Sustainable Agriculture in Costa Rica

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XI WORKSHOP INTERNACIONAL BRASIL/JAPÃO
ENERGIA, BIOCOMBUSTÍVEIS E DESENVOLVIMENTO SUSTENTÁVEL

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Sustainable Agriculture Problems

- Climate change
- 2020 - 2080 Central America will increase temperature (1.1°C to 5°C)
- Precipitations reduce 50% in Central Pacific, Costa Rica
- Increase sediments loads not use BMP´s
- 85% of available water is used for agriculture.
- 45% decrease soil productivity.

State Policy for Agricultural Sector

Competitiveness

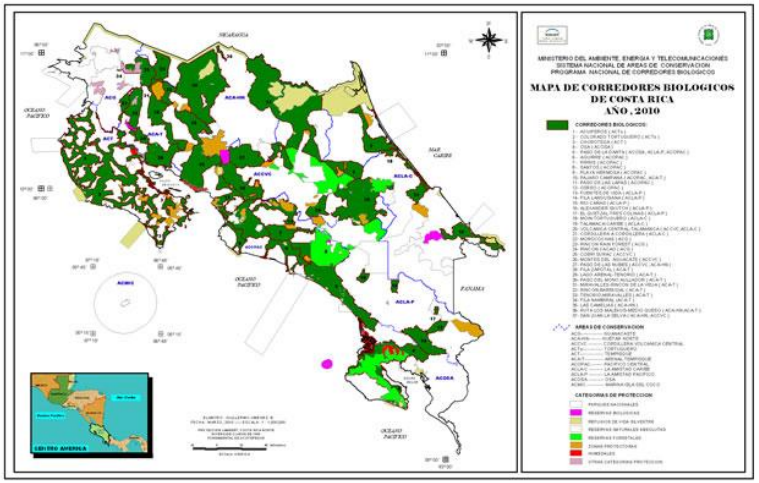
Innovation and Technological development

Management of rural agriculture

Climate Change and Agro-Environmental Management

Steps to Sustainability

- 25.1% territory is preserved and establish of biological corridors. (goal 45%)
- 5% world biodiversity
- Environmental Services payment
- Ecological labels: preserve and increase incomes-
- Goal 2020: Carbon Neutral
- 98% Energy: Renewable: Hydropower, Eolic and geothermal



University of Costa Rica

SOILS AND WATER RESOURCES

MACHINERY AND MECHANIZATION

BIOSYSTEMS ENGINEERING

BIOPROCESSING

PROJECTS DEVELOPMENT

- UCR change and upgrade its curriculum to integrate the concepts of competitiveness and production to sustainable agriculture to achieve our goal to be an ecological country

Bioenergy Engineering

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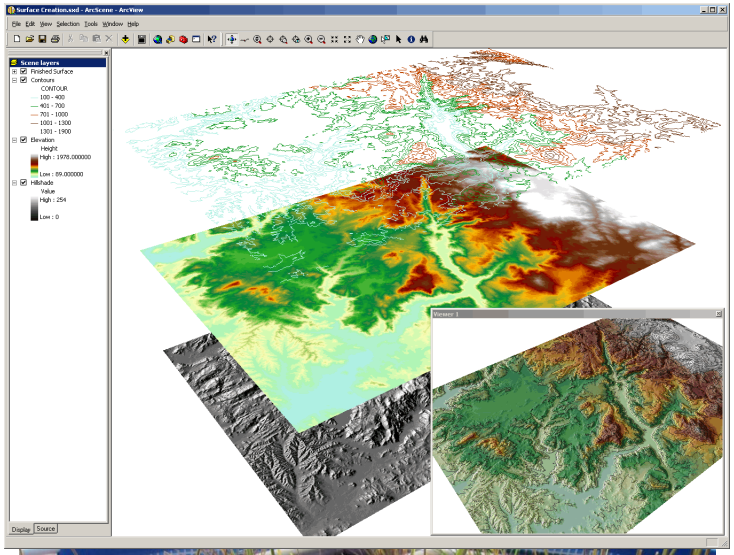
COSTA RICAN AND MSU OFFICIALS HELP DEDICATE **NEW ANAEROBIC DIGESTER**

Contact(s): Layne Cameron

Ecosystems Enginering

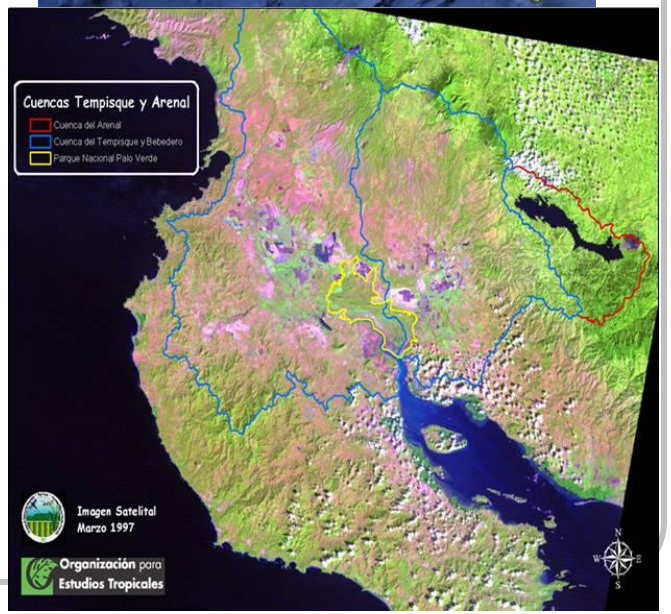


Technology applied production

Water Resources Managment

Arenal Tempisque Irrigation Project

- Located in Guanacaste, Costa Rica.
- Created in 1984
- Total Area: 60,000 ha:
  - 40,000 ha from Arenal Basin
  - 20,000 ha from Tempisque River
- 280 km^2 and 995 recipients
  - 257 km^2 surface irrigation
  - 16 km^2 pumping irrigation
  - 7 km^2 fishing activity (tilapia)

