

Steep soil Conservation Practices for its Use and Sustainable Management

Marco Fidel Romero Zárate*

Agricultural Engineer, Expert in Edaphology and Agriculture of Precision, Colombia

***Corresponding Author:** Marco Fidel Romero Zárate, Agricultural Engineer, Expert in Edaphology and Agriculture of Precision, Colombia.

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Considering that most of the world's soils have degraded significantly from a physical, chemical, biological and environmental point of view, severely affecting ecosystems and in general life on the planet; which has led to many agricultural and agro-industrial activities contributing greatly to the current phenomena of climate change and global warming, as large volumes of greenhouse gases are released into the atmosphere and simultaneously polluting the waters and in general the entire natural environment by inadequate anthropic practices.

These phenomena are common in flat and perhaps more severe areas of hillside where soils are most fragile for degradation due to severe deforestation and grade of slope.

In the present case, some of these practices for the use and proper management of soil resources in hillside areas are described in general, some of which are as follows:

1. Soil recognition studies in a region or country should be conducted to understand its properties, geo-spatial distribution and potential for use in accordance with the land classification methodologies developed by the USDA (US Department of Agriculture, FAO, IGAC or any other system that applies such scientific concepts).
2. Selection of the most appropriate crops for the region according to the classification of land fitness and agro-ecological and environmental conditions of the area.
3. Make minimal tillage of the floors strictly where necessary and the slopes allow it or zero tillage, only in the places where the plants are to be planted (opening of holes, preferably of good size, incorporate organic matter to improve soil properties).
4. Sow the crops using the triangle system (tresbolillo) following the curves of level or contour lines.
5. Sampling for soil analysis for fertility purposes, at least 2 months before the establishment of the crop to carry out chemical amendment applications in time and also have the results to develop the fertilization plan more adequate, thus avoiding inappropriate applications and in many cases polluting water sources, air and increasing production costs without getting good answers in production.
6. Rotation of crops and leave "rest lots" to allow the recovery of the soil especially in the physical and biological aspects.
7. In rest lots, it is possible to sow "green fertilizers" (*Crotalaria* or *Vitabosa*) or any legumes and then incorporate such organic materials into the soil.
8. Proper management of arvenses, selecting species preferably low vertical growth tracers, eliminating grass weeds, which are rapidly developing and severely competing with crops; in such a way that they behave as soil cover to reduce the impact of rainfall, the speed of runoff, soil loss and nutrient washing from erosion.

9. Frequent incorporation of organic matter with the aim of maintaining their levels so that macro and micro-organisms are always present in high proportion, which guarantees the sustainability of soil properties in the long term and promotes the assimilation of nutrients.
10. Establishment of living barriers that reduce the speed of runoff.
11. Opening of stilts or hillside ditches, which must be done in contours, always protected in parallel at the top to avoid soil removal and formation of karcavas, this practice is very important in regions of high rainfall.
12. Incorporating or distributing crop residues, preferably chopped so that they have a larger surface area of contact with soil, moisture and other macros and micro-organisms, this practice accelerates the breakdown of organic matter.
13. Completely avoid burning of all kinds, as these progressively reduce the productive capacity of soils due to the destroying of organic matter and its organisms present, in addition to releasing greenhouse gases to the atmosphere.
14. Use bio-inputs (products of natural origin) instead of broad-spectrum agrochemicals, to promote the presence of macro and micro-organisms of the soil and environmental pollution.
15. Use of improved seeds to prevent soil infestation with pests and diseases, thus reducing agrochemical applications to the soil.
16. Planting of multiple crops, in sashes or associates, which allows the gradual restoration of soil biology, the balance between pest and beneficial insects, improvement of agro-ecosystems and generates varied income to the farmer or for his Consumption.
17. Avoid contamination of water sources with the use of heavy metals or other toxics, which progressively contaminate the soils.
18. Avoid over (intensive grazing) especially in livestock areas established in hillside areas, this reduces the formation of terraces (cow legs) and future processes of mass removal and soil degradation.
19. Under no circumstances should "naked soil" be left, i.e. without any vegetation and completely rule out the use of the "azadon" or any similar tool, since its overuse has caused the severe degradation of hillside soils in many regions of the world [1-6].

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