RAIN Research Note 051215

Keyline Subsoiling: What, Why, and How

SUMMARY

Keyline ploughing is a straightforward agricultural technique developed in the 1950s to help Australian farms better manage water on their lands. While originally developed to aid farmers in semi-arid regions of the Australian outback, keyline ploughing is actually a specific pattern of topographical sub-soiling used to better distribute water across the land. There are two components to the keyline technique of land management: the plough itself, and the applied subsoiling design.

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What is keyline design?[1,2]

Keyline design is an agricultural design process intended to increase the fertility of soils through water retention and redistribution. The primary outcome of Keyline design is the development of better soil structure and increased soil fertility for both crop and pasture lands. Keyline design maximizes the use of water over a specified landscape; slowing the shedding of water from higher elevations which are typically drier, and limiting the amount of water which would gather in low lying lands. Installing a keyline system on your property requires planning but is straightforward in its execution.

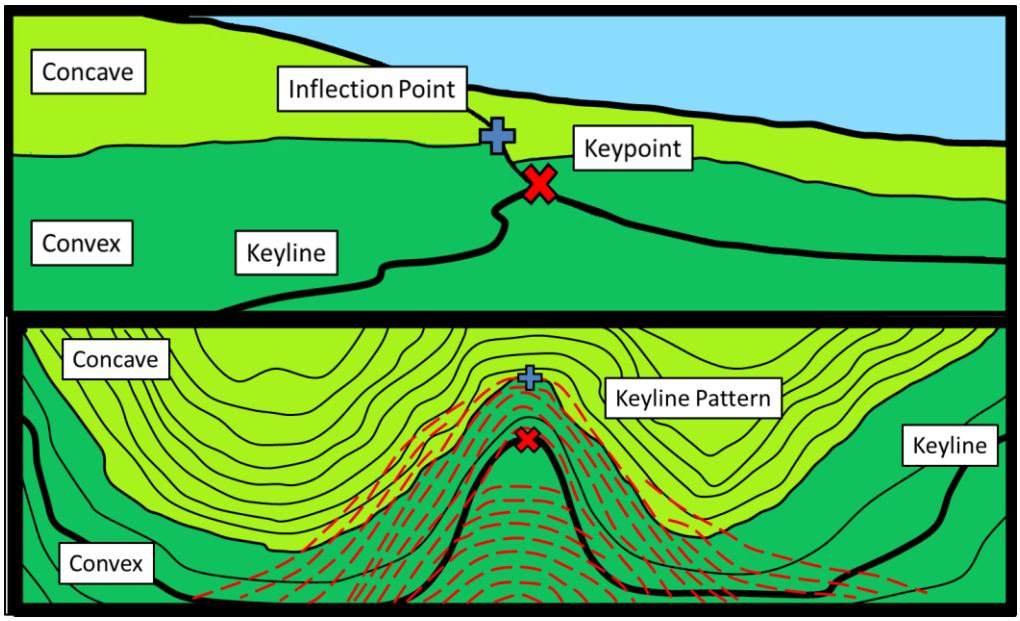

Figure 1. Determining key point location for installing keyline pattern irrigation

Keyline pattern subsoiling begins by establishing the keypoint on the land base. The key point is found at the point where the valley exhibits its steepest slope; the key point is below the point of inflection, which is defined as the point where the land changes from a concave to a convex shape (figure 1; top). The keyline is a special contour line that intersects the keypoint but is not dependent on elevation, the keyline must cross contour lines in order to move water. Once the keypoint and keyline have been established, a specialized subsoiler is used to trace the keyline in a parallel manner up and down the slope.

In planning the layout of a farm, it is often the case that only the keypoint for each primary valley needs to be marked, this is usually accomplished using a laser level. Generally, keyline contour surveying costs are minimal and can be achieved with regular surveying equipment such as a transit. The keyline pattern itself is installed with the use of a specialized subsoiler (figure 2).

The subsoiler was developed by P.A. Yeoman as a response to the unpredictable rainfall found throughout Australia's arid agricultural lands. The unique feature of the plough is a specialized shank that can deeply penetrate the soil without causing a major disturbance to the soil structure itself, and this soil preservation approach follows in line with the benefits of no-till seed drills. Subsoiling in general serves multiple functions, the more important being breaking up compacted soils; however, the use of a Yeoman shank minimally disturbs soil microbe habitats (see research note: Soil Health and Ecology for additional information). Aerating soil increases the amount of oxygen, water, and nutrients to depths which would take years to reach otherwise. With a well-managed pasture system, subsoiling can aid in the production of topsoil, increase general fertility, and greatly increases the water holding capacity of soils.

Figure 2. Keyline plough shank

Figure 3. Pasture with an installed keyline design

Although originally developed under drought conditions, a keyline design will help to distribute rainfall more evenly across the pasture. Under heavy rainfall conditions, an installed keyline design will slow runoff under the same re-distribution mechanism and, because of the channels caused by the plough, allow a greater amount of water to be retained in the soil. Keyline design has the potential to dramatically benefit Northern Ontario farmers by improving soil fertility and by mitigating the effects of extreme weather conditions.

For additional resources please visit rainalgoma.com on keyline designs please visit crkeyline.ca – a non-profit keyline research project being conducted on Vancouver Island, British Columbia.

1. Yeomans, K.B., Yeomans, P.A. (1993). Water for every farm.
2. Georgi Pavlov . Understanding the Application of Keyline Geometry.

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