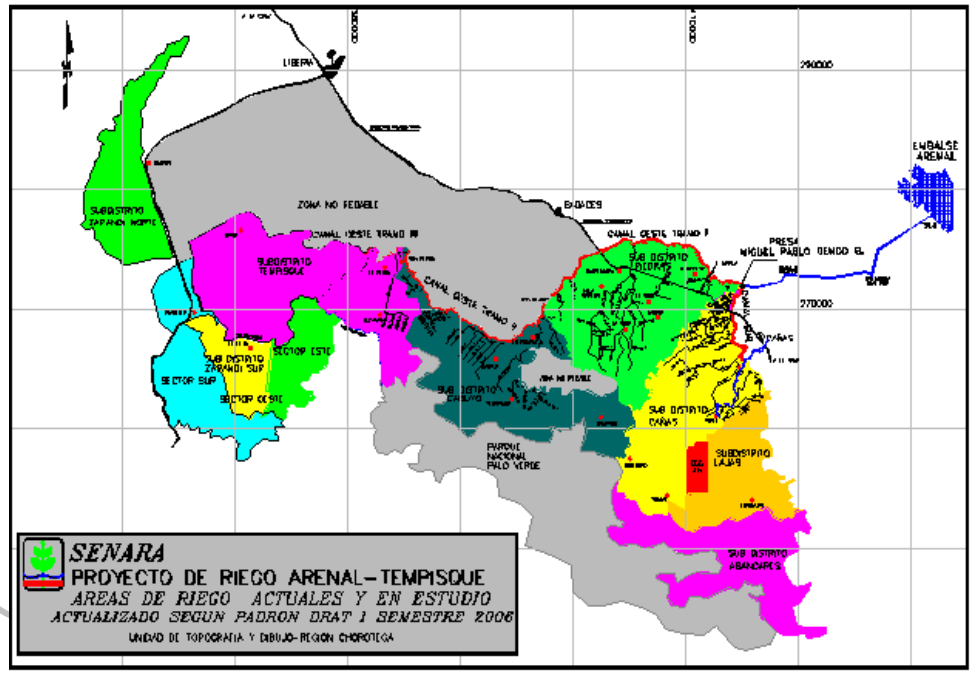


Principal Crops in the Irrigation Project

Crop	Area (ha)	% national
Sugarcane	14,800	45.8%
Rice	9,230	
Pasture	2,790	
Tilapia	700	
Cotton	315	
Others:	100	
Pineapple		
Cantaloupe		71%
Papaya		
Onions		

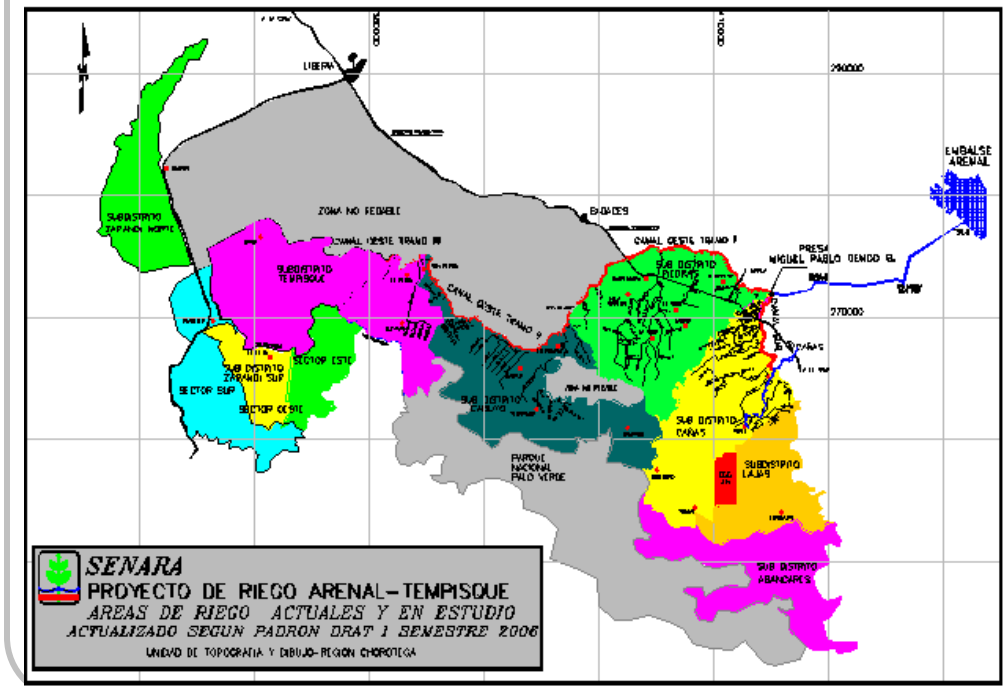
Hydraulic Resources

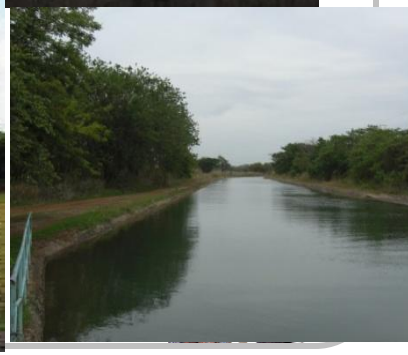
- Hydric dependence of Electricity Costa Rican Institute (ICE)
- Diversion discharge from Arenal Basin: 80 cms
- 3 powerhouses to generate electricity in the dry season (1/3 national consume)



