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Key Technology of Soil Formation by Compound Mixture of Arsenic Sandstone and Sand

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Abstract

Arsenic sandstone with ShaFu as key technology to steal land, water, soil and anchor as the goal, after more than 10 years of test and engineering practice, developed a new material with soil, rich in colloidal substance found arsenic sandstone and sandy soil and its mechanism, explored the theoretical foundation of the sand control engineering, research and development of the distribution of soil - water management - sand-fixation technology, Engineering is constructed from land use and the management pattern, use local materials, variable arsenic sandstone and sand "to both" as a "treasure", cracked the sand disasters seriously, leaking like fat, low productivity, crop growth, and many other problems, successfully reversed the direction of land desertification, fruitful, can provide guidance for similar sand land management. Improved the local agricultural production conditions and the construction of infrastructure, improve the agricultural productivity, in the protection of national food security, poverty alleviation, engines and rural revitalization of benefit is remarkable, and opened up a new way of land "demand-supply" equilibrium and, for the "on strengthening the protection of cultivated land and improve the opinion of dynamic balance, and other countries provide technology support policy implementation.

Keywords

Arsenic Sandstone; Sand; Compound; Soil; The Key Technology.

1. Research Background of Soil Formation by Compound Mixture of Arsenic Sandstone and Sand

China has the largest area of desertification in the world and is seriously affected by sandstorms. Desertified land totals 2.6116 million square kilometers (3.917 billion mu), accounting for 27.2 percent of China's total land area. Desertified land reached 1.7212 million square kilometers (2.582 billion mu), accounting for 17.9 percent of China's total land area [1].

Mu Us Sandy Land is located at 37°30 '-39° 20’N, 107°20' -111° 30’E, starting from Shenmu County of Shaanxi Province in the east, reaching Yanchi County of Ningxia Hui Autonomous Region in the west, reaching the Great Wall in the south and the southeast of Ordos Plateau in the north [2,3]. It covers an area of 73,344 km^2 (110 million mu) with an altitude of 1200-1500m, accounting for 4.26% of the desertification land in China. The land use types in this area are complex and the different land use patterns are often staggered. The intersecting distribution of agricultural, forestry and animal husbandry land showed obvious regional

difference from southeast to northwest, and the southeast had better natural conditions, serious man-made damage and significant quicksand ratio. In addition to the distribution of quicksand in the northwest, there are patches of semi-fixed, fixed sand distribution. In the east and south, farmland is highly concentrated in valley terraces and beaches, while in the northwest, farmland decreases and grassland increases. Existing agriculture, animal husbandry, forest land is not fully used, extensive management [4].

Northern Shaanxi is located in the Mu Us Sandy Land. In the 1960s, the people in the Yulin sandy area lived a difficult life, "three times five kinds of nine not harvest", barren mountains, barren quicksand engulfed farmland, threatening life, Yulin survival and development of the most dangerous opponent [5]. Over the past 20 years, over 1.3 million hectares (20 million mu) of desertified land have been controlled in Shaanxi, and over 2,000 kilometers of windproof and sand-fixing forest belts have been established [6]. In the hinterland of the desert, 165 forests of more than ten thousand mu have been built, greatly improving the ecological environment. According to monitoring, the area of desertified land in Shaanxi Province has changed from an average annual expansion of 0.02 million hectares (3,000 mu) at the end of last century to an average annual reduction of 20,000 hectares (300,000 mu) at present [7]. According to the results of the second land survey in Shaanxi Province, the area of cultivated land decreased from 77.1 million mu to 59.96 million mu, indicating that the protection situation of cultivated land in Shaanxi Province is very grim. The decrease in arable land was mainly due to the conversion of arable land to forests. Forestland increased from 140.98 million mu to 168.48 million mu, an increase of 27.5 million mu [8]. In 2014, the government carried out a new round of work to convert farmland to forests, making it difficult to protect the red line of 1.8 billion mu of arable land. Therefore, the Ministry of Natural Resources (formerly the Ministry of Land and Resources) issued the Notice of the Ministry of Land and Resources on Improving Management Methods and Effectively Implementing the Balance between the Occupation and Supplement of Cultivated Land (Land Resources Regulation [2017] No. 13) in 2017 and put forward the following: "Agricultural land suitable for development, such as garden land and remnant forest land formed in history, which has not been included in the scope of cultivated land protection, can be integrated into the scope of land consolidation after the feasibility assessment organized by the people's government at the county level and the review and confirmation organized by the provincial land and resources authorities. New cultivated land can be used for the balance of occupation and compensation."[9] In order to better implement the central about strengthening the protection of cultivated land and improve the opinions of the relevant spirit of dynamic balance and Shaanxi province issued "the CPC Shaanxi provincial party committee of Shaanxi province people's government on further strengthening the cultivated land protection and improvement of the implementation opinions of dynamic balance" (shan hair [2018] 9) file, will CanCiLin to reserve resources development requirements issued by the county comply with them[10].

