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**International Virtual Workshop on
Water, Energy, Food Nexus**
Riyadh, Kingdom of Saudi Arabia.



ANALYSIS OF WATER ENERGY FOOD NEXUS IN AN ELECTRO-DEPENDENT GROUNDWATER BASIN. THE CASE OF ANTINACO - LOS COLORADOS VALLEY (ARGENTINA)

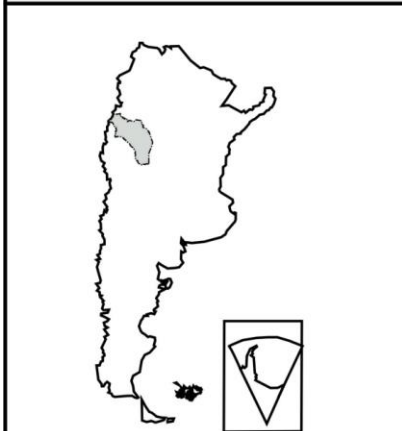
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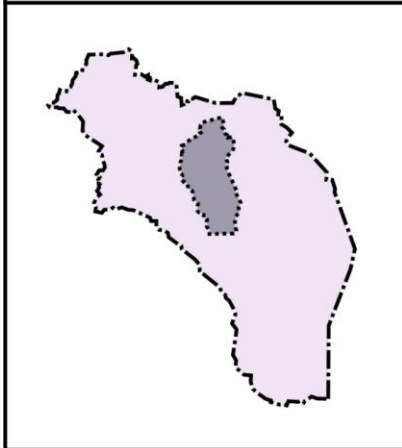
Ministerio de Agricultura,
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Argentina

ANTINACO-LOS COLORADOS BASIN (VALLEY)

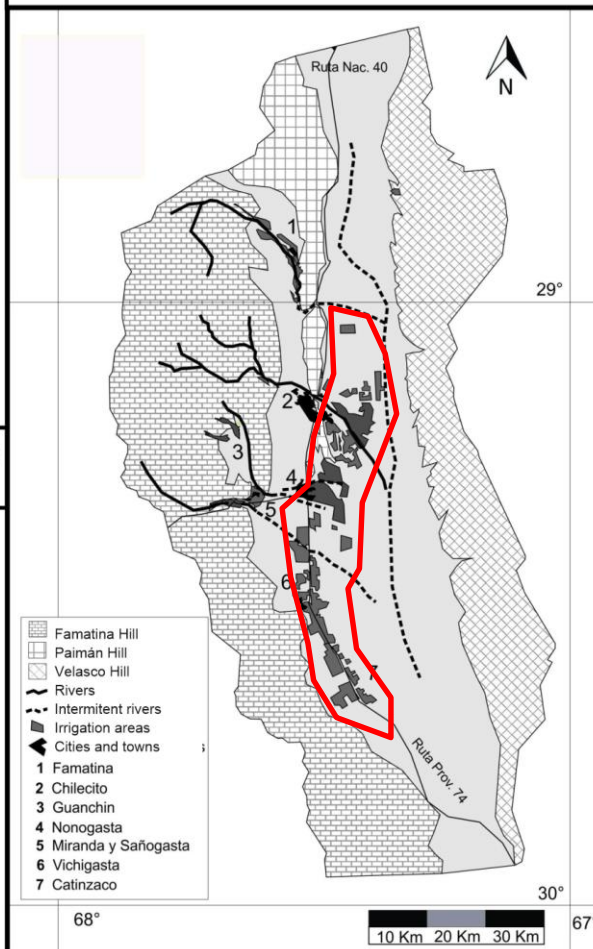
Argentina and La Rioja State



La Rioja State and Antinaco - Los Colorados Basin



Antinaco-Los Colorados Basin



Area

Total basin 8200 km²
 Central Valley 2900 km²
 Area under study 920 Km²

Arid basin

Precipitation 174 mm/y
 Potential evaporation 1193 mm/y
 (rain mainly in summer time)

River and Spring Flow

Mean flow < 2 m³/s

Groundwater reserve

18.000 hm³ Braccacini y Rey, 1951
 22.700 hm³ Sosic, 1971
 4.000 hm³ Poblete y Guimaraes, 2006