Hydraulic Resources

- Miguel Pablo Dengo Reservoir:
- South Channel: 8.5 km length and 30 cms, max capacity
- West Channel: 42 km length and 55 cms max capacity
- Secondary and tertiary channels



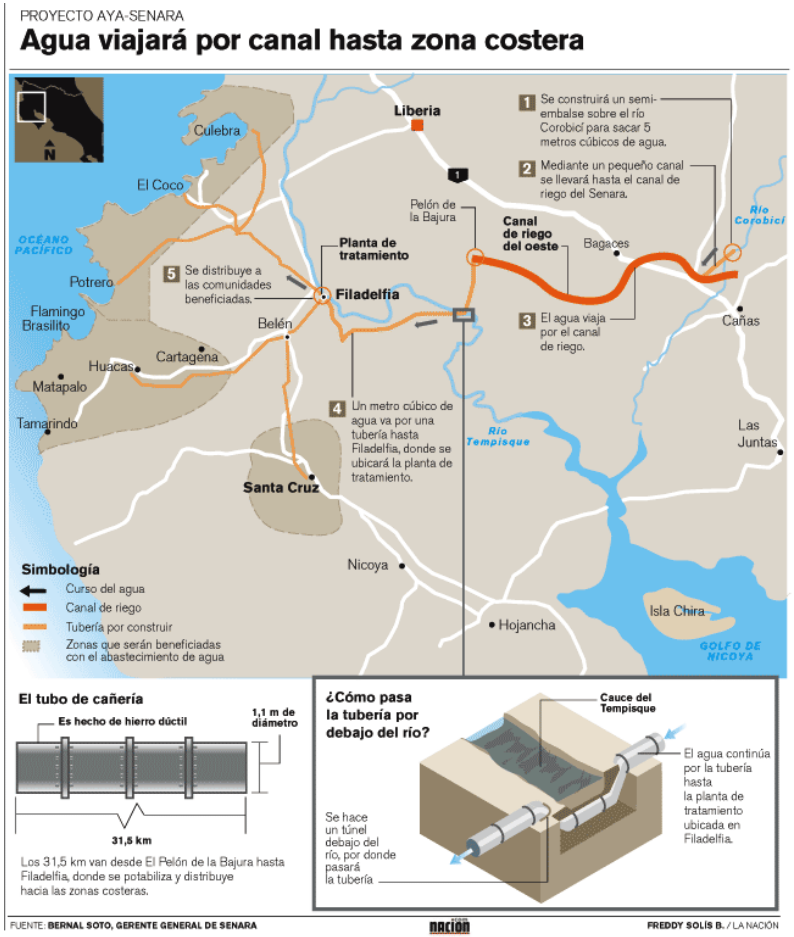


Necessities in the Irrigation Project

- **Modernize the geospatial data base**
- **Preservation of water resources**
  - Discharged flows return to system to costal areas and wetlands
    - Palo Verde National Park
- **Implement a volumetric rate for the farmers**
  - Water Rate is based on field size $100/ha /year
- **Treatment of effluents and reuse**

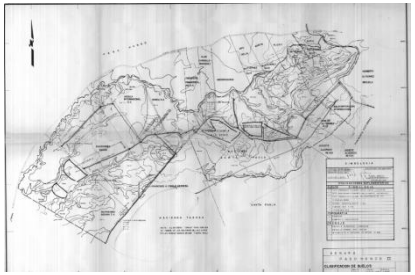
Necessities in the Irrigation Project

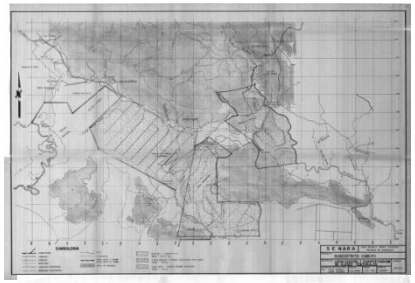
- Irrigation Project for water sustainability considering climate changes and critical operation in dry season.
- Expand the project to Guanacaste Municipality for water supply

