Organic reconstruction and application of soils

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Abstract. The organic reconstruction of soil generally means that human beings adopt engineering methods to give full play to their subjective initiative under the premise of respecting the laws of nature, so that the process of soil formation is accelerated, slowed down or reversed, and the organic process is driven by inorganic means or promoted by organic development. In actual operation, the soil can be reconstructed by using physical, chemical and biological reconstruction methods through technical means such as replacement, compounding, addition and reduction. The soil construction can increase the area of arable land, relieve the shortage of land in our country, and at the same time improve soil quality, ensure regional food security, build a new ecosystem, and ensure regional sustainable development.

1. Introduction

The process of natural land use is relatively slow. The soil has gradually formed and changed continuously under the influence of natural action for thousands of years and tens of thousands of years and human social and economic activities. Some changes are benign and some are malignant. The organic reconstruction of soil generally means that human beings take engineering means to give full play to their subjective initiative under the premise of respecting the laws of nature, so as to speed up, slow down or reverse this process, and promote the organic process through inorganic means or promote the development of inorganic through organic means. Research on the materials, structure and biological nutrition that constitute the soil, rebuild the soil structure with technical means such as replacement, compound, increase and decrease, improve the quality of the land, and improve the soil environment. Reconstructed soil that is difficult to use or unused soil for degradation, defacement, inefficient use, etc., transform soils with inanimate characteristics and poor conditions into soils with vital characteristics and suitable for survival and reproduction of living entities. Reconstructed soil can be applied to both agricultural production and construction. This article only discusses the former.

2. The scope of soil organic reconstruction

The research scope of soil organic reconstruction is mainly defined from the surface to above the first phreatic layer, and the longitudinal span ranges from a few centimeters to hundreds of meters.
Depending on the target value, a certain depth range is selected for research and reconstruction to achieve the basic conditions that the target life body needs to carry. The organic reconstruction of soil is essentially different from the basic research of other structures. It has certain life characteristics and can maintain the process of the reproduction and development of life.

Traditional soil reconstruction belongs to inorganic reconstruction, which mostly addresses the load-bearing requirements of non-living bodies, such as land flatness and load-bearing properties. The fundamental difference between soil organic reconstruction and soil inorganic reconstruction is that the main purpose of soil organic reconstruction is to meet the carrying requirements of the target life body, such as the survey of remediation objects, the selection of materials, and the construction of soil structures, the adjustment of the chemical composition of soil, the deployment of biological nutrients, etc., the living body is the decisive factor. The needs of non-living bodies on the land, such as the calculation of mechanics, soil leakage, and soil settlement, are also the content of the organic reconstruction of soil, but the purpose is still to meet the bearing needs of living bodies. The research scope of soil organic restructuring is broader and more targeted. In soil organic restructuring, soil is a complete life system, and microorganisms, plants, animals, humans and other life entities that rely on soil to survive are all its service object (Table 1).

| Difference | Inorganic reconstruction | Organic reconstruction |
|------------|-------------------------|-----------------------|
| Service object | Above-ground building | Organic life |
| Research object | Characteristics of soil-body buildings | The characteristics of soil-body that breeds life |
| Research objectives | Construct the bearing foundation of the above-ground building | Construction of soil life system and succession mechanism |
| Nutrient Control | no | Soil nutrients, plant nutrition, microbial nutrition, etc. |

Both the soil organic reconstruction and the inorganic reconstruction basically serve the living body. The difference between the two can be summarized in the following aspects: The first is the service object. The organic reconstruction of soil serves the organic life body, while the inorganic reconstruction serves the buildings, structures and other construction facilities. The second is the research object. The research object of soil organic reconstruction is to promote the ability of soil to breed life, while inorganic reconstruction is to control the ability of soil to breed life and ensure the safety of buildings and structures. Again is the research goal. The research goal of soil organic reconstruction is to construct the soil life system and succession mechanism, while the inorganic reconstruction is to construct the bearing foundation of buildings and structures on the ground. The way of serving life is different. The organic reconstruction of soil directly serves the organic life, while the inorganic reconstruction of the soil indirectly serves the life through buildings and structures.