Grounwater recharge

136 hm³/y

AGRICULTURE, WATER AND ENERGY TIMELINE

Mostly wine grape and vegetables

Mostly olive, wine grapes, nuts and vegetables

1960

River water
for agriculture



1970

Groundwater
Irrigation
Agriculture colonies
Pumping by fuel
energy



1980 to 2000

Groundwater
Drip irrigation
Tax deferrals
Pumping by
electricity

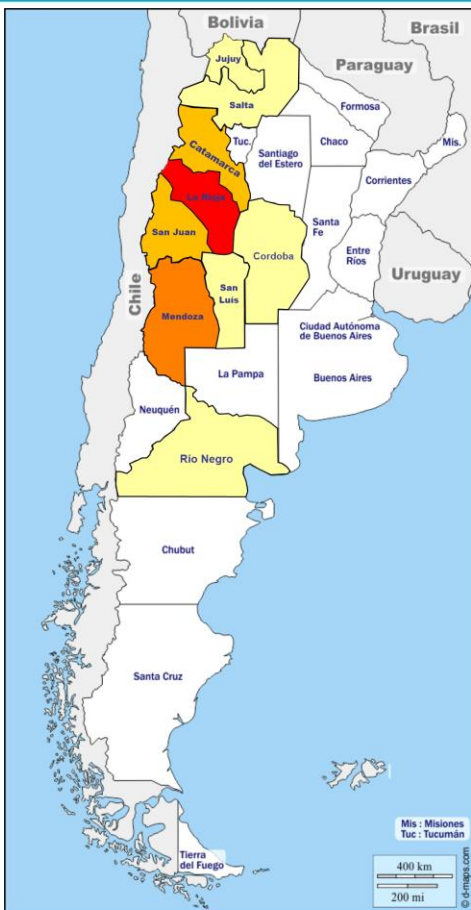


2010 to 2020

Groundwater
Drip irrigation and
controlled deficit irrigation
Agro-business
Pumping by electricity
Solar Energy



ELECTRO-DEPENDENCY AND WATER FOR IRRIGATION



| State | Irrigated (ha) | Energy (MWh/y) | ha/MWh/y |
|--------------|------------------|----------------|-------------|
| Mendoza | 276.324 | 474.138 | 0,58 |
| Jujuy | 117.299 | 32.293 | 3,63 |
| Cordoba | 102.000 | 32.970 | 3,09 |
| San Juan | 95.704 | 72.204 | 1,33 |
| Rio Negro | 79.320 | 24.264 | 3,27 |
| San Luis | 76.437 | 42.368 | 1,80 |
| Catamarca | 61.847 | 50.416 | 1,23 |
| La Rioja | 51.738 | 155.508 | 0,33 |
| Resto | 888.855 | 80.404 | 11,05 |
| Total | 1.749.524 | 964.565 | 1,81 |

