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The Unprsendant Farmland Soil Monitoring Project and Feasible Remediaiton Approach in Taiwan

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ABSTRACT

Soil and groundwater remediation Act was enacted in year 2000. More than ten years has already passed, Monitoring project has been completed,pollution status has been defined,contaminated sites depollution have been launched, a great progress has been made. This paper majorly to depict the extensive farmland soil qauality monittoring which is unpredent in Taiwan and believe has never been done worldwide.

This project was initiated from February 8th, 2002 to August 8th, 2002. The project tasks including digitalization of cadastre, farmland listing, basic information collecting, field investigation, sampling & analysis planning, field sampling, soil sample analysis, data evaluation, suggestion of contaminated farmland control, and analysis of potential pollution sources and transfer routes.

2,251 soil samples,had been sampled from Chang-Hwa County, Yun-Lin County, Nan-Tao County, and Chia-Yi City, and been analyzed in this project. 44% of these samples concentration exceed the soil pollution control standard (Table 1), including 492 farmlands (125.65 ha registered) with total contaminated farming area of 108.38 ha in Chang-Hwa, and 6 farmlands (0.39 ha registered) with total contaminated farming area of 0.39 ha in Nan-Tao County. However, the concentration of samples from Ynu-Lin County and Chia-Yi City do not exceed the soil pollution control standard.

To coordinate with the investigation results of the relative project regarding to water and sediment quality of irrigation channels in Chang-Hwa area, the pollution sources are preliminary concluded to be the irrigation channels surrounding the farmlands in Chang-Hwa area. As to the Nan-Tao County, the abandoned brick furnace plants neighboring the farmland are suspected to be the pollution sources.

The results show that the soil of the investigation area in Chang-Hwa County is the most polluted. Base on the Geostatistics study and the distribution of the irrigation channels; the area neighboring the investigated farmland in this project is suspected being polluted. For the farmlands exceeding soil control standard, Geostatistics method is suggested to coordinate with the information of the irrigation system to clarify the contaminated area so as to be the basis of land control and remediation work. As to the farmlands, not being investigated in this project but with high pollution potential according to the Geostatistics study, detail investigations are suggested. Regarding to soil pollution remediation, it is suggested to coordinate with the effluent control and irrigation channel remediation to achieve an all-out success.

***Keywords*:** Soil Monitoring; Farmland; Soil Pollution Standard

1. Introduction

Based on the previous farmland soil small scale monitoring results indicated seriorus possible heavy metal tainted farmlands was around 1024 hectars. Besides less toxic metal copper and Zinc, the contaminated farmland was around 319 hectars.

This extensive farmland montiroing project has been launched. Specifically, toxic heavy cadiaum and murcury have been focused. It intended to scrucintnize the serious polluated condiation.

Soil and groundwater remediation act has been enacted and executed since year 2000. It has been ten good years

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till today where lots of remediation techniques progressively employed to improve Taiwan soil and groundwater resource quality. Regulatory agencies, academia, remediation consulting firms, on-site professional engineers all contribute the proud ten years in terms of soil and groundwater clean-up contribution. However, some of technologies were un-environmental friendly even detrimental and damage to Taiwan precious soil and groundwater resourcescommonly employed remediation are unlawful and merely aiming to save time and money consideration without any care to our land. Dig-and-dump and soil acid washing are damage employed in almost every single local environment agency soil clean-up project. Lot of money, effort and time has been spent during past ten years. Most of the spending is not improving soil quality. In Article one of the current Taiwan soil and groundwater Act, it clearly stated that soil is a precious nature resources. Soil definitely is not a waste, shame on us most of current most

It is really confusing regarding the lesson learned and gained while used these chemical physical, not environmental friendly treatment techniques. Two remediation approaches, namely dig-and-dump and soil acid washing simply treat soil as garbage, waste, and junk, not the soil law indicated soil is a resource. The purpose of this paper is aimed to raise all you concerns and care toward our precious soil property, toward remediation engineers and particularly those governmental authorities who have so far never taken it as deep thought of current serious situation regarding soil damage.

A novel green remediation approach intends to convey in this paper by employing plant to gradually reduce soil metal contamination through several rounds of planting and harvesting. Unlike phytoextraction, phytoattenuation aims to reduce soil metal pollution in a gradually and less aggressive approach such as chelator assisted remediation (Meers *et al*., 2010). The initial pollution level generally is lower than most soil contamination sites. Therefore, plant is easier to propagate to increase biomass inducing reliable metal uptake. The conceptual model is shown in Figure 1.

Attenuation is borrowing from the concept “natural attenuation” which has been commonly proposed as a remediation approach for organic pollutants such as DNAPL (dense non-aqueous liquid) solvent TCE (tri-chloro ethylene) and PCE (tetra-chloro ethylene) or LNAPL (light non-aqueous liquid) petroleum product BTEX (benzene, toluene, ethyl benzene, and xylene. Natural attenuation mainly used natural pollution mitigation mechanism including microbial degradation, adsorption, volatilization, etc. This approach is targeted to pollutant which is not degraded in a reasonable time using conventional remediation techniques, technical imperfectability, or the cost beyond the affordable monetary amounts, economical imperfectability.

2. Materials and methods

2.1 Background data analysis and collection

1. To plot the possible pollution site map using TM scale. The potential monitoring site has been define.
2. Not only the soil detetion,the surrouning surface water body, irrigation channel, waster discharge point pollution sources also been alarmed.

2.2 Soil sampling

1.100*100 scale has been used to conduct this project to illusate the pollution status of farmland. Each address and plot of peddy rice field need at least one sampling point.

2.Based on the center point, north, east, west, south requiered has one sampling point.

3.Sampling sample mandated to preserve based on the Standard Method of Taiwan regulation.

2.3 Heavy metal analysis

This project uses the aqua regia digestion method to extract total heavy metal Cu weight contained in the soil in the pot culture experiment. Soil was baked at 104℃ in the oven and after filtering with # 20 mesh, 0.5g soil was mixed with concentrated nitric acid and concentrated hydrochloric acid at the volumes of 3.0 mL and 9.0 mL, respectively, with MarsX microwave for microwave absorption. AA was also used for analysis.

3. Results

The results show that the soil of the investigation area in Chang-Hwa County is the most polluted. Base on the Geostatistics study and the distribution of the irrigation channels; the area neighboring the investigated farmland in this

project is suspected being polluted. For the farmlands exceeding soil control standard, Geostatistics method is suggested to coordinate with the information of the irrigation system to clarify the contaminated area so as to be the basis of land control and remediation work. As to the farmlands, not being investigated in this project but with high pollution potential according to the Geostatistics study, detail investigations are suggested. Regarding to soil pollution remediation, it is suggested to coordinate with the effluent control and irrigation channel remediation
to achieve an all-out success.

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The total sampling area 197.41 hectars, 2251 sampling points had beed conducted. The results demonstrated 87.68, 69.09, 81.03, 99.85, 12.97, 69.09, 81.03, 99.85,12.97,0.39 for Cu, Cr, Zn, Ni, Cd, Pb hetcars above soil regulatory standards,respectively.

The most serious conuty is Chang-Hwa County 985 samples above regulatory standards The heavy metal species is Ni following by Cu, Zn, Cr. The toxic Cd has 8.28 hectars. The pollution sources majorly is the unlicenced illegal surface finishing industry. These industries unlawful discharged their into irrgation channel and were use to irrgate rice paddy field. The situation has been dammed by genral public.

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4. Conclusion

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