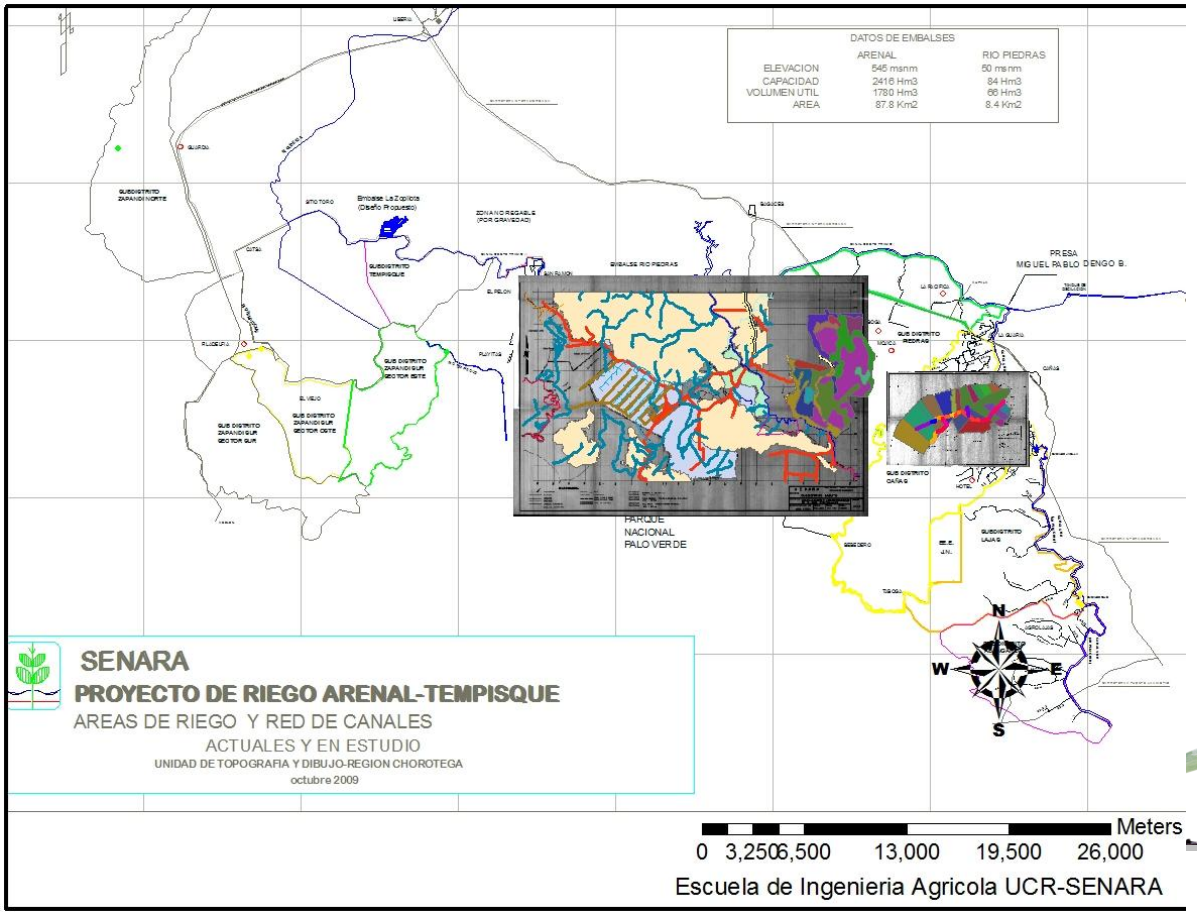


Progress

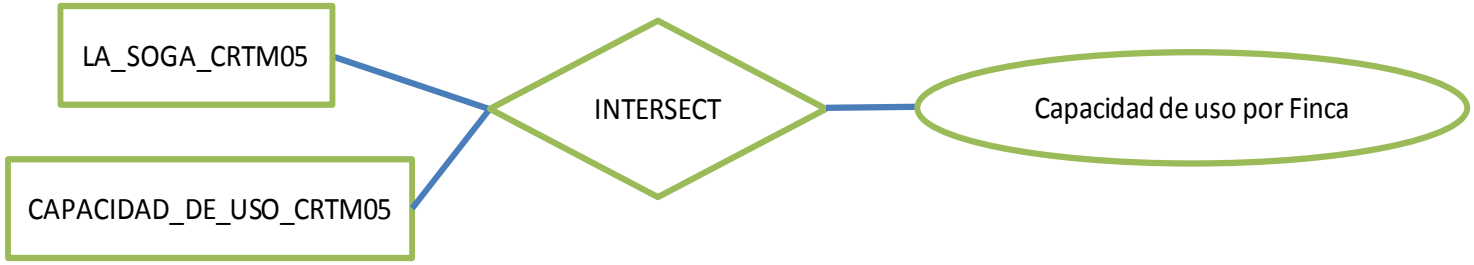
- Generation of Geospatial data in the Irrigation Project

