

## **SOIL CARE – Will we make the right choices?**

By Don Lobb

2015 is International Year of the Soil, and from April 19-25, National Soil Conservation Week brings focus to soil care in Canada. We need to consider our record through the ages as we implement soil protection now.

Through the past 10,000 years, history records the successive rise and failure of great civilizations and powerful nations. For example, Mesopotamia (now Iraq), with nearly 20 million people in 3,000 BC, was the most progressive nation in history and then it declined. By 100 BC, Rome had become the most powerful and industrious, but by 500 AD the power of Rome was gone. The decline of these and most civilizations happened for many reasons, but ultimately when their capacity to grow food declined people moved on to new frontiers and fresh soil.

Now – there are no new frontiers! We cannot afford to repeat past mistakes.

The ancients did not carelessly squander their land. It gave them food, wealth and strategic political advantage. Productive soil was a prized possession, yet over the centuries its productivity slipped away. Failure came when agriculture was extended to fragile land, when the cropland water supply failed and when the soil was depleted by tillage-based agriculture. Tillage always removes more from the soil than can be returned. Plato, a Greek citizen and philosopher who tended his own soil, observed that soil building ended and soil erosion began with plow-based agriculture. In 350 BC, plowing was banned on hillsides in Greece.

By 1500 AD, farmers in Lowlands Europe – Holland, Belgium and adjoining lands in France and Germany – had learned how to build soil organic matter and improve productivity with the use of plant residues, manures, crop rotation and new plant types such as legumes. In the late 1800s, Charles Darwin recognized the value of earthworms in soil building. Much later, mycorrhiza fungi were recognized as important contributors to nutrient retrieval for plants and for the development of soil aggregates that resist wind and water erosion. All of this contributes to biologically active, healthy, productive soil as well as the soil-building process.

Around 1730, Jethro Tull an English entrepreneur studying plant growth, wrongly concluded that plants grow by absorbing small particles of soil through their roots thus intensive tillage was advocated. The plant-growth response was actually the outcome of nutrient release by bacteria that prefer tillage. However, tillage destroys soil biology, organic matter and aggregates – the entire soil-building process.

Zero tillage (direct seeding or no-till) should disturb as little soil as possible. Zero tillage equipment that aggressively disturbs soil does not contribute to soil conservation nor does vertical tillage or the rotation of tillage practices. All these contribute to soil degradation and tillage erosion. Tillage by itself erodes far more soil than wind and water combined and it does so every year – largely unnoticed – even on gently undulating land. The long-term cost in lost soil productivity is enormous. When net effects are considered, tillage can never be justified. For example, tillage to reduce soluble phosphorus loss results in unacceptable loss of soil aggregates and organic matter that are both essential to sustainable crop production. We should apply best alternatives to tillage.

Geomorphologists tell us that the only sustainable way to use soil is to mimic nature. On either the dry grasslands of the prairies or the moist woodlands of the east, undisturbed soil is highly aggregated. This provides strong resistance to water or wind erosion and creates important capacity for water infiltration. The ground is covered with protective plant litter and the soil is stabilized by undisturbed root systems. Undisturbed biota contributes to plant nutrient supply, soil aggregation and soil development.

Only no-till or direct seeding crop production mimics nature. Farmers have used this practice successfully and profitably. They can actually conserve moisture and build soil through careful management of crop residue.

Soil degradation has always been influenced by water – either too much or too little. In the humid Great Lakes and Eastern Canada region, excess precipitation has resulted in gully formation, serious topsoil erosion and lost productivity. The management of surface water runoff and soil moisture is critical to reducing soil erosion.

On the dryland prairies, moisture shortage contributed to the dust bowl disaster and continues to limit soil productivity in dry cycles. Here, we now benefit from continuous cropping and have learned the real value of crop stubble/residue and wind breaks in trapping snow to retain moisture and reduce wind-induced water evaporation. When experiencing the wet phase of long-term weather cycles, we should not become careless about the need for moisture conservation and protection from the devastation of wind erosion.

The retention of wetlands and potholes can be a nuisance for field activity, however, they add to the water holding capacity of the landscape. The construction of many small headwaters reservoirs can add to this benefit and reduce the need for downstream flood control. Where water is retained there is opportunity to irrigate high-value crops or add productivity to field crop land. This value should be considered as it contributes to overall landscape management.

Dr. David Montgomery, author of *DIRT – The Erosion of Civilizations*, recounts the sad legacy of tillage-degraded soil during the past 10,000 years. He then points out that “Soil is not lost because we farm – soil is lost because of how we farm.”

As we look forward we must remember that like us, the ancients did have good soil, and they were serious about soil care – and yet they lost it. Today we have tools and knowledge that can allow us to avoid that fate. Will we use them? What will be our legacy to future generations? Will we make the right choices?

The Soil Conservation Council of Canada encourages sober reflection of the lessons of history. It encourages enthusiastic adoption of new and truly sustainable practices that protect our soil, water and natural heritage. The SCCC believes that “how we farm” matters. This is what can set us apart from history.

Don Lobb is a recipient of the L.B. Thomson Award, a member of the Canadian Conservation Hall of Fame and a life-long soil care advocate.