

EVALUATION OF EROSION IN VOLCANIC SOILS OF THE CUENCA DE COINTZIO, MICHOACÁN, MEXICO

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This study, which takes place within the European REVOLSO project, is aimed at assessing the influence of various agricultural practices on erosive processes in the Cointzio watershed, Mexico. Experimental plots were set, on which various parameters were studied, such as soil type, vegetative cover, soil work or rainfall amount and intensity. Results show that soil loss for a fersiallitic soil is important, often higher than one ton/ha/year; it is then superior to the soil formation rate, which creates a disequilibrium. It was also proved that crops sown in drills increase soil susceptibility to erosion, as they let it

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more exposed to drop impact (comparison red kidney beans – oat). The organic treatment is helping to prevent erosion phenomena too, thanks to the input of manure that contributes to improve soil structure and hence to decrease its erodability. However, rainfall remains the main factor to study in such a type of research, as correlation coefficients between soil loss and precipitations can reach 0.93; in Michoacán state, the presence of a pronounced rainy season influences erosive processes. The problem complexity, due to the multiplicity of the parameters involved, makes the study difficult; but the importance of this pattern imposes to find solutions rapidly to prevent and mitigate soil loss, working directly with producers so as to set a sustainable agriculture, in harmony with its environment.

The DPSIR framework was applied to soil erosion, and it was found that the intensification of agriculture could be considered as the main driving force. Unsustainable agricultural practices constitute a threat at the ecosystem level, as well as the disappearance of forest areas that, until now, contributed to clean water and to prevent soil loss. Indeed, in addition to on-site impacts (soil loss), off-site consequences were also evaluated by sampling the main stream of the watershed, showing that various land uses generate significant differences in nitrates' concentration all along a river (0,07mg/l at the source of the river, 0,43mg/l in an agricultural zone). The highest concentrations were found in the Cointzio reservoir itself (3,7 mg/l of inorganic nitrogen). Water quality is a matter of primary importance as the Cointzio reservoir is used to provide 30% of Morelia's drinking water (the state capital). It is then important to monitor water quality in this watershed to prevent health diseases, since many people rely on this water resource. The intensification of agriculture also has an impact on the atmosphere, since greenhouse gases are emitted from agricultural soils or domestic livestock. This pattern was under-estimated due to the extensive land management of Michoacán, but should be considered as agriculture contributes directly to emissions of greenhouse gases through a variety of different processes, even in extensive systems like it is the case in the watershed under study. Indeed, it was estimated thanks to the IPCC methodology that 6 114,41 tons of methane are emitted from the Cuitzeo river basin, and 2 764,775 tons of nitrogen, through direct and indirect pathways (2,59% of what is applied as fertilizers on the watershed). Human practices in the Cointzio watershed have an impact on the various media of the ecosystem; hence reforestation programs (especially on the river banks) and a more adequate use of fertilizers on fersiallitic soils should be implemented to mitigate soil loss, water pollution and greenhouse gases emissions.

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