Irrigation area and energy consumption in Argentina

ha/MWh/y nexus



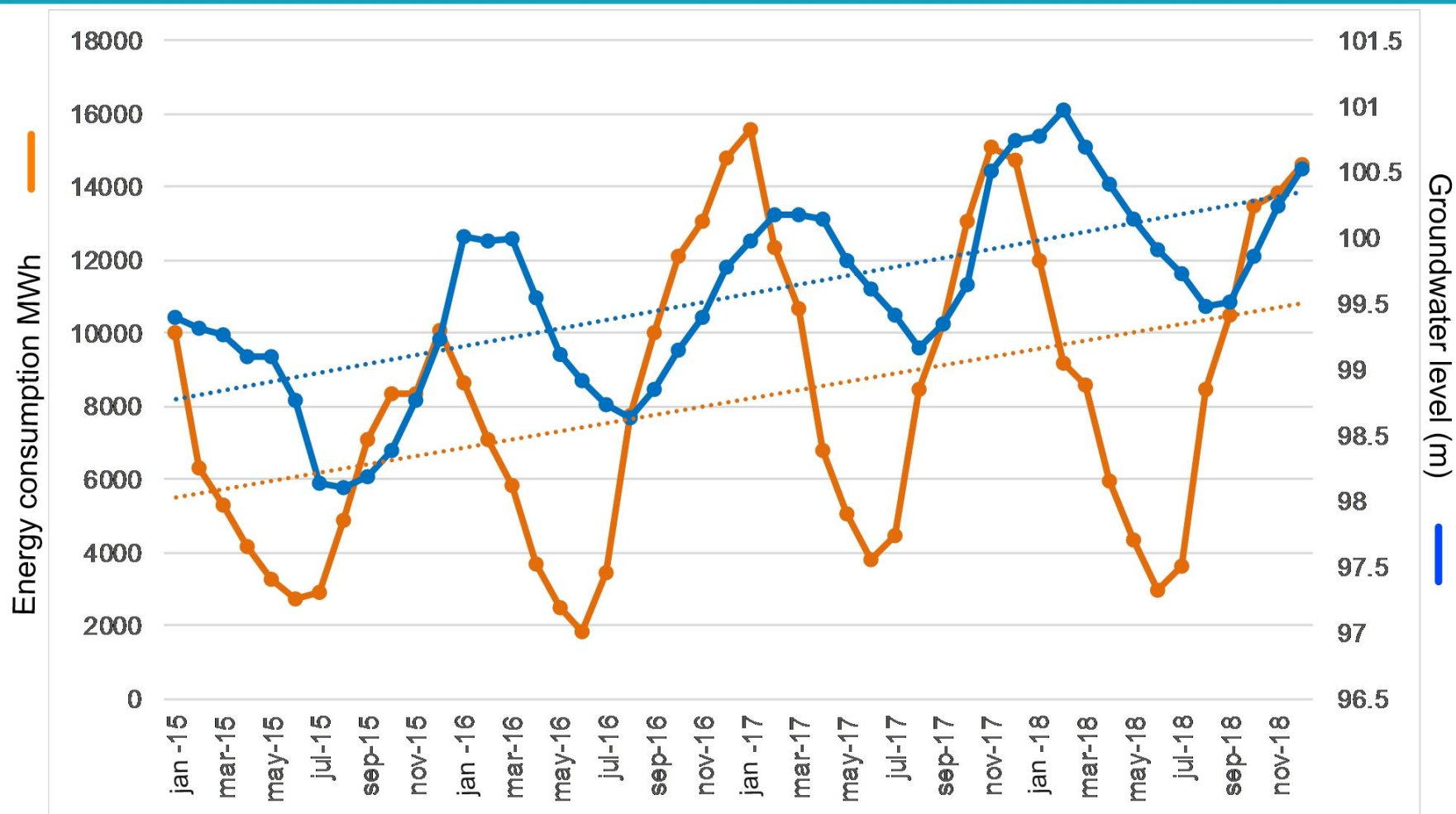
Miguel y Gareis, 2020 [unpublished]

Antinaco-Los Colorados Valley
 Irrigated area: 18.090 ha
 Electricity for irrigation: 73.255 MWh/y
Nexus: 0,247 ha/MWh/y

Data Sources:

Secretaría de Energía de la República Argentina. Anuario de energía eléctrica. Disponible en <https://www.argentina.gob.ar/produccion/energia>
 Organización de Naciones Unidas para la Alimentación y la Agricultura. 2015. Estudio del Potencial de Ampliación de Riego en Argentina. Desarrollo Institucional para la Inversión, UTF/ARG/017/ARG
 Frontera agrícola, recurso agua y energía. Ampliación de la frontera agrícola e industrial en la Cuenca Antinaco – Los Colorados. Su implicancia en el recurso hídrico y en la energía. Miguel, Roberto Esteban; Gareis, María Cecilia. Revista RASADEP, Revista de la Asociación Argentina de Ecología de Paisajes. Aprobado. Vol. 7:2. pp 1-11. E-book: http://docs.wixstatic.com/ugd/688647_afbe4d6406cd427fabfd17d5f282f663.pdf

