, plus the Na₂O, K₂O, CaO and other unstable chemical composition, the structure of the arsenic sandstone is destroyed, the corrosion resistance was weakened.

2. Treatment Measures of Sandstone Area
Since its founding, growing ecological civilization construction in our country, sand preventing greening the motherland continuous progress, especially after the reform and opening-up policy, state support for the work of scientific research, arsenic sandstone areas have been included in the national ecological environment construction and soil and water loss control key area, gradually makes how governance arsenic sandstone areas became a hot issue of soil and water conservation and management of the Yellow River. After decades of exploration and research, biological, engineering, plant flexible dam and anti-erosion and pro-growth measures have been formed.
(1) Biological measures
The biological measure is to control the soft sandstone area by planting trees, grass and other plants. The exploration of biological measures began in 1987, when Qian Zhengying, then the minister of water resources, put forward the slogan of "taking the exploitation of sea-buckthorn resources as a breakthrough to accelerate the treatment of the loess plateau", and then started the big chapter of biological treatment of the sandstone. In practice, the drought-tolerant plants such as poplar, sea-buckthorn, pinus tabulaeformis, caragana korshinskii and salicornia were selected successively. After many years of exploration, the composite types of trees and grass of pinus tabulaeformis and sea-buckthorn, willowwood, pinus tabulaeformis, caragana and alfalfa were gradually formed.

(2) Engineering measures
The engineering measures for the soft sandstone area are the construction of horizontal gully, fish scale pit and silt dam, etc., mainly including: slope protection engineering, gully head protection engineering, gully control engineering. Slope protection measures include: horizontal ditch, horizontal level, fish scale pit, hidden ditch, etc. Ditch head protection engineering is divided into two types: drainage type and water storage type. Gully management engineering measures are: silt dam, valley, tangba, etc. Warping dam and other protection projects have a long history in the middle reaches of the Yellow River. Decades of production practice has proved that warping dam plays a significant role in the interception of sediment, flood storage and detention, erosion and consolidation ditch, etc. In Liu Hui fang, Qin Wei, wen-hong cao's contribution to the research of warping DAMS in the river basin soil and water conservation measures, in 1990 ~ 2007 year after year rainfall data, set up five different land use conditions, respectively for the desert, all for the forest land, all the grass, all for the terrace, slope of weeds and channel to build DAMS, using SWAT simulated analysis, it is concluded that 1990-2007 average annual sediment reduction quantity is the biggest is warping DAMS, the second is the terrace, in turn, is the result of woodland and grassland, show that in the soil and water conservation measures, The silt dam contributes the most to reduce the amount of silt into the Yellow River. This also shows that engineering measures are indispensable in the process of soil erosion control.

(3) Plant flexible dam
Plant flexible dam refers to the planting of several rows of plants with developed roots and strong reproduction ability, such as seabuckthorn, in the direction of the vertical flow in the river, and the use of plant branches to conduct flood detention and sediment precipitation to form a sand barrier structure, which is a pervious dam. This kind of channel control measure not only has the effect of plant measure to reduce the erosion of the surface, but also has the effect of silt to stop the sand. This measure is put forward to develop seabuckthorn resources as governance after a breakthrough, accelerate the loess plateau ci-fen bi and others began to explore research, science to determine the design principle of the seabuckthorn flexible dam, construction principle and the density, through reasonable layout and follow-up, in block sand, discharge and flood erosion, raise the benchmark, the respect such as ecological restoration effect is remarkable, has realized the water-sediment partition. Then, the research work of plant flexible dam is gradually deepened, trying to be matched with engineering measures such as gufang, silting dam, etc., which lays a foundation for comprehensive management of soft sandstone area.

(4) Anti-corrosion and pro-growth measures
Anti-erosion and pro-growth measures are a comprehensive measure to control soil erosion on sandstone slopes and quickly restore vegetation. It uses environmental protection high - tech composite material in the sandstone slope surface, so as to achieve not only consolidation of the surface, water erosion, wind erosion, and promote the growth of plants. To solve the slope caused by water erosion, gravity erosion and water loss and soil erosion is serious, the problem of plant measures is difficult to play a good role, northwest agriculture and forestry university of science and technology in 2011 was carried out by arsenic sandstone areas EN - 1 experimental study on the stability of the slope soil solidified mechanism, after research by wen-yi yao W - OH corrosion for raw material, this material is on the basis of the original hydrophilic polyurethane fusion nanometer modification, structure change and complex technology of functional materials, The modified hydrophilic polyurethane composite was prepared by polymerization of isocyanate, polyether polyols
and various functional modified materials at specific temperature, time and ratio. Through with concentration of 3%, 4% and 5% respectively of W-OH and 0.5% of water retention agent spraying experiment comparison, and then respectively at 0, 6, 18, 42, 90, 162, 258, 618, 810, 1050, 1290 h, at 10 ~ 15 cm away from the surface deep in its moisture content by arsenic sandstone sample, the results showed that spraying concentration of 3% can obtain good effect of water, show that the technology not only consolidated the surface, and provided a condition for plant growth.