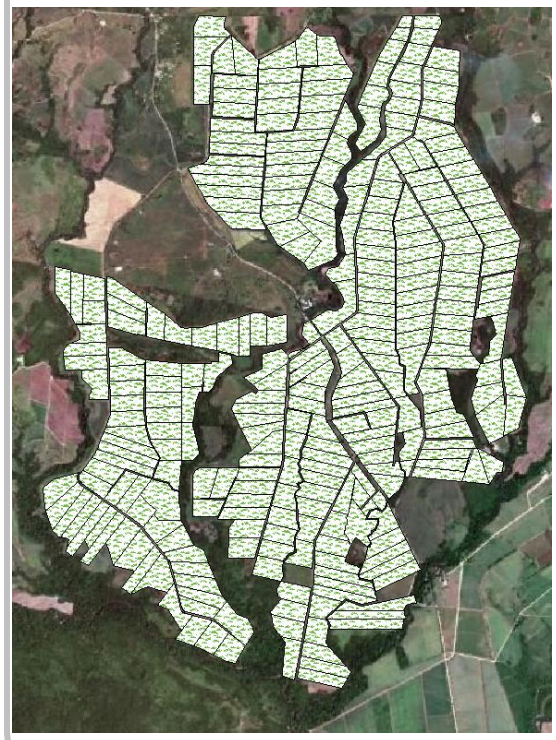


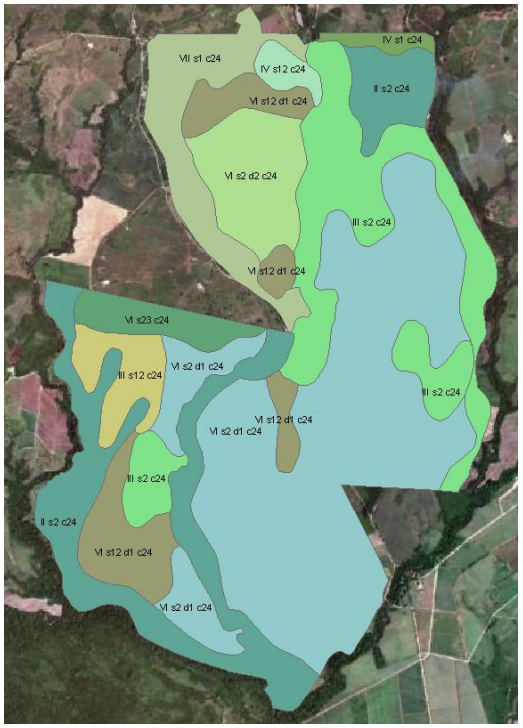


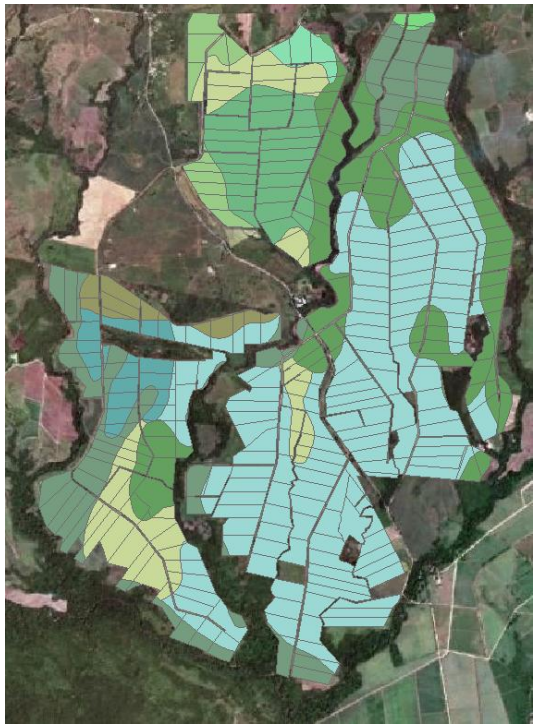


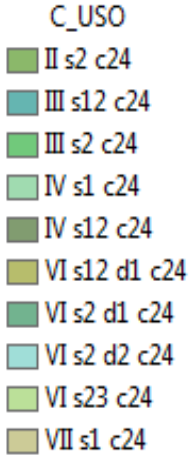
Cartographic model for land use capacity



