IOP Conf. Series: Materials Science and Engineering **301** (2018) 012103 doi:10.1088/1757-899X/301/1/012103

Proposal and Research Direction of Soil Mass Organic Reorganization

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Abstract. Land engineering as a new discipline has been temporarily outrageous. The proposition of soil body organic reorganization undoubtedly enriches the research content for the construction of land engineering disciplines. Soil body organic reconstruction is designed to study how to realize the ecological ecology of the land by studying the external force of nature, to study the influence of sunlight, wind and water on soil body, how to improve the soil physical structure, to further strengthen the research of biological enzymes and microbes, and promote the release and utilization of beneficial inert elements in soil body. The emerging of frontier scientific research issues with soil body organic reorganization to indicate directions for the future development of soil engineering.

1. Introduction

What is researched in Land Engineering, which essence is a process of ecologicalization of the land? Ecologicalization is a result of joint action that natural external force (such as sunlight, wind, water) and the intermolecular forces inside objects with engineering tools. What is the core research content of land engineering, which issue began to be discussed in this article?

2. The Concept of Soil Mass Organic Reorganization

In the process of research about land engineering of Han jichang and his research team, who first proposed the concept of soil mass organic reconstruction, and pointed out that the soil mass organic reconstruction is the core part of land engineering research. The research object of soil mass organic reconstruction is a certain depth of soil mass, whose research content are material, structure and biological nutrition and so on of soil mass and the engineering and technical means are replacement, compound, increase or decrease. The soil mass organic reconstruction rebuild the soil mass structure, improve land quality and soil mass environment, regenerate or reconstruct the defective or unused land such as degraded, contaminated, damaged or inefficient land[1]. The soil mass in the concept of soil mass organic reconstruction refers to these included parts above the surface to the first floor of the diving layer, whose longitudinal span from several centimeters to several hundred meters and the longitudinal span is different according to different topography. Need to explain is that the object of soil mass organic reconstruction including but not limited to soil mass surface loose soil, rocks, gravel on construction sites, slag in coal mine production, all man-made objects on the ground, animal and plant debris on the surface and underground, rubbish and so on.

Whether horizontal or vertical, the researchful scope of soil mass organic reconstruction is very broad that can change these soil mass of non-living characteristics and poor condition into the kind of

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soil mass of possessing the characteristics of life and can promoting the survival and reproduction of living things, which provides a scientific and effective mean for the sustainable use of land.

3. The Research Direction of Soil Mass Organic Reorganization

3.1. The Study on Modifier of Soil Mass

The use of suitable structural modifiers into the soil mass to study the effect on soil mass structure and hydrodynamic parameters in order to achieve the improvement of non-chemical fertility productivity and the ecological management of the land.

Structural modifiers have the ability to regulate soil fertility conditions, improve soil mass structure and permeability, as well as water and soil conservation ability. Poly-acrylamide as a soil mass structure ameliorant can stabilize or improve soil mass structure and aggregate the suspended particles of runoff, increase rainfall infiltration and reduce runoff and erosion of soil mass, so as to improve soil mass water status and structure, increase available water content of plants, improve water use efficiency, reduce the loss of pesticide and fertilize, optimize soil mass structure and improve ecological environment.

According to the results of Lentz and Sojka, the use of PAM can reduce 94% furrow erosion (range from 80% to 99%), increase 15% infiltration (from 8% to 57%), the phosphorus, nitrogen, biochemical oxygen demand (BOD) and sediment losses of runoff were reduced by 84%, 83%, 72% and 57% respectively [2,3]. Chinese scholars by experimental research also show that the main role of soil mass structure modifier is to reduce runoff and increase water infiltration [4, 5].

However, in essence, soil structure modifier can play a role in reducing runoff and increasing water infiltration, mainly because that the improvement of soil mass structure affects the soil mass moisture movement parameters. Therefore, on the basis of previous studies, we should focus on the internal mechanism of soil mass structure modifier on soil mass structure.

3.2. The Study on Biological Fertilizer of Soil Mass

Soil mass organic remodelling advocates less fertilizers and chemicals such as chemical substances to improve soil quality, that is, soil mass ecology can be done by physical (soil mass modifier has been mentioned above) or biological methods.

Microbial fertilizer is one of the means. Some studies have shown that, which helps salinized soil improvement [6]. This kind of soil mass improvement is essentially to improve the micro-ecosystem inside the soil mass, promote the growth of microorganisms, increase the number of bacteria and actinomycetes and improve the diversity of advantages bacterial, but the combination of biological fertilizer and inorganic fertilizer, still needs further study. Wang Yangjuan through the apple orchard land studies show that microbial fertilizer on the prevention of pests and diseases of apple trees has a certain effect [7]. Organophosphorus pesticides due to difficult to degrade, the residue will also bring pollution to soil mass and environment. The phosphate-solubilizing microorganisms not only can be used as microbial fertilizer to solubilize phosphorus, but also can be applied to the remediation of pesticide residues in farmland. Even some phosphate-solubilizing and potassium-solubilizing microorganisms can also be applied to weathering lava to improve soil mass loose layer [8].

