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