3. Materials of reconstruction soil

The service object of the organic reconstruction of soil is organic life. Through the research of a certain depth of soil, the technical means such as replacement, compounding and reconstruction provide the necessary conditions for carrying life. The study of soil organic restructuring materials is to apply soil, organic matter and other natural materials, polymers and other artificial synthetic materials to the organic restructuring of soil as the material composition of soil, adjust the soil mechanical composition, and determine the thickness of the composite soil layer, optimize the section configuration of soil, improve the physical properties of soil, carry out analysis and research on the particle composition, water retention characteristics, and nutrient supply characteristics of natural soil-forming materials and artificial synthetic materials, and carry out soil-forming application research of different materials to make breakthroughs limiting factors of soil resources, in order to improve the efficiency of land use by remediating the land damaged inefficient use, irrational use, unused land and land damaged by
production and construction activities and natural disasters. Therefore, the organic restructuring of soil must first conduct the research and development of materials. Only after selecting suitable materials, ensuring human safety and providing healthy soil materials, can the subsequent processes be better carried out. In order to adapt to the development trend of engineering modernization and to respond to my country’s call for building a resource-saving and environmentally-friendly society, the use of low-energy, multi-functional, less-polluting, and recyclable materials will be the development trend of my country’s land materials. The integration of comprehensive benefits such as development, environmental protection, cleaner production, and effective use of resources is in line with the development trend of the times and human development needs.

With the development of social economy, the land area is reduced and the quality of land is reduced. The contradiction between human life and land demand is becoming increasingly acute, so the development of unused land and the improvement of land quality have become urgent issues. The purpose of land consolidation in the new era is to seek to rebuild and develop new resources based on local actual conditions to form new soil. Reconstructed soil materials are divided into common and special types. Common soil reconstruction materials are mainly various soils, which are generally divided into silt, loam and clay according to their texture. They are generally taken on-site during construction. Special soil reconstruction materials mainly include ore materials, biological materials, wastes, and synthetic materials. Among them, ore materials include soft rock, shale, sand, vermiculite, etc., biological materials include biochar, wastes include fly ash, coal gangue, furfural residue, sludge, etc.; synthetic materials include polyacrylamide, polyvinyl alcohol Resin, polyvinyl alcohol, polyethylene glycol, urea-formaldehyde resin, etc. Polyacrylamide is the artificial synthetic soil amendment that researchers pay most attention to. There are also improved materials such as humic acid, sulfur, black vitriol (ferrous sulfate), crude sulfuric acid, aluminum sulfate and acid fertilizers, gypsum, phosphogypsum, desulfurized gypsum, calcium oxide, limestone, etc.

4. Method of reconstructing soil structure
It mainly includes physical reconstruction of soil structure, soil chemical reconstruction of rapidly matured soil, and soil biological reconstruction to improve soil nutrients and microbial activity. Through reconstruction, new soil can be formed or original soil quality can be improved.

4.1. Physical reconstruction of soil
In the development of unused land, the treatment of contaminated land, the improvement of degraded land, the improvement of low-standard farmland, etc., attention should be paid to the particle gradation and profile configuration of soil, and the soil structure should be modified to make it adapt to the growth of different life and provide a good land foundation for human activities. Generally speaking, the reconstruction of soil particles and the reconstruction of soil profile levels are carried out simultaneously. In land engineering, measures should be taken in accordance with local conditions and the situation should be guided by the application of land engineering techniques to transform and improve the configuration of soil profiles. Under farming conditions stably adjust its fertility and stability, so that the formation of the entire soil profile level develops in a favorable direction.

Soil particle reconstruction mainly includes two aspects: soil preservation and soil improvement. Among them, soil preservation generally involves engineering or biological improvement measures to ensure that the amount of soil loss is within a certain threshold. Controlling the loss of soil is a prerequisite for soil improvement. The purpose of soil improvement is to optimize the particle gradation of soil, change the three-phase composition of soil, increase soil organic matter and nutrient content, stabilize soil structure, improve soil properties, and improve soil fertility. The physical method of soil particle reconstruction is mainly to modify the soil layer. The main methods include the guest soil method, soil layer mixing method, flood and silting method, reasonable irrigation, sun drying, freezing land and so on.

During the formation of a soil body, the profile configuration of soil body is affected by biological, climate and other factors, which restrict and regulate the fertility factors such as water, fertilizer, gas,
and heat in the soil body and the transport of salt in the soil body. It has a direct impact on crop yield. The soil structure has been widely used in the research and practice of soil classification, soil fertility and land resource evaluation, and soil ecological evaluation. Therefore, when investigating and studying different soil bodies with particular characteristics, through theoretical discussion and practical verification, the main indicators of soil body configuration are identified, the type of soil body profile configuration is determined, and the best soil body configuration is found to provide scientific basis for guiding agriculture production and improving agricultural land. The transformation of cultivated land mainly aims at poor cultivated land, bad soil with sandy, sticky, slab, thin and gravel texture. Different technical measures are adopted to create a loose layer of topsoil, an intermediate nutrient layer and a compact bottom layer for water and fertilizer layer [1]. According to the characteristics of the profile structure of the cultivated soil and the excellent soil characteristics, the construction of the soil layer maintains or is better than the profile layer structure of the normal cultivated soil, which are of great significance to establish suitable plant growth environment and quickly restore the productivity of the land [2], and improve utilization and output rate of land resources, increase the effective cultivation area and alleviate the contradiction between man and land.