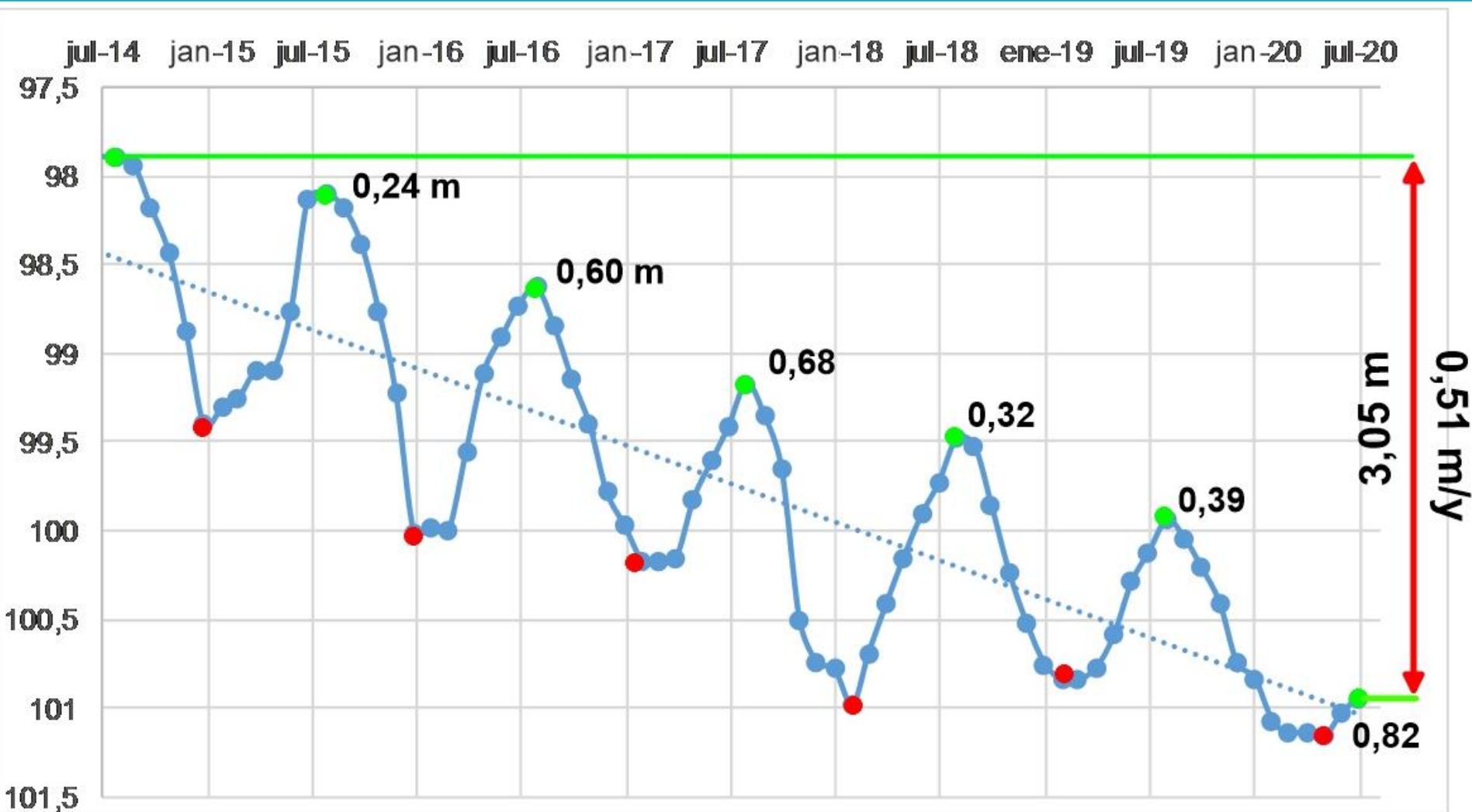
GROUNDWATER LEVEL AND ENERGY CONSUMPTION



