FOREST4EU

ITHub 5 - Agroforestry Systems

FOREST4EU partner: ANSUB
OG: EcoMontadoXXI
OG's country: Portugal
Type of Innovation: Process

Use of Keyline to increase soil's moisture retention capacity in summer months

Introduction

Keyline is an agricultural system developed by Percival Alfred Yeomans (PA), in Australia, in the late 1940s and 1950s, after combining experiments carried out on his farm, with his readings on ecological agriculture and the knowledge of some academics. Keyline is a topographic line traced using a point on the ground as reference where the water, when descending, abruptly slows down, resulting in an area of accumulation of water. Using this line as a reference, slightly uneven lines (about 1% in relation to the Key Line) are drawn for surface water redistribution and/or water storage. This way, water is distributed in the soil and progressively transported from the valley for the peak zones. Thus, the infiltration rate is increased at the same time as the surface runoff and the evaporation rate are reduced, allowing a significant improvement in soil fertility and structure. By improving the distribution of moisture in the soil, it increases

the total content of organic matter, as well as the biological activity. This system is designed to promote the retention and redistribution of water in the soil, as well as the active construction of the soil in clean areas or with a low degree of forest cover to improve installation conditions of new vegetation cover, including improved pastures, aromatic, or trees in different agroforestry systems.

Assuming that the impact of Keyline is mainly felt at the level of soil moisture, 30 humidity measurement probes were installed on 2 properties in south Portugal.

we can see that Keyline effects indicate that soil's moisture content vary according to weather and the altitude zone. In the upper zone, the results indicate greater moisture retention at depths from 10 to 40 centimetres, from March to July, when the reduction of precipitation starts to affect soil moisture values.

In the intermediate zone, there was a greater retention of soil moisture at depths from 0 to 20 centimetres. On the other hand, in the lower zone, there was a reduction in moisture retention at depths from 0 to 10 centimetres, since the first marking of the Keyline, in February 2019, with reinforcement of this effect after the second Keyline marking, in June 2020.

Thus, a reduction in waterlogging is observed in the most superficial layer of the soil. However, for depths from 10 to 50 centimetres, a greater retention of moisture in the soil is already observed again in the

months of May and June, when it starts to dry. In another property, an increase in the humidity values in the deepest layer of the soil, from 40 to 50 centimetres, is observed in the high zone, with a simultaneous decrease in the values of soil humidity in the most superficial layer, from 0 to 10 centimetres, for the months from March to May. In this situation, which coincided with a period of higher precipitation, there seems to have been a drainage of water from the most superficial levels to the deepest levels of the soil, due to the Keyline effect. From May to July, there is a reduction in soil moisture levels similar both in the share of control as in instalment with Keyline. In this situation, corresponding to the higher altitude topographical location, Keyline had no effect on soil moisture retention.

Lessons learned

Keyline has an impact on soil moisture, but it varies according to weather and the altitude zone. Therefore, the implementation of this Keyline system is not recommended in sandy loam or sandy soils, with the exception of areas that are prone to saturation, where the Keyline could reduce this tendency.

In places where the textural composition of the soil frequently leads to situations of waterlogging or reduced infiltration into the deeper layers, the implementation of Keyline brings advantages by enabling an increase in the soil moisture retention capacity in the months summer, mitigating the effects of the lack of water during this season and facilitating the drainage of water in the lower areas, when there is more precipitation.

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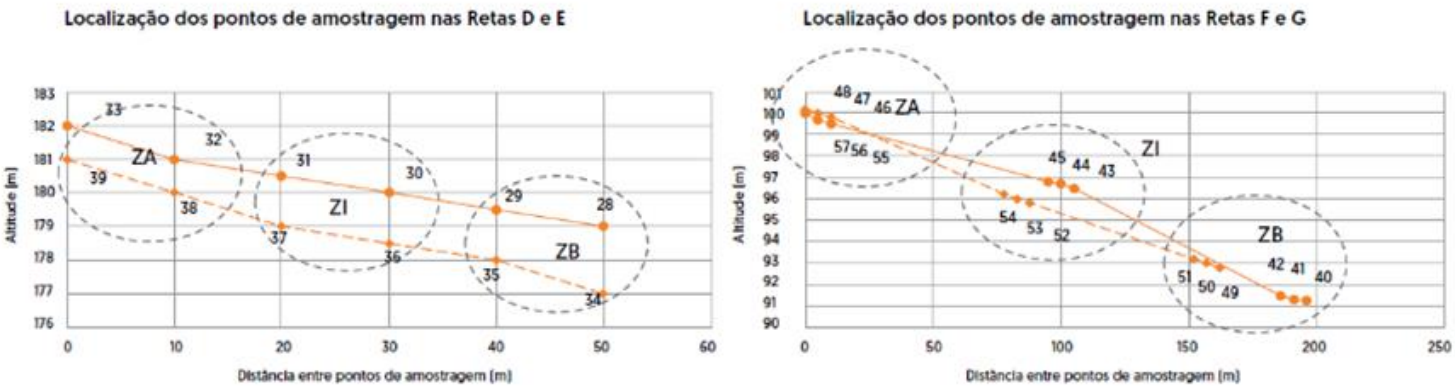

Figure 1. On the left, placement of the sampling points along the lines D and E. On the right, placement of the sampling points along the lines F and G.

The information presented in this factsheet was developed by the FOREST4EU partner, drawing on the innovations and knowledge generated by the indicated operational group with their explicit authorization.

Further information

http://www.ecomontadoxxi.uevora.pt/

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