3.3. The Study on Beneficial Elements Release of Soil Mass

This is a research focus of soil mass organic reconstruction to rely on soil mass itself some conditions to improve the function of soil mass repair. Soil mass organic reorganization takes the construction of land life system as the research goal, and the construction of land life system cannot be separated from the participation of many elements. How to promote some efficient release of some beneficial elements. Some studies have shown that litter will have some impact on the release of trace elements in different types of trees on the Loess Plateau [9]. Some researchers by studding the release of nitrogen, phosphorus and potassium after withering of masson pine artificial forest showed that appropriate temperature and humidity environment is more conducive to the release of nitrogen and phosphorus in wither leaves [10]. Other studies also pointed out that soil fauna can physically decompose the coarse-grafted plants and increase the specific surface area of the litter. At the same

time, soil fauna excreted the excrement directly, whose nutrient content was rich, easily decomposed and reduced the C / N ratio of the fallout, so that the nutrients of the fallout were easier to release [11].

4. Conclusion

Soil mass organic reconstruction, in short, is a project of remoulding not suitable for biological growth soil layer. For example, in the governance of sandy land, in view of the texture and structural complementarity characteristics of feldspathic sandstone and sand, which are organically compounded according to the quality or volume to make soil particles grading suitable and soil structure good[12]. Another example for Saline alkali governance, through the element ions diffusion to reduce the salt content of topsoil [13]. Another example for the returning to the field in hollow villages remediation, considerring the soil layer of materials returning to the field is also a kind of thought of soil mass organic reconstruction. In short, the soil mass organic reconstruction provides a concrete solution for solving the land problem by engineering means and scientific guarantee for the engineering development of land.

5. Acknowledgments

This work was financially supported by Shaanxi Province Land Engineering Construction Group Research Project "Moisture Characteristics and Transport Law of Mixed Media in feldspathic sandstone and aeolian sandy soil in Mu Us Sandy Land (DJNY2017-23)" fund.

6. References

[1] Han Jichang. Land Engineering Basics [M]. Beijing: science press. 2017.
[2] Sojka R E, Lentz R D. Time for yet another look at soil conditioners [J]. Soil Sci, 1994, 158: 233-234.
[3] Lentz R D, Sojka R E, Foerster J A. Estimating poly-acrylamide in irrigation water [J]. J of Envir Quality, 1996, 25: 1015-1024.
[4] Xia Haijiang, Zhao Puxing. Experimental Study on the Effect of PAM on Soil Physical Properties [J]. Northeast Water Conservancy and Electric Power Journal, 1999(7):7-8.
[5] Wang Xiaobin, Cai Dianxiong. Research and application of soil conditioner in agriculture [J]. Plant Nutrition and Fertilizer Sience, 2000,6(4): 457-463.
[6] Wang Jing, Pang Huancheng, Li Yuyi, et al. Effects of Microbial Fertilizer on Soil Microflora and Sunflower Yield in Saline Soil [J]. Journal of Agro-Environment Science, 2012(11):2186-2191.
[7] Wang Yangjuan. Study on microbial fertilizer on apple trees' grow and disease prevention [D]. Northwest A&F University, 2014.
[8] Zhang Chao, Li Yixin. Mechanism of Organic Phosphorus Pesticide Degradation by Microorganism [J]. Pesticide Science and Administration, 2006, 27(04):29-33.
[9] Du Liangzhen. Influences of mixed litter decomposition of different forest species on microelement release in Loess Plateau [D]. Northwest A&F University, 2012.
[10] Liu Hua. Effect of forest gap size on nitrogen, phosphorus and potassium element of four litters [D]. Sichuan Agricultural University, 2016.
[11] Yang Zengjiang, Zeng Jie, Xu Daping, et al. The processes and dominant factors of forest litter decomposition: A review [J]. Ecology and Environment, 2007, 16(2):649-654.
[12] Zhang Lu, Han Jichang, Luo Lintao, et al. Water-holding characteristics of compounded soil with feldspathic sandstone and Aeolian sandy soil[J]. Journal of Northwest A&F University (Nat. Sci. Ed.) 2014, 42(2):207-214.
[13] Han Jichang, Xie Jiancang, Zhu Jiwei, et al. Comprehensive method for treatment of saline lands [J]. SHUILI XUEBAO, 2009, 40(3): 372-377.