In view of the particle and structure reconstruction of degraded soils, specific improvement measures include: timely cultivation, increased organic fertilizer, and improvement of poor soil; foreign soil, flooded sand, flooded silt, etc., improved sandy and clayey soil [3]; leveled land; Set up irrigation and drainage systems, drain and wash salt, plant rice and wash salt, to improve saline-alkali soil [4,5]; plant trees and grass, build shelter forests, set up sand barriers, fix quicksand, improve aeolian sandy soil, etc. [6].

4.2. Chemical reconstruction method of soil
For alkaline soils, the focus of chemical reconstruction is to apply soil amendments to reduce or eliminate soil salinity and alkalinity. The principle is mainly to use colloidal ion adsorption and exchange and acid-base neutralization reactions. There are four specific methods. One is the application of desulfurized gypsum, the other is the application of biological organic fertilizer, the third is the application of sulfur/iron sulfide and waste sulfuric acid or green alum, and the fourth is the application of physiological acid fertilizer.

For acidic soils, the focus of chemical reconstruction is to adjust the acidity of the soil to provide a good environment for plant growth and development. Chemical improvement of acid soils must be combined with water conservancy and agricultural measures to achieve better results. There are three specific methods. One is to apply lime or phosphogypsum. The amount of lime required for acidic soil can be roughly estimated by the amount of exchangeable acid or hydrolyzable acid. It can also be estimate based on the amount of cation exchange and base saturation of the soil, and the amount of potential acid of the soil. The second is the application of boron mud and the third is the application of organic substances.

4.3. Biological reconstruction of soil
The purpose of soil biological reconstruction is to further improve soil quality on the basis of soil chemical reconstruction, improve soil microstructure, form a good soil ecological environment, and ensure food security. One is to apply a certain amount of green manure, organic fertilizer and compound fertilizer to improve the soil nitrogen, phosphorus, and potassium content, and to supplement the organic matter and nutrient elements of crop growth to make it grow faster; the other is to put in beneficial microorganisms and animals in the soil for forming a virtuous circle according to the environmental conditions of the soil.

5. Application of soil organic reconstruction
The core of land engineering is the organic reconstruction of soil, and the service objects are the life bodies carried by soil, including plants, animals, microorganisms and humans. The organic reconstruction of soil is the foundation of ecological civilization, and ecological civilization is the
ultimate goal of land engineering. On the one hand, land engineering can directly provide more clean land for mankind and promote the development of ecological civilization. In abandoned mine areas, we have adopted chemical and biological measures to reduce or eliminate heavy metals and other pollution from contaminated land, reconstruct the quality of contaminated land, restore forest land and cultivated land, and build a new ecosystem. The current ecological environment in the area has been improved, and the beautiful homes have been reproduced. On the other hand, land engineering also indirectly solves other ecological problems facing human survival and development, and contributes to the continuous improvement of human living environment. Smog spreads everywhere, and public hazards and occupational diseases caused by environmental pollution have occurred from time to time. Land has a strong adsorption effect and is an important collection and distribution center for pollutants. Through land engineering, the point-scale environmental quality is first changed, and then the regional ecological environmental quality is improved. The long-term effect will surely improve the overall ecological environmental quality of the earth. In the end, the global ecological environment facing mankind will be fully resolved, and the foundation of human ecological civilization construction will gradually be consolidated.

6. Conclusion
The survival and development of mankind cannot do without land resources. My country's land area is vast, but from the per capita level, it is less than 1/3 of the world level. With the development of the national economy, damaged land abounds. In addition, since the 1980s, urbanization has expanded rapidly, construction land has taken up a lot of land resources, and the shortage of land resources has further deepened. The state encourages land consolidation, especially agricultural land consolidation, requiring the transformation of medium and low-yield fields, the improvement of idle and abandoned land, the improvement of the quality of arable land, the increase of effective arable land, and the improvement of agricultural production conditions and ecological environment.

The construction of reconstructed soil can increase the area of arable land and relieve the shortage of land in our country. At the same time, chemical and biological measures can be used to reduce or eliminate contaminated land, improve soil quality, ensure regional food security, and restore woodland, grass and cultivated land can build a new ecosystem, form a good ecosystem, and ensure regional sustainable development.

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