



Subsoil Injection

Paragon Soils with Sustainable Development Technology Canada and others 2008 to 2009

This project involves an innovative technique for alleviating subsoil compaction in active and abandoned industrial sites such as pipeline rights-of-way by injecting the EarthRenew organic matter fertilizer into the soil to a depth of approximately 16 inches. This provides plant nutrients and water holding capacity as well as channels for downward water and root movement. It is anticipated that the organic pellets will keep the channels open for three to four years. During this period, the abundance of roots interacting with the soil and organisms should create an open structure that is sustainable.

EarthRenew is a member of a consortium supporting the research project, led by Paragon Soil and Environmental Consulting Inc., developing the equipment and conducting the field research. Other partners in the consortium include the Prairie Agricultural Machinery Institute in Saskatchewan; the University of Saskatchewan; Canadian Natural Resources Ltd. and TransCanada Pipelines Ltd. Significant funding and oversight is provided by Sustainable Development Technology Canada.

Key benefits realized with subsoil injection of organic matter fertilizer include:

- Improved soil quality, and a substantial increase in yield and biomass production on industrial compacted sites;
- Increased crop production with ample nutrient supply that persists more than two seasons;
- The ability to apply organic material and nutrients to no-till soils while keeping the surface undisturbed;
- Increased carbon sequestration (by adding carbon and reversing soil degradation and increasing root and biomass production);
- Reduced emissions and runoff of animal manure and other waste materials from surface applications;
- There is sufficient carry over after two years following a single subsoil injection in cereal and canola fields to anticipate as much as two more years of benefit. Though the nutrient carry over may diminish in three years, the organic matter is expected to continue providing value in maintaining good soil structure, associated improved aeration, and moisture infiltration and storage.
- Eliminates the requirement to apply chemical fertilizers on reclaimed land, preventing nutrient enrichment of ground and surface waters via runoff and downward leaching of them;
- In many cases will reduce the need for importing topsoil, a valuable and diminishing resource, or adding amendments such as local manure or compost all of which may be laden with weed seeds that create an ongoing management challenge.

Two years of research demonstrate the feasibility of the technology with resulting improved reclamation success plus increased crop yields of 30% up to 50% in cereals and canola plus even higher response in forage crops compared with the uncompacted field adjacent to the treatment.

In 2008 and 2009, the technology was applied at 40 demonstration sites, ranging in size from 10 x 16 foot replicated plots, up to 15 hectares plots. A total of 275 tons of organic matter fertilizer has been applied in this very extensive research project. Test sites are located in northeastern, central and southern Alberta and northeastern British Columbia, and include cover forage, canola and cereal fields and forestland. Soils on which trials are located include natural and reclaimed Gray Luvisols, Black Chernozems, Black Solonetz, plus non-saline and saline Humic Gleysols.

In summary, the research trials compared subsoil lifting down to approximately 16 inches with a subsoil ripper



alone, subsoil lifting plus injection of EarthRenew organic fertilizer at the 16-inch depth and a control with no subsoil ripping in numerous locations in Alberta and British Columbia in 2009. Multiple trials were established on a wide range of soil types and locations covering a total of 37 acres of land. The research results showed that subsoil lifting and the injection of EarthRenew organic matter fertilizer has resulted in 30% to 45% increase in barley and wheat yield, and 50% to 100% increase in yield and biomass of canola and forages, based on two years of study. This non-intrusive method of addressing subsoil compaction is being rapidly adopted and utilized in the reclamation industry. This project will continue through 2010.