

Standing Senate Committee on Agriculture and Forestry 'Status of Soil Health in Canada' – January 26, 2024

Donald W. Lobb, P.Ag. (Hon)

Senator Marty Klyne's Question:

"What kind of timeline before the point of no return when we run out of runway" to establish food supply security?"

In 2015, the UN-FAO estimated that if farming practices remain unchanged globally, "We will only have 60 years left when we can produce the food necessary to support the world population."

Now, please consider this comment by Patrick Carson, a VP Environmental Affairs, with Loblaw's many years ago: "If in 1860, when the world population was just over one billion people, a farmer was told that in 1960 (100 years hence), farmers would need to feed three billion people, that farmer would respond – 'Impossible! To do that, the entire world would be buried three feet deep in horse manure!'"

At that time, horses provided the most advanced form of farm power. We view the world through the lens of today. It is difficult to predict the future.

I believe that my children will be okay. In Canada, we presently have a substantial food production buffer. I do worry about the fate of my grandchildren and their children as they will not live in isolation from the rest of the world. A world with an increasing population that must be fed from a diminishing soil resource that relies on a shrinking fresh water supply.

We need to give serious consideration to the facts at hand as we consider the urgency, the options and the consequences in our quest to ensure food security.

The Canadian Situation – Cropland Productivity:

- Land tenure
- Land use priorities
- Land management

The Global Situation – Cropland Productivity:

- Peak soil versus peak population
- Land use priorities
- Water availability

THE CANADIAN SITUATION – Land Tenure

The trend to farmland use by non-owner-operators de-incentivizes the use of soil care practices in favour of short-term profits. Profits that are essential to provide return on investment (ROI) for both private and institutional land owners. Soil has become a commodity to be used – and used up! Through history, this kind of agriculture has never been sustainable.

Powerful incentives are needed to ensure soil care and improvement as a means to improve long-term soil productivity.

THE CANADIAN SITUATION – Land Use Priorities

- Diversion of agricultural land to non-foodland use is cause for alarm. According to the Canada 2001 Census, we were losing about 500 hectares per day and the rate was accelerating. If we carry that loss rate forward to 2100, we will lose the equivalent of about one-third of our farmland – much of that is our very best cropland. As our population grows from 40 million today to its projected 57 million by 2100 (Source: Institut National d'Études Démographiques INED), much production will be pushed out onto more fragile land where production is less reliable and sustainable. No civilization has survived that shift.

Canada has an abundance of land that is not well suited to crop production but could accommodate non-agricultural development. We need to mandate development to those areas.

- Crop choice shifts. Due to agenda-inspired trends and government encouragement, we are experiencing shifts in crop choices and crop management that will have long-term impact on foodland soil availability and productivity.

Example #1: The diversion of foodland to biofuel crops uses up soil and crop production resources without net environmental benefit. “Food security” and the environment would be better served with a hydrogen energy focus.

Example #2: There is public pressure for high protein crops to replace animal protein in the human diet. A high protein crop focus contributes to lost soil carbon that is essential to soil, water and nutrient availability. Production of protein for the human diet can better be achieved by growing perennial forages on fragile land and processing them through ruminant livestock to produce essential protein. Production of perennial crops is the only sustainable way to produce food on fragile land.

THE CANADIAN SITUATION – Cropland Management

- Soil degrading practices. Much effort and short-term incentives have been invested toward soil care and protection. Crop residue now covers much of Canada's cropland as a result of direct seeding on the Prairies, some inconsistent use of strip-tillage in eastern Canada and widespread use of shallow, high-speed vertical tillage all across the country. Crop residue alone is not good enough. As applied, these practices almost always contribute to tillage erosion, soil carbon loss, bio-disruption, compaction, and destruction of water stable soil aggregates. The outcome is loss of water that plants need during dry periods. The combined effects are clearly visible through satellite images of cropland in every province in Canada. Light coloured (low organic matter) upslope positions indicate continued lost crop production opportunity on those eroded areas.

The practical and reasonably quick way to improve productivity on eroded areas is through “landscape restoration” – the movement of high organic topsoil from depositional areas to upslope positions. This increases productivity over the whole field.

Soil productivity can be further improved by mimicking nature to accommodate development and maintenance of water stable soil aggregates. This allows deep water infiltration, storage and availability to crops. The same practice minimizes wind erosion, water erosion and compaction. To do this, we must concentrate soil disturbance to the immediate seed planting zone. Some farmers have been doing this successfully for more than 30 years. The use of cover crops can

enhance the system. When combined with elimination of any full surface tillage, these practices will extend the time that the repositioned topsoil stays in place.

- Water use efficiency. Water availability to plants is the first limiting factor for crop production. There is no element of science or ingenuity that can contribute to increased soil productivity beyond what available water allows. Canada has an abundance of fresh water. However, it must be managed with care. Most irrigation water is surface collected and there is opportunity to extend that system. Aquifer use is monitored and controlled. Because water is a shared resource, conflict over use is an increasing issue. (Source: “The Health of Our Water”, AAFC – 2000).