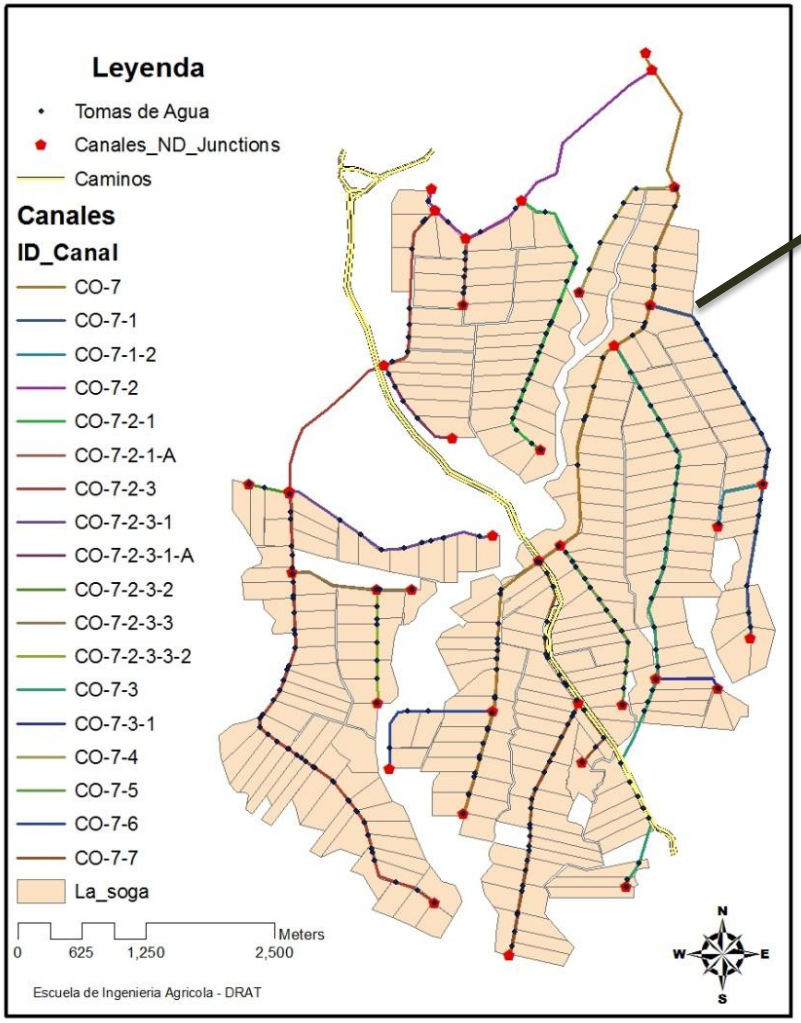


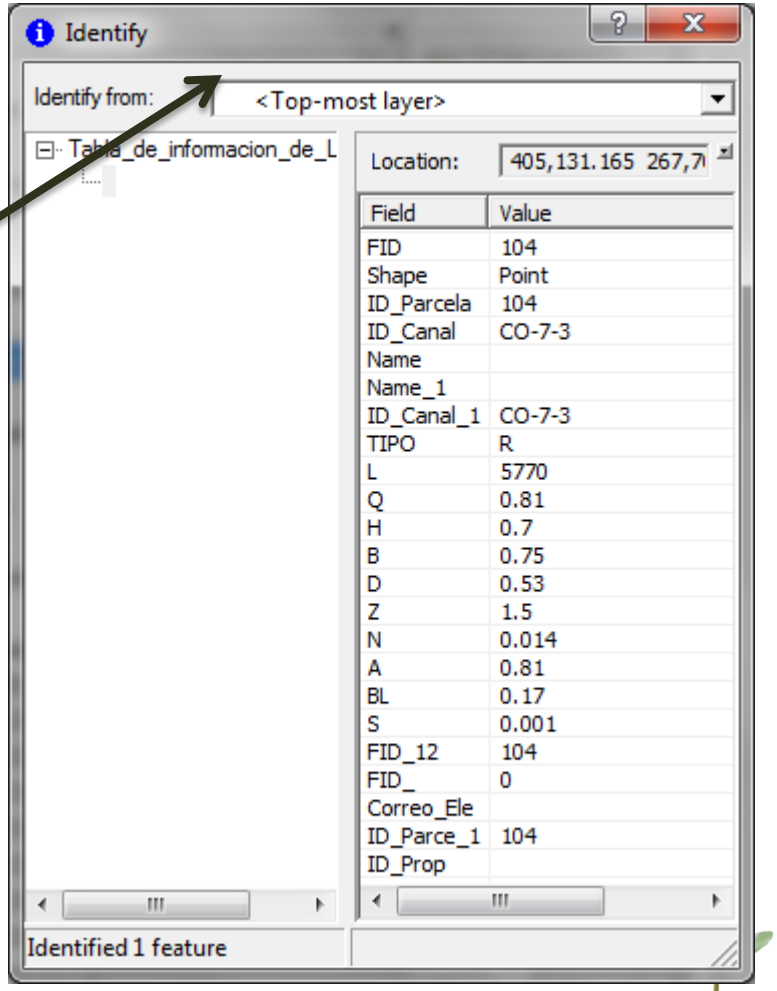




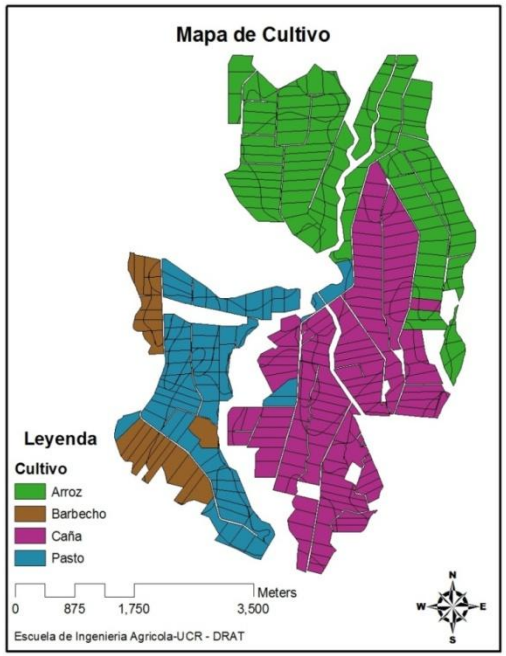


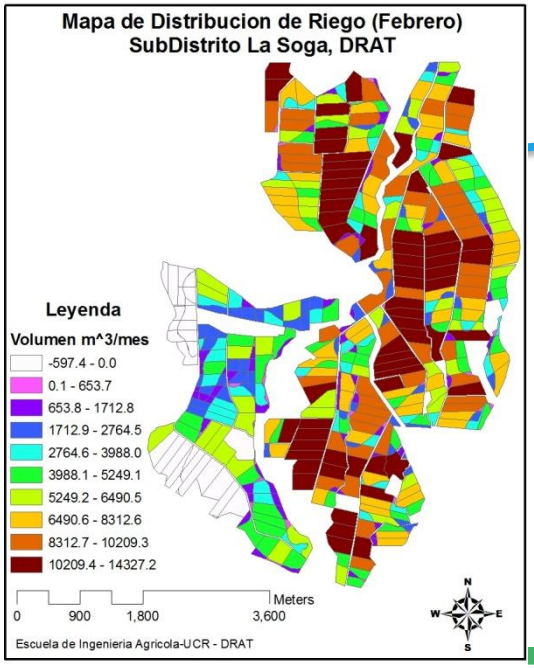
Irrigation Channel network and water intakes location