CanCiLin to refers to the department of homeland scope of the second national land survey database for the woodland, and does not belong to the forestry sector, forest right Limbaugh, returning farmland to forest and forest planning related to protected areas within the scope of the degradation of forest land, is influenced by human disturbance or other ACTS, in forest wither away, structural imbalance, vegetation coverage and low canopy density, soil erosion is serious, The stands with low economic value and ecological function[11,12]. The trees in Guanzhong and Southern Shaanxi are more mature than those in Northern Shaanxi and can be reclaimed from the remnant forest land in Northern Shaanxi. Soft soil desertification in northern Shaanxi area, groundwater resources are relatively abundant, development scale and intensification of agricultural production and operation, but due to lack of "soil", "soil" key technology of levelling auxiliary, first for the United Nations "rao BoShiJiang" female farmers NiuYuQin sand for 35 years, finally realizes the desert oasis of stick to.

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Building land in Shaanxi province engineering technology research institute co., LTD. The research team and land engineering construction group co., LTD in Shaanxi province from land, water saving, sand-fixation as the goal, after more than 10 years of test and engineering practice, the development of new material with soil, rich in colloidal substance found arsenic sandstone and sandy soil and its mechanism, explore the theoretical basis of sand control engineering, Research and distribution of soil - basis - sand-fixation technology, building engineering from land use and the management pattern, use local materials, arsenic sandstone and sand "to both" as a "treasure", cracked the sand disasters seriously, leaking like fat, low productivity, crop growth, and many other problems, successfully reversed the direction of land desertification, fruitful, can provide guidance for similar sand land management[13]. Improved the local agricultural production conditions and the construction of infrastructure, improve the agricultural productivity, is advantageous to the resettlement of idle rural labor force, increase the farmland area, ensure food safety, save engineering cost, promoting the value of ecosystem services of multiple targets, in the protection of national food security, poverty alleviation, engines and rural revitalization of benefit is remarkable, In addition, it has opened up a new way of "balance between occupation and subsidy" for cultivated land, providing scientific and technological support for the implementation of national policies such as the Opinions on Strengthening the Protection of Cultivated Land and Improving the Balance between occupation and subsidy.

Therefore, the development of the residual forest land in northern Shaanxi should rely on the key technology of soil formation by recombination of arsenic sandstone and sand, to achieve the planting conditions of "soil formation" and "soil formation" as soon as possible, and realize the effect of scientific sand fixation and remediation of the residual forest land. CanCiLin soil desertification and sandy land there is a certain difference, so this project is to CanCiLin desertification land as the research object, with arsenic sandstone as covering new materials, research on arsenic sandstone with CanCiLin desertification land distribution of soil - water - the scientific mechanism of sand-fixation, establish CanCiLin desertification land renovation of "soil organic refactoring" new theory [14-16].

2. The Market Demand

In order to ensure China's grain production and food security, the state has issued a large number of strict farmland protection policies, requiring to strengthen the protection from the quantity and quality of cultivated land. In the past, it was mainly through remediation of unused land to supplement arable land. However, with the continuous decrease of unutilized land reserve resources and the increasing difficulty of development, the existing regulation model has been unable to meet the needs of the balance of land occupation and compensation. The current Notice of the Ministry of Land and Resources on Improving Management Methods and Effectible Implementing the Balance between the Occupation and Supplement of Cultivated Land (Land Resources Regulation [2017] No. 13) includes agricultural land suitable for development, such as specific gardens and remnant forest land, into the scope of land consolidation. At present, Jingbian County, Dingbian County and other places have carried out the renovation of waste forest land, among which, three development projects of waste forest land using the key technology of soil making by recombination of Soft Stone and Sand in Jingbian County passed the acceptance inspection at the end of 2019, covering an area of about 3,225 mu, with a total investment of about 11.6 million yuan, benefiting 551 households, including 21 poor households. Planting corn is estimated to increase economic income of about 2 million yuan every year. In 2019, the comprehensive improvement of the remnant forest land in Dingbian County achieved remarkable results, with the balance index of the circulation of

cultivated land accounting for the compensation of 16,000 mu, and the income of 450 million yuan.

Based on the prediction of the decision service information management system of sandy land regulation, the key technology of soil formation by recombination of arsenic sandstone and sand can be used to increase the cultivated land of at least 20 million mu in the 63 million mu in the Mu Us area, and 100 million mu in the whole country (the estimated output value is more than 10 trillion yuan). It can be seen that there is considerable market demand for comprehensive regulation of residual forest land in Shaanxi Province, and other areas can use this technology to promote regulation, open up a new way of "balance between occupation and compensation" of cultivated land, improve local agricultural production conditions and infrastructure construction, and improve agricultural productivity.