Rain-fed crop is typically not getting full benefit of precipitation. Tillage induced destruction of water-stable soil aggregates results in limited water infiltration, storage and availability to crops. This is an issue with any full surface tillage. The problem is compounded with compaction that further limits water infiltration.

Where there is seasonal excess of soil moisture field work time is limited, the crop root zone is shallow and surface water runoff contributes to downstream peak flow. Surface drainage almost always adds to downstream damage.

Through soil management that maintains water stable soil aggregates to ensure water infiltration, through intensive surface water collection and management and through efficient use of irrigation and careful use of sub-surface drainage, root zone soil moisture can be managed for optimal crop production in almost every region of Canada. Water use efficiency is the most critical element of crop production improvement.

THE CANADIAN SITUATION – SUMMARY

Choices by Canadian policy makers and the agricultural community will determine the length of time that we can produce enough food to satisfy our need.

If we choose the status quo, then the evidence at hand would suggest that beyond one more generation declining soil health and a declining land base will result in lost capacity to produce food to meet demand. The consequence is serious.

If we choose to protect soil from non-essential use and if we completely adopt those practices that contribute to enduring soil productivity, we could meet domestic food demand indefinitely.

The question then is, how do we manage soil to accommodate rapidly growing global demand for food? We ARE part of the global community.

THE GLOBAL SITUATION – Peak soil versus peak population

- The UN-FAO reports that 95 per cent of our food is dependent on healthy soil, that just 12 per cent of the world land produces all cultivated crop, and 26 per cent is pasture/grazing land.

Peak soil. In 2022, we reached peak soil. From that point forward we cannot replace soil as quickly as it is lost from production. Currently, most new cropland comes from pasture land conversion, which is usually fragile land. From 1960 to 2000, cropland was lost at the rate of one-half percent per year. The rate of loss is increasing due to the demand associated with population growth. (UN-FAO) The total lost from agri-food production is alarming.

Peak Population. Global population will peak before the end of the century – in 2086, at just over 10.4 billion people, even though the population growth rate has been declining. In 1968 at 2.1% per year (peak rate); current rate is 1.1%. (UN-FAO)

For the past 60 years, the amount of global arable land per person has declined. (1961 at .36 ha; 2020 at .18 ha, World Bank). The effect has been buffered through increased food production per unit of land. In 2020, only 30 per cent as much land was needed to produce the same amount of food that was produced in 1961. (UN FAO) This allowed continued population growth. As we move forward with peak population extending 60-80 years beyond peak soil, soil and water use will be intensified and the outcome of errors will be sharpened. History records that population size is always determined by food availability.

THE GLOBAL SITUATION – Land use priorities

- Diversion of cropland from food production has and continues to undermine food security. In just five years, from 2010 to 2014, globally there was a 23 per cent increase in urbanization, disproportionately from the most productive cropland. This was the equivalent of a 2.5 per cent “loss in world food grain production”. (UN-FAO) Beyond non-agriculture development and urbanization, other non-food cropland uses include: production of poppies, tobacco and crops for bio-fuels. Any activity that forces agri-food production from our best cropland to more fragile land will add to food shortage risk or pressure.

THE GLOBAL SITUATION – Water availability

- Water availability defines the usefulness of cropland soil. Thus, global water supply and management is cause for concern because 40 per cent of the world food supply comes from two percent of the land and that is mostly irrigated. (UN FAO)

For example, India, the second largest agricultural producer in the world irrigates 51 per cent of its cultivated land, 65 per cent of that from ground water where aquifers have been drawn down 250 to 300 meters. This is a country with 18 per cent of the world’s population but just 4 per cent of the fresh water. (UN FAO)

India irrigates two times more land than China, the largest agricultural producer and 2.25 times more than the USA, the third largest producer. Irrigation supply is approaching crisis state in all three countries as they have rapidly depleting aquifers. (UN-FAO)

Globally, most rain-fed cropland soil is not managed to maximize water capture and use efficiency, as excessive tillage continues. Crop residue cover is not enough.

THE GLOBAL SITUATION – SUMMARY

If current trends continue through the next 65 years, the global population will grow by another 2.4 billion people who must be fed as the productive land base shrinks by about 35 per cent.

Through that time, water use efficiency for food production will increasingly be tested by weather uncertainty and the limits of available water.

As food insecurity evolves, conflict to acquire land or migration to reliable food producing regions are the historical natural outcomes. The beginnings of both are active now.

* * * * *

As Canadians, we have the resources and knowledge to sustain soil productivity. Do we have the vision, discipline, commitment and courage for action?

Our grandchildren will know.

Don Lobb, P.Ag.(Hon)
H: 519-605-0121
C: 416-606-2221
DonaldWLobb@gmail.com

Note: The reference data varies in magnitude between sources; however, the trends are consistent. I have based my assumptions on what I believe to be reliable sources. The United Nations – Food and Agriculture Organization (UN-FAO) is referenced unless otherwise noted.