From the above introduction to the sandstone area and its treatment measures, we can see that with the continuous deepening of the research, biological measures and engineering measures are gradually beginning to be jointly applied:

(1) On the steep slope, biological measures are mainly adopted, while on the top of the slope, biological measures are adopted and combined with engineering measures such as fish scale pit and horizontal ditch. Through the examination, the ecological control measures of the mixed disposition of seabuckthorn as the main material, twisted strip, pinus tabulaeformis and so on were formed. According to hao fei, more than 20 kinds of shrubbery tree species were introduced into the experimental field of shrubbery sandstone. The sea-buckthorn has been proved to be more suitable as a "pioneer tree" in the treatment of sandstone area.7 * in terms of the treatment effect, according to the research and observation of Yang zuirui, hu jianzhong, Yang fangdu and other researchers, sea-buckthorn plays an obvious role in reducing water and sediment, improving soil and improving ecology. Furthermore, the mixed forest of pinus tabulaeformis X sea-buckthorn formed in practice, combined with engineering measures such as fish scale pit, has obvious ecological and social benefits.

(2) In the gully, the management mode with plant flexible dam and siltation dam, valley and lane, small sand barrier engineering, and ditch head water storage and drainage protection engineering is developed and formed. In terms of materials, plants with developed roots and strong reproduction and renewal ability, such as seabuckthorn, are selected as the dam body for plant flexible DAMS, while engineering measures such as silting DAMS, gufang and small storage projects mainly take local rock materials as materials. In terms of effect, according to the ci-fen bi of the arsenic sandstone areas channel bar plant "flexible dam" test ", Yang Fang and Zhang Hongmin, li hao, etc under the condition of the different slope "seabuckthorn plant flexible dam", the effect of the resistance of water shows that the seabuckthorn plant flexible dam on water flow velocity in the front of the dam has obvious attenuation block effect, but also significantly increased soil water content. According to liu hufang, qin wei, cao wenhong, et al., "study on the contribution of warping dam to water and soil conservation measures in river basin", it is shown that warping dam is an effective water and soil conservation engineering measure to intercept sediment, protect special water and soil, enrich land, increase grain.

3. Assumption of Comprehensive Treatment Technology for Soft Sandstone

The treatment technology of arsenic sandstone is comprehensive, providing treatment paths from local to overall, from key to extensive forms. But in general, there is no more comprehensive management, research on different corrosion mechanisms, research on different degraded vegetation restoration and reconstruction technologies, research on the selection and adaptability of different types of vegetation in resistant materials. In order to plan the governance of the arsenic sandstone area as a whole, this paper conducts a comprehensive study in the Yellow River water conservancy science research institute of orodos plateau arsenic sandstone area ecology, puts forward the following ideas:

(1) In the covered soft sandstone area, the mode of combining ecology and economy should be adopted, with emphasis on the development of ecological forest fruit industry, and excessive agricultural planting and development should be avoided.

(2) In the hydraulic erosion, gravitational erosion serious bare arsenic sandstone areas, in the "top slope one channel system composite erosion control technology", "consolidation vegetative function integration of multiple measures stereo configuration mode on the basis of optimized, main consideration set buffer in top place, distinguish with buffer protection zone and economic zone, reduce man-made damage to the buffer protection area, protection zone is focused on protection, economic zone is the economy and ecology. Through the channel slope, slope direction, land utilization and rock structure, using GIS buffer analysis, analyze the effect of a mild influence area, moderate and severe impact area, in the three areas of runoff, water flow to the factors such as, set up...
three buffer zone defense line, through the biological measures and scale-hole, the combination of engineering measures, such as rainwater harvesting project step by step to reduce the energy. The vegetation in each buffer zone is mainly composed of tree species with well-developed roots, drought resistance and easy survival. The engineering measures can be generally adopted such as fish-scale pit, horizontal ditch and rainwater harvesting engineering. Through the three-dimensional model of trees and grass and engineering measures to prevent sand deceleration, control the erosion of hydraulic power, reduce the top of the slope surface runoff, at the same time, the rainwater collected after the sand barrier, so as to reduce the steep wall due to too much water caused by gravity erosion serious, reduce the river caused by too fast water serious erosion. To sum up, five lines of defense -- three slope top buffer zones plus two dimensional configuration mode of slope, channel control measures. And outside the buffer zone, it mainly carries on the exploration of the economic forest planting, develops the economy to retain the ecology.

3) In the sand cover area dominated by wind erosion, sand fixation work is mainly carried out. Some engineering measures, such as grass squares, are used to prevent wind and sand fixation with erosion, sand fixation and pioneer plants which are easy to survive. The grass grid also ACTS as a wind shield for plants to reduce unnecessary water evaporation. Because there is less water and less soil fertility in the sandy overburden areas, water and fertilizer are needed and plants with low survival rates are needed. Of course, the selection of plants and planting techniques have yet to be explored.

The application and practice of buffer zone technology began in Europe in the 15th and 16th centuries, and it plays a very important role in the construction and management of ecological agricultural landscape in developed countries such as Europe and America. Common agricultural buffer zone, river bank and lake buffer zone, windbreak forest belt. Throughout its development, in the long-term practice of soil and water conservation and treatment, this soil and water conservation and treatment measure is outstanding in controlling soil and water loss on slopes, channel erosion, prevention and control of non-point source pollution, protection and ecological restoration. It is mainly used in residential areas, agricultural areas, parks, commercial areas or factory areas, and lakeside areas. However, the buffer zone system has not been studied in the treatment process of soft sandstone, so the concept of buffer zone is put forward, which is expected to focus on the exploration and research on the setting range of buffer zone, plant selection, plant and engineering configuration, and how the selected plants can block sand and fertilize land.

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