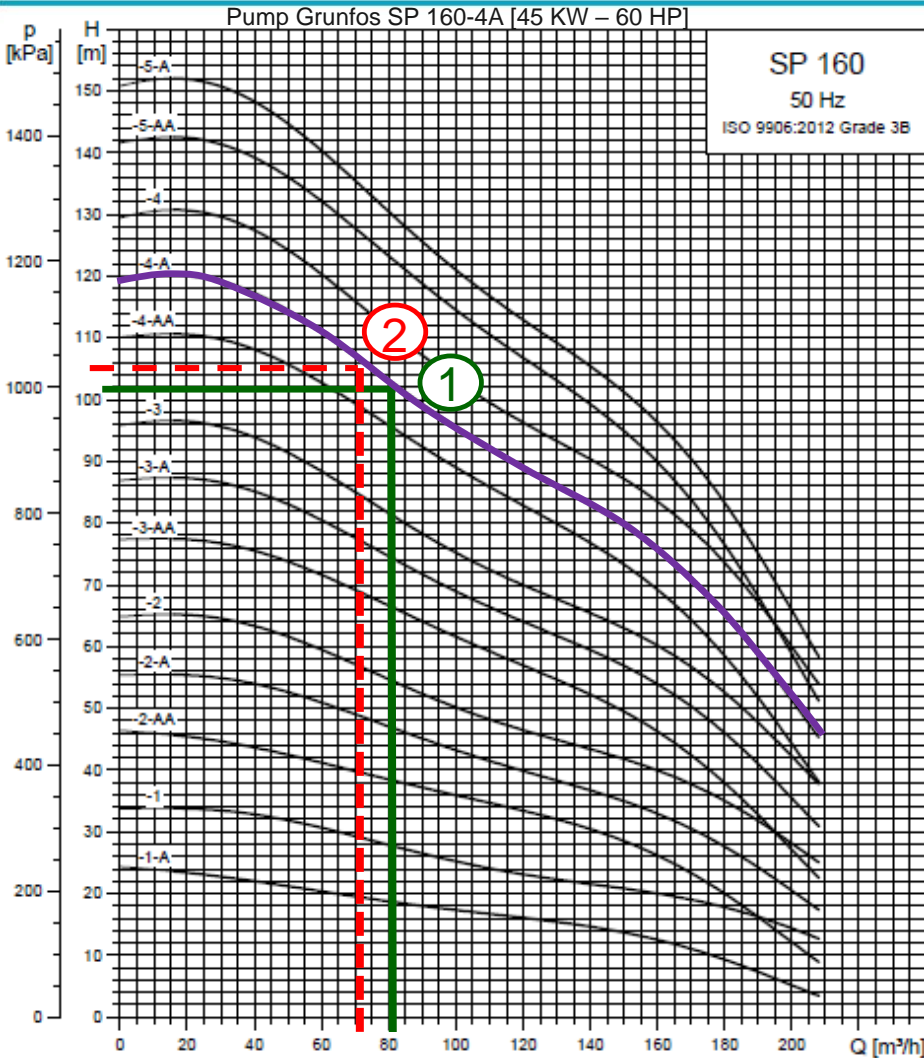
* Data of energy from Chilceto district was provided by EDELaR - ANEXO I - GCOR 1741_19 - RPTA. A N.S. 189939.

* Data from pumping well 1 INTA EEA Chilceto (Lat: -291511 Long: -67,4352)

