



## The Organo-Zeolitic Bio-fertilizer: A New Approach to Plant Nutrition.

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### Abstract:

The adoption of a biological method of plant nutrition has proved to be extremely efficient. The method does not involve the use of chemical salts as used in traditional plant fertilizers. These fertilizers used over some 80 years has had a deleterious effect on soil health due to the diffusion of the salts used which often lead to over application. The new approach to improve soil health and plant growth uses natural crushed zeolite rock and organic waste as a soil amendment. This material supplies nitrogen, phosphorus and potassium together with minor and trace elements which are essential and beneficial to plant growth. Zeolite minerals are well known to adsorb ammonium ions which are provided by the decomposition of the organic component. When the organo-zeolitic mixture is added to a soil the ammonium ions are replaced by soil Potassium. The slow release of the ammonium ions are oxidised by Crenarcheota, a soil micro-organism that is now known to be the most prevalent ammonium oxidizing microbe in the soil environment. This behaviour provides a gradual accumulation of nitrate in an ionic condition that can be accepted by the growing plant. In this way there is very little access nitrate to diffuse into the soil and with phosphorus supplied from the organic waste and potassium, available from the soil. the three major nutritional elements (NPK) are present. As the process of nitrification, involves enzymes which produce hydrogen in the form of hydronium ions that are very reactive, releasing a range of elements from the soil which provide minor element ions, in trace quantities, required for strong plant growth. The organic component maintains an adequate supply of carbon which is lost in the long-term use of traditional chemical fertilizers. The presence of soil carbon is essential for soil health as its reduction results in loss of soil structure and water holding capacity, resulting in a fragile soil which is prone to transportation by wind and rain. The dust bowls of the Midwest of the USA are a spectacular example of this effect. Thus the adoption of the organo-zeolitic-soil



system, in countries that benefit from the presence of economic deposits of zeolitic tuff, is a step forward in arable farming and the phytoremediation of contaminated land as well as the production of fuel crops on such land and the improvement of marginal farmland.

### Biography:

Peter J Leggo graduated from the University of St. Andrews, Scotland after a four year Honours Geology degree course in 1959. He gained his Ph.D. degree from University of Bristol graduating in geology and mineralogy in 1963. He joined Australia National University to work on isotope geochronology, 1963-65. He continued this work during a post-doctoral fellowship at the University of Leeds, 1965-68. He accepted Professorship at the Department of Geology, University of Florida, USA and later at the Department of Environmental Studies, University of Virginia, USA. On return to the UK in 1995 became interested in natural zeolites which led to current work on biological plant fertilizers at the Department of Earth Sciences, University of Cambridge

### Publication of speakers:

1. Leggo, P.J. 2013. Enhancing the growth of plants on coal waste using a biological fertilizer. *International Journal of Environment and Resource*. 2,(3), 59-66.
2. Leggo, P.J, Ledésert, B and Day, J. 2010 Organo-zeolitic treatment of mine waste to enhance the growth of vegetation. *Eur.J.Mineral*. 22, 813-822.
3. Leggo, P.J and Ledésert, B. 2009. The stimulation of nitrification in an organically enriched soil by zeolitic tuff and its effect on plant growth.

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