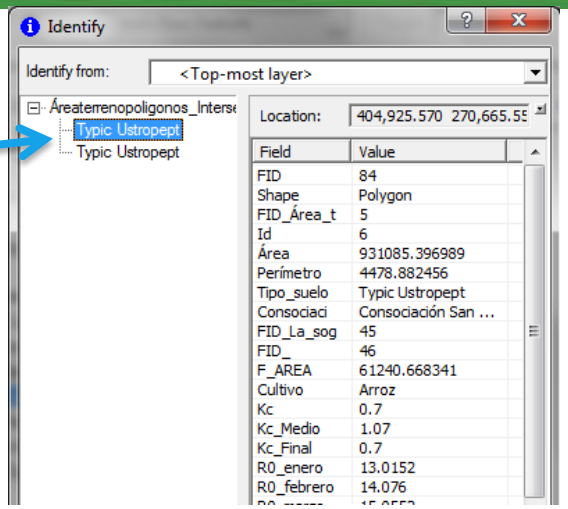


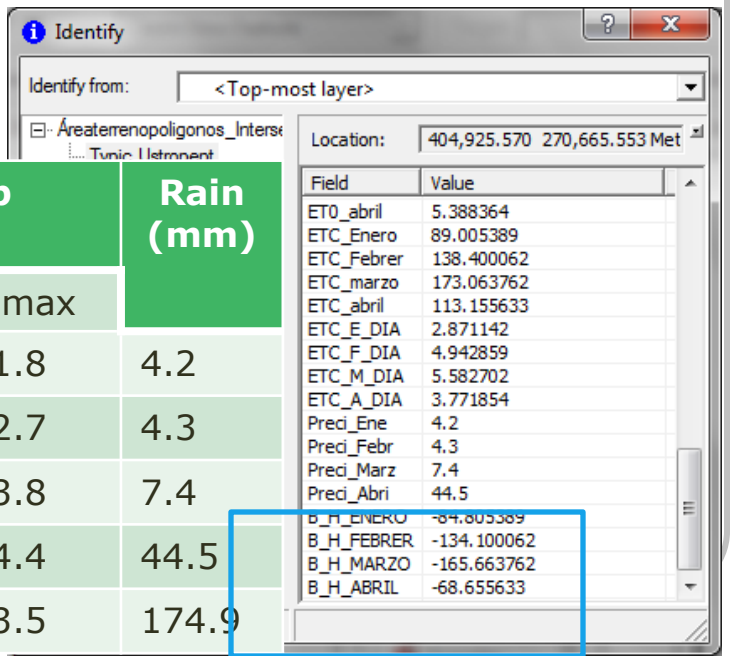


Water crop requirement by property





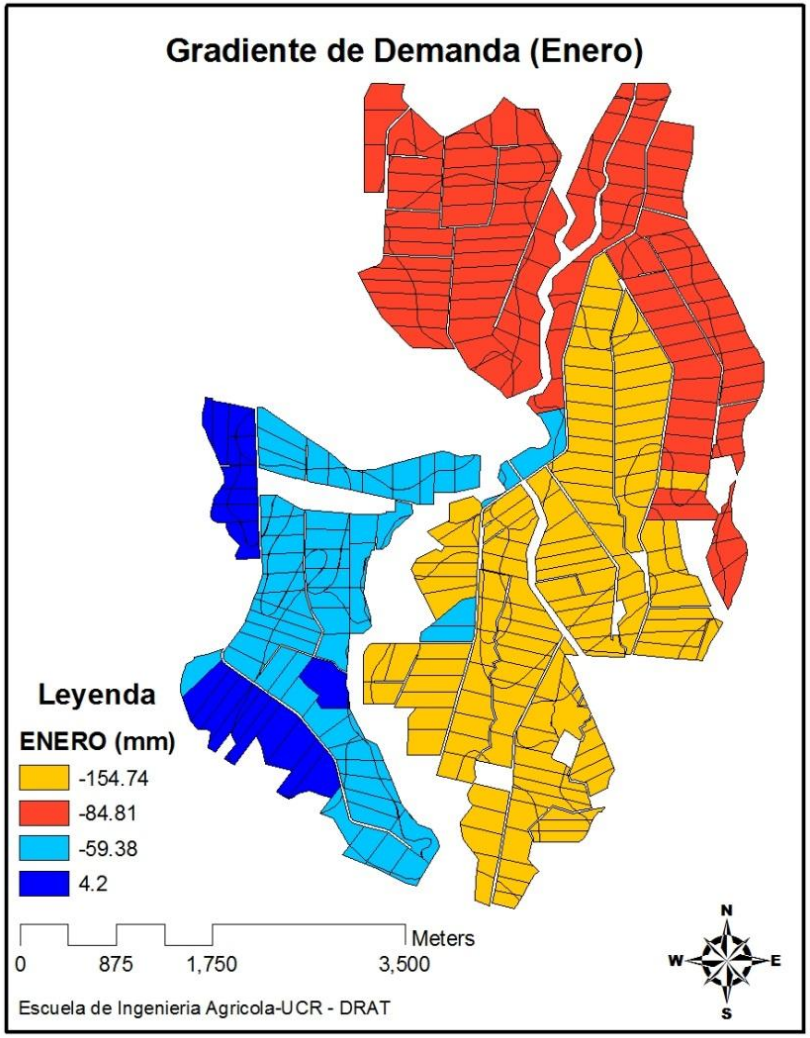


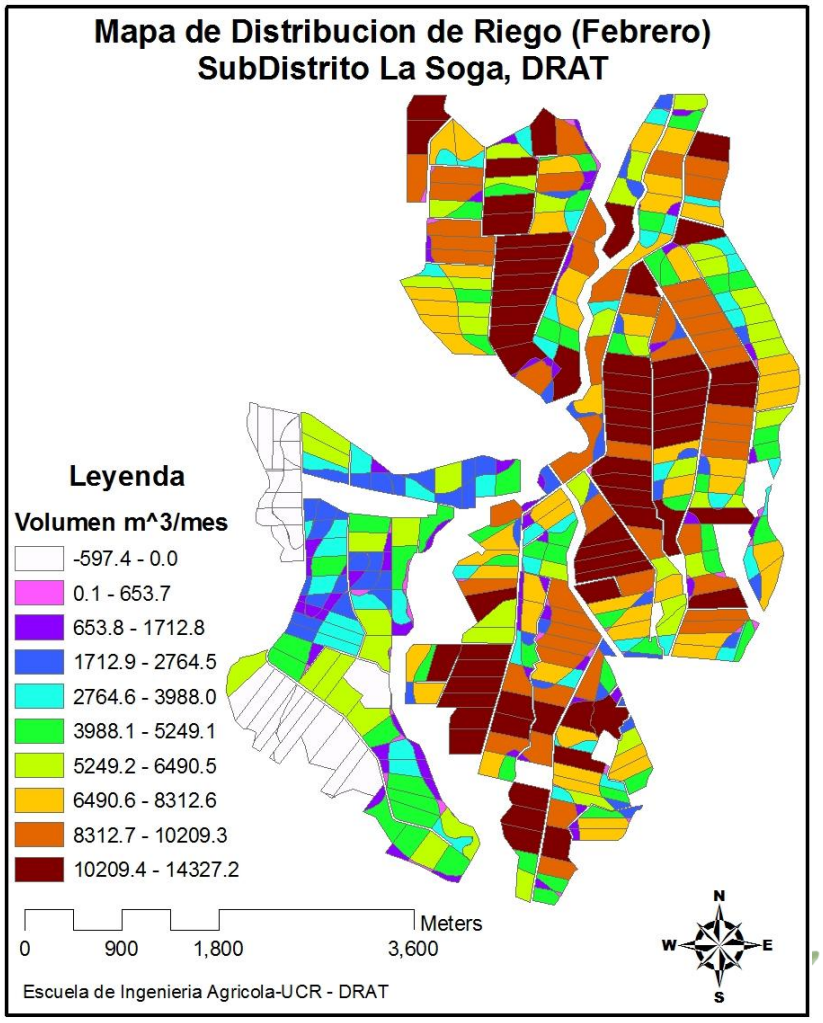


Crop	day	Kco	Kc2	Kc3
Rice	150	1.05	1.2	1.05
Pasture	70	0.3	0.7	0.5
Sugarcane	365	0.4	1.25	0.75

Month	Temp		Rain (mm)
	T min	T max	
Jan	22.5	31.8	4.2
Feb	22.9	32.7	4.3
March	23.2	33.8	7.4
April	24.0	34.4	44.5
May	23.7	33.5	174.9

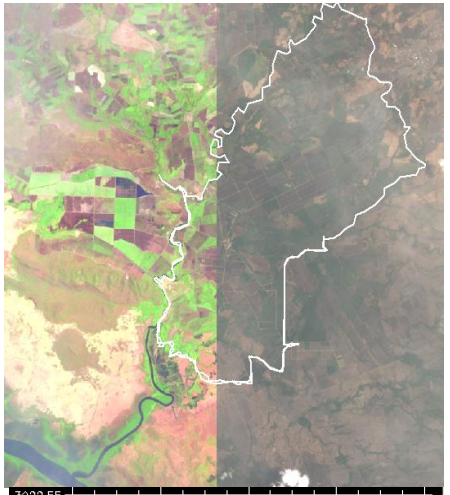