GROUNDWATER DEPLETION



GROUNDWATER DEPLETION AND ENERGY CONSUMPTION



① Dynamic water level= **102 m**

Flow = **80 m³/h**

18 hs x 220 días = **3.960 h/y**

Flow = **316.800 m³/y**

② Dynamic water level= **105 m**

Flow = **72 m³ h⁻¹**

18 hs * 220 días= **3.960 h a⁻¹**

Flow = **285.120 m³/y**

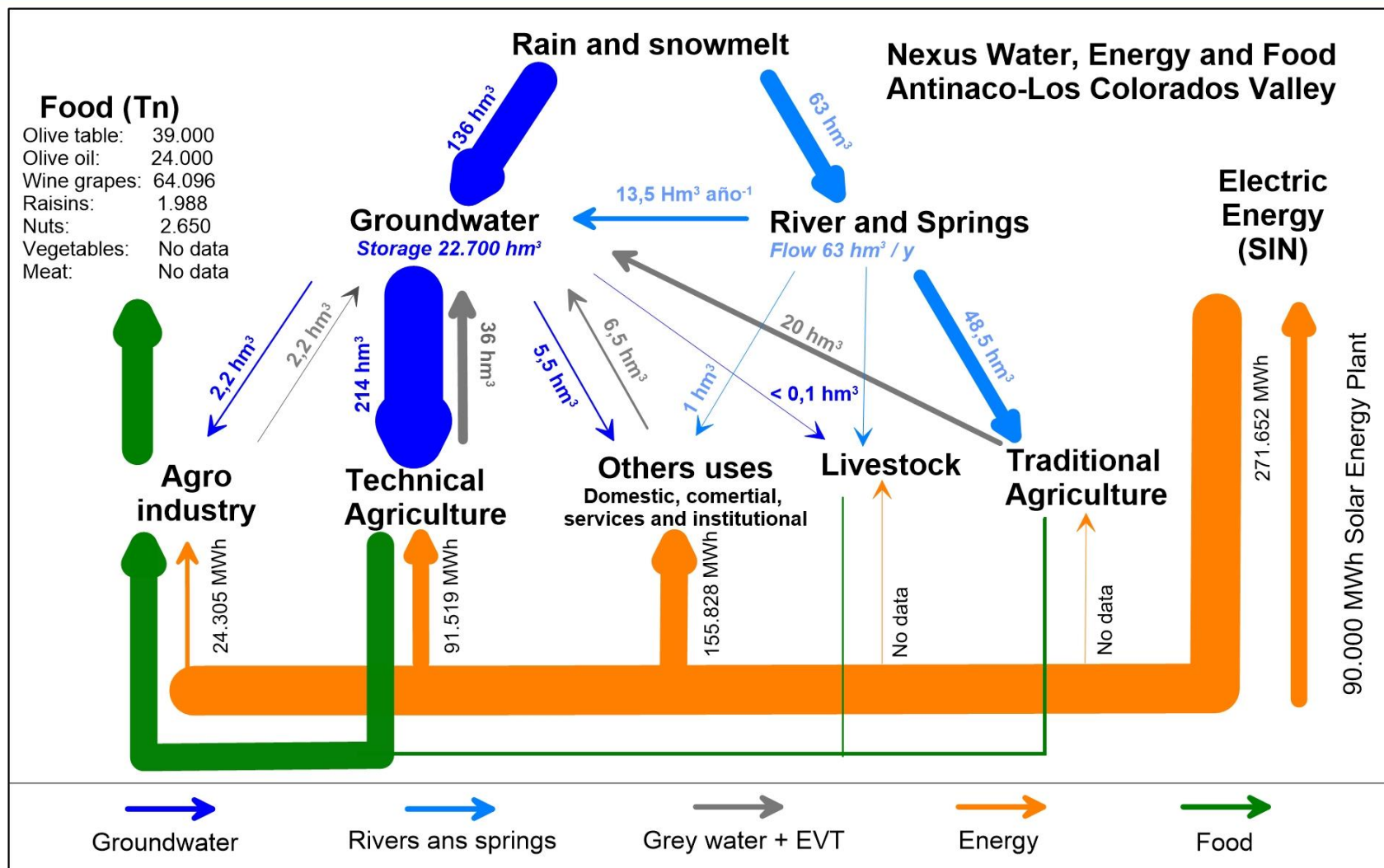
The situation ② needs **440 hours** of additional pumping to equal situation 1.

The situation ① increases the energy consumption in **19800 kWh/y**.

① 0,203 ha/MWh/y

② 0,182 ha/MWh/y

NEXUS WATER, ENERGY AND FOOD



CONCLUSION AND COMMENTS

Antinaco-Los Colorados Valley is an arid areas that depends of **groundwater and energy to produce food**.

The **aquifer** respond to the pumping with a **continuous deeping of groundwater level** (intensive exploitation).

The **groundwater depletion** generate an **increase** in the **energy** consumption.

More **knowledge and control** of **groundwater** evolution.

Efficient irrigation, However, Can all farmers do efficient irrigation? Who can and who can't? Why? Do we need **policies** according to the type of farmers?.

Policies to generate data to **analyze** and validate the **Nexus**.

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¡Thanks!

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