USING GIS IN DESIGNING A SOIL SAMPLING CAMPAIGN TO GENERATE SOIL MAPS FOR AN ECUADORIAN WATERSHED ASSESSMENT

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Objective

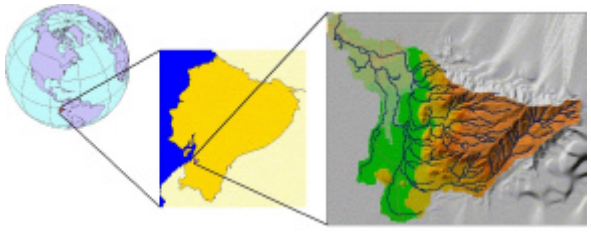
Generate soil map information ready to be used in a pesticide evaluation for an Ecuadorian watershed

Site Location

Chaguana River Basin, Southwestern part of Ecuador, El Oro Province. (see figure below, left image corresponds to a DEM which is only valid for the area inside the basin)

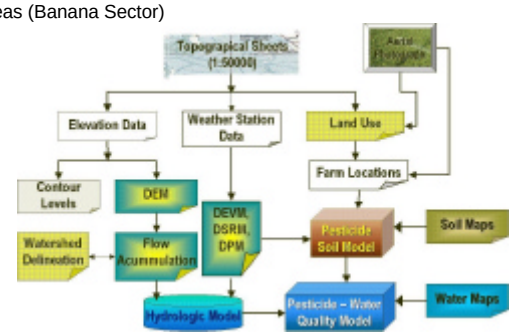
Watershed Extension

34,000 Ha



Methodology

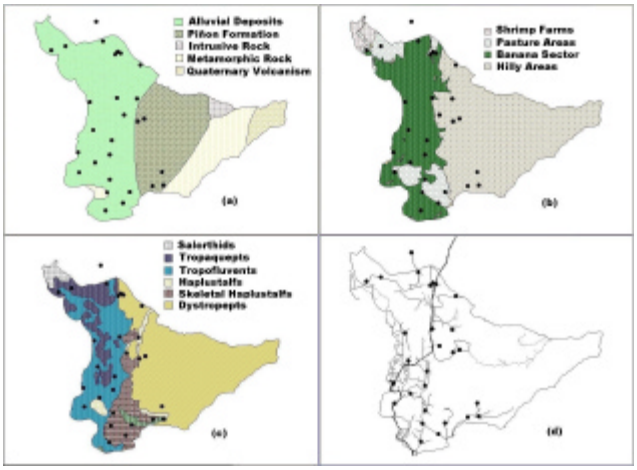
- Existing information is available in Topographical, Geological and Edaphological Maps (scale 1:100,000)
- Watershed Assessment is focused mainly to potential pesticide generator areas (Banana Sector)



Soil Sampling Design considered sample stratification based on existing data and area of interest (from a pesticide point of view):

a) Geology (Alluvial Deposits)
b) Landuse (Banana Sector)
c) Edaphology (Tropofluvent Soils)
d) Available Roads

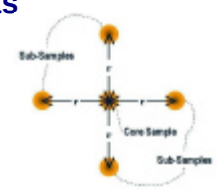
28 Sampling Sites were located on the basis of strata of interest.



Soil Sampling Results

Soil sampling depth: 0 – 50 cm below ground level

Number of Samples per site: 2 (a core sample and a composite sample from a cross-shaped pattern sampling)



	% Organic Matter	% Water Content	Bulk Density (Kg/m³)	% Sand	% Silt	% Clay
Range	0.13 – 2.01	7.53 – 53.15	1078 – 1777	6 – 99.5	0.4 - 78	0.1 – 73
Mean (X)	1.16	31.11	1409.62	41.3	40.58	18.11
Standard Deviation (s)	0.51	10.44	186.65	24.82	20.92	15.33

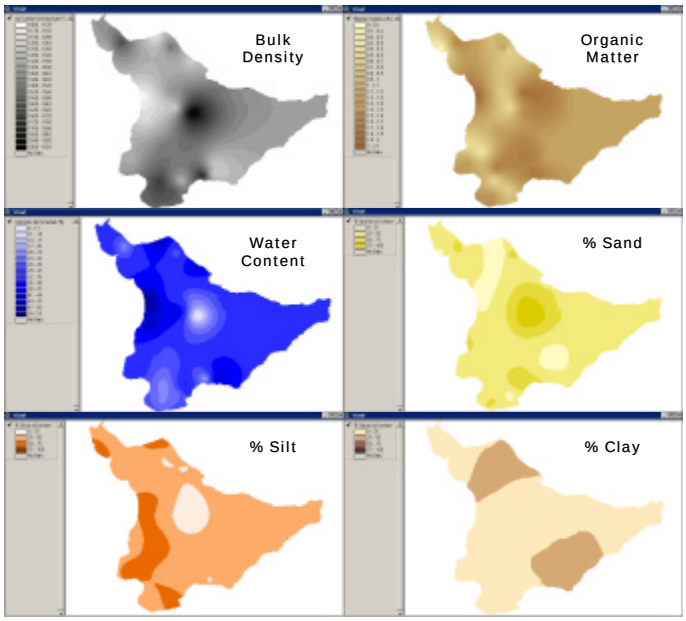
Generated Soil Raster Maps

GIS Platform: ArcView, ESRI

Interpolation Method: Kriging (VESPER tool)

Raster Cell Size: 100 m × 100 m

Parameter	% Organic Matter	% Water Content	Bulk Density (Kg/m³)	% Sand	% Silt	% Clay
Kriging Method	Double Spherical	Double Exponential	Double Exponential	Double Spherical	Penta Spherical	Linear with sill



CONCLUSIONS

- A soil sampling campaign was optimized due to sample stratification. More samples were taken on sites where the interest of the project was highest (pesticide usage).
- Soil maps can be generated by Kriging interpolation in raster format, for further use in pesticide soil models.

MAIN REFERENCE

D. Matamoros, J. Bonini, E. Guzman, G. Ramirez and P.A. Vanrolleghem (2001). Design and Implementation of a measuring campaign to model pesticide impacts in an Ecuadorian Watershed. In: *IWA Conference on Water & Wastewater Management for Developing Countries*. Kuala Lumpur, Malaysia (in Press)

Acknowledgement

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