Water crop requirement by property

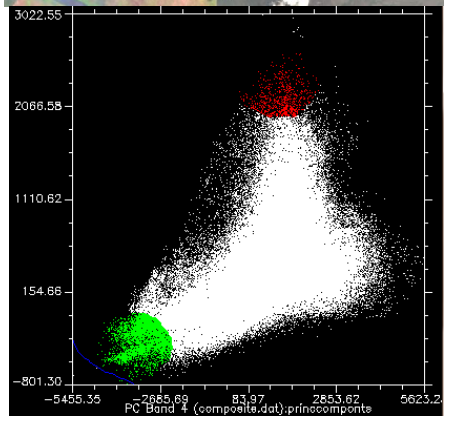


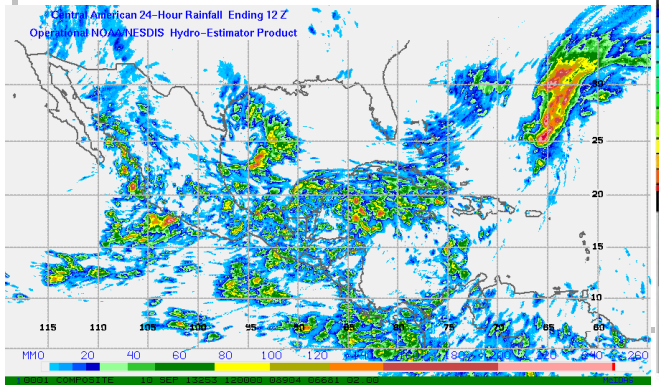


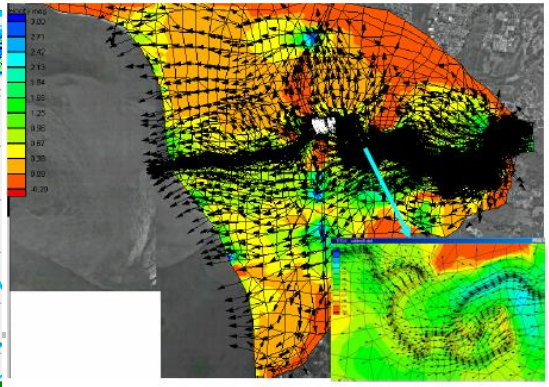
Working Process

- Water requirements for crops in the Irrigation District by crop/growing cycle/user.
- Analysis of LanSAT Images for crop parameters
- Aerial Evapotranspitation
- Aerial Rainfall from HydroEstimator (validated)
- Generate flood zone maps









$$k_C = 1.2246\,NDVI + 0.2203$$

$$ET = ET_0 k_c$$

Thank you