

Development of Carbon Reducing Vegetation Based Ingredient Technology for Increasing Function of the Ecosystem

1. Summary

■ Purpose of and Need for Research

- As global warming phenomenon from emission CO₂ recently, the temperature of the earth increased by 0.74°C in the past 100 years and is predicted to increase by up to 1.4 ~ 5.8°C by the end of the century.
 - If the earth temperature rises by 2°C, it is warned that ecosystem of the earth will be difficult to be maintained due to decrease of food production capabilities, destruction of medical system occurrence of safety accidents, etc. worldwide as result of typhoon, flood and draught.
- Based on researches conducted so far, the biggest source of storage of, CO₂ is the ocean and the next highest source of storage is recognized to be the soil.
 - Especially, as soils containing vegetation such as forests, farm lands, green lands, etc. are discovered to be important carbon sinks, research on carbon flux of soil and vegetation is being conducted actively worldwide.
- After the Kyoto Protocol became effective in 2002, to respond to climate changes these days, the world is establishing nationwide efforts and international collaborating system and as technological alternative, Carbon dioxide Capture & Storage(CCS) technology is being highlighted.
- For Korea, although forest areas take about 67% of the national land, but after the end of 80s, the entire forest area based on the land covering map is reduced by approximately 4,7043km², which is about 4.7% due to land development resulting from economic development.
 - Mostly, they were converted to use for urban areas which are known to be largest source of carbon dioxide emission such as factories, roads, sites, etc. and as result, the soil, which is the main storage sink of CO₂ was disturbed and damaged and simultaneously, the service function of the ecosystem is also decreasing.

- In addition, pursuant to the greenhouse emission trading system (ETS) in 2015, developing CO₂ reduction (30% compared to BAU) related products and technologies of public institutions, regional governments, large companies, etc. is currently urgent.
 - Also, due to the 2012 London Convention becoming effective, as throwing wastes into the ocean became prohibited, demands to recycle organic waste resources such as agricultural byproducts, food wastes, environmental wastes, wood wastes, etc. have rapidly increased currently.
- Up to know, various efforts of academic, industries and regional governments have been made for restoring the ecosystem such as establishing ecoparks and urban forests, afforestation of artificial grounds, etc. However, compared to interest in and research and development of species of indicator, in danger of extinction, etc. and vegetation of herbages and woody plants, interest in and research and development of soil ecosystem has been in fact unsatisfactory.
- Also, vegetation based creation focused around artificial soil, which has been researched and developed so far, is mostly insufficient for activating growth and development of various soil organisms, microorganisms, vegetation which make up the soil ecosystem and physical property, chemical property and micro organic property which show quality of soil are in fact substantially lacking compared to the original form of soil.
- The soil being the vegetation base composing and supporting the ecosystem and the key carbon sink, restoring the soil ecosystem is expected to contribute largely to alleviating carbon unbalance, improving biological diversity and increasing ecosystem functions and this is determined to be possible through developing appropriate vegetation base for various social and environmental demands such as reducing carbon, reducing environment harming materials, recycling resources, improving quality of soil through aggregation, increasing vitality of soil organisms, microorganisms and vegetation.

■ **Contents and Scope of the Research**

- In this research, to produce vegetation based materials, raw materials of biochar are explored and suitable production conditions are deduced.
- Using produced biochar, technology utilizing as vegetation based materials is

developed and the amount of carbon dioxide occurring and effect of reducing heavy metals when it is applied at the site are surveyed.

2. Research Results

■ Results of Research and Development

- Paper sludge, spirits sludge, sprigs and perlite filtering sludge are used, among which sprigs had the best properties.
- Sprigs which came as wood materials, were decomposed thermally at 400°C, which was applied to carbon/contaminating reducing soil ameliorater.
- Developed soil amelioraters were processed for each vegetation creation, which were all shown to have effects in both vegetation sites.

Especially, effects of reducing heavy metals were surveyed to be excellent.

■ Plans to Utilize the Results of Research and Development

- As this research develops carbon reducing and contamination reducing soil ameliorater using biochar which shows heavy metal fixating effects and AM fungi, its effect was deduced by applying test-bed.
- In the future, this technology is expected to be utilized in artificial ground afforestation, soil modification and ecosystem restoration related industries and through substantiation, environmental policy and business model is expected to be proposed for public utilization.

Source: National Digital Science Library