On March 12, 2020, Shaanxi provincial land engineering construction group co., LTD and land development projects signing ceremony held in dingbian county, this batch of land development project is the third batch CanCiLin dingbian county land development project, located in dingbian county AnBian town, white mud well town, town of beam, the stone ditch town, brick Wells, royal circle town, Philippine trench town and the town of fort saltworks eight villages and towns, It is divided into 43 projects, the total construction scale of the project is 105,700 mu, and it is expected to realize the new cultivated land of 100,100 mu, and the total estimated investment is 556 million yuan. This project intends to develop research in jingbian, arsenic sandstone with ShaFu into soil from key technology is introduced into CanCiLin to regulation, CanCiLin desertification land as the research object, with arsenic sandstone as covering new materials, research of arsenic sandstone and CanCiLin desertification land distribution of soil - water - the scientific mechanism of sand-fixation, establish CanCiLin desertification land renovation of "soil organic refactoring" new theory, The key technology system and promotion and application mechanism of Pisha sandstone as newly formed soil materials were established. The standard model and implementation scheme of Pisha sandstone as newly formed soil materials in the province were established.

3. Key Technology of Soil Formation by Compound Mixture of Arsenic Sandstone and Sand

"Much starker choices-and graver consequences-in" since, our country implemented the national sand prevention planning the second phase of the Beijing and Tianjin sandstorm source treatment project planning, "" national desert park development plan" and a series of planning, to speed up the implementation of the Beijing and Tianjin sandstorm source control, "three north" shelter forest construction, returning farmland to forest and grazing grassland, rocky desertification comprehensive treatment such as national key project, A total of 8.8 million hectares (132 million mu) of desertification control tasks have been accomplished nationwide, accounting for 88 percent of the control tasks in the 13th Five-Year Plan [17]. After years of improvement, the ecological conditions of Mu usu, Hunshandak, Horqin and Hulun Buir sandy lands have been improved overall, with forest and grass vegetation increased by 2.267 million hectares (34 million mu) and desertification land reduced by 169,000 hectares (2.535 million mu) [18-20].

After more than 10 years of scientific research and engineering application, the key technology of soil formation by recombination of arsenic sandstone and sand has achieved 135,600 mu of newly increased cultivated land, built modern agricultural demonstration base, gained direct economic benefits of about 2.59 billion yuan, and realized the win-win situation of construction land index replacement and farmland protection in different areas. This technology mainly includes the technology of recombination of arsenic sandstone and sand into new materials, the

technology of comprehensive management of water saving and fertilizer conservation, and the technology of information management system of decision-making service for sand regulation.

(1) New material technology of recombination between arsenic sandstone and sand

Sand-fixing materials widely promoted and applied at home and abroad treat symptoms but not root causes, and their effects are difficult to be sustained, and even threaten physical and chemical pollution. For example, domestic adhesives promote the formation of sand into soil and are easy to be mineralized and decomposed. The cost of loess recombination farmland in different places is about 17,000-20,000 yuan/mu, which may damage the soil source area. The key technology of soil construction by recombination of Pisha sandstone and sand is made of Pisha sandstone which is rich in many kinds of high-quality colloids and has the advantages of multi-function, permanent effectiveness and no harm. Pisha sandstone is rich in reserves and easy to be exploited. The "two harms" of Pisha sandstone and sand have become one treasure.

The validity period of the mechanical sand barrier at home and abroad is only 2-5 years, the survival rate of the shelterbelt is low, and the oil emulsifier for sand fixation has water repellency and pollution. The key technology of soil formation by composite soil of arsenic sandstone and sand is to build strong wind erosion resistance of soil, supplemented by biological barrier and physical sand fixation, which significantly enhances the sand fixation and stress resistance of composite soil.

(2) Water saving and fertilizer protection comprehensive management technology

Domestic and foreign water-saving and fertilizer conservation technologies are mainly based on water-saving facilities, which are limited by the quality of water resources and have high cost. Combined with irrigation and topdressing, the water saving is 61%, the water use efficiency is increased by more than 2.7 times, and the nitrogen use efficiency is increased by 31.4%. The water and fertilizer keeping properties of the soil are obviously improved, which can promote the organic process of the soil. After 9 years of planting, the total amount of microorganisms multiplied, and the average content of organic carbon was 10 times that of the original sandy land. The organic carbon storage in 0-100cm soil layer increased by 44.9%, and the aboveground carbon density of plants increased by 20.4 times.

(3) Information management system technology of sandy land regulation decision service

Based on the constraints of engineering cost, water resource supply and ecological environment, the system can realize the information acquisition, concept planning and scientific decision-making of the short-time sandy land regulation project, and provide guidance for the reasonable development intensity and scale of sandy land.

Arsenic sandstone with ShaFu soil from key technology compared with domestic and foreign similar technology, has the treatment cycle is short, a governance and sustainable development, comprehensive functions, management of low cost, wide application range of advantages, the characteristics of the comprehensive benefit is remarkable, results in from land, grass, afforestation, urban greening has many fields such as application and dissemination of radiation more than 200 ten thousand mu, The shortage of arable land and the limited land supply have been solved. Shao-zhong kang, jiu-lin sun, Chen Xuegeng academicians and experts believe that the results for the sand scale renovation from lack of material and technology, the system was carried out by arsenic sandstone with ShaFu soil, the mechanism of key technology research and engineering application, achievements reached the international leading level, won the 2019 state science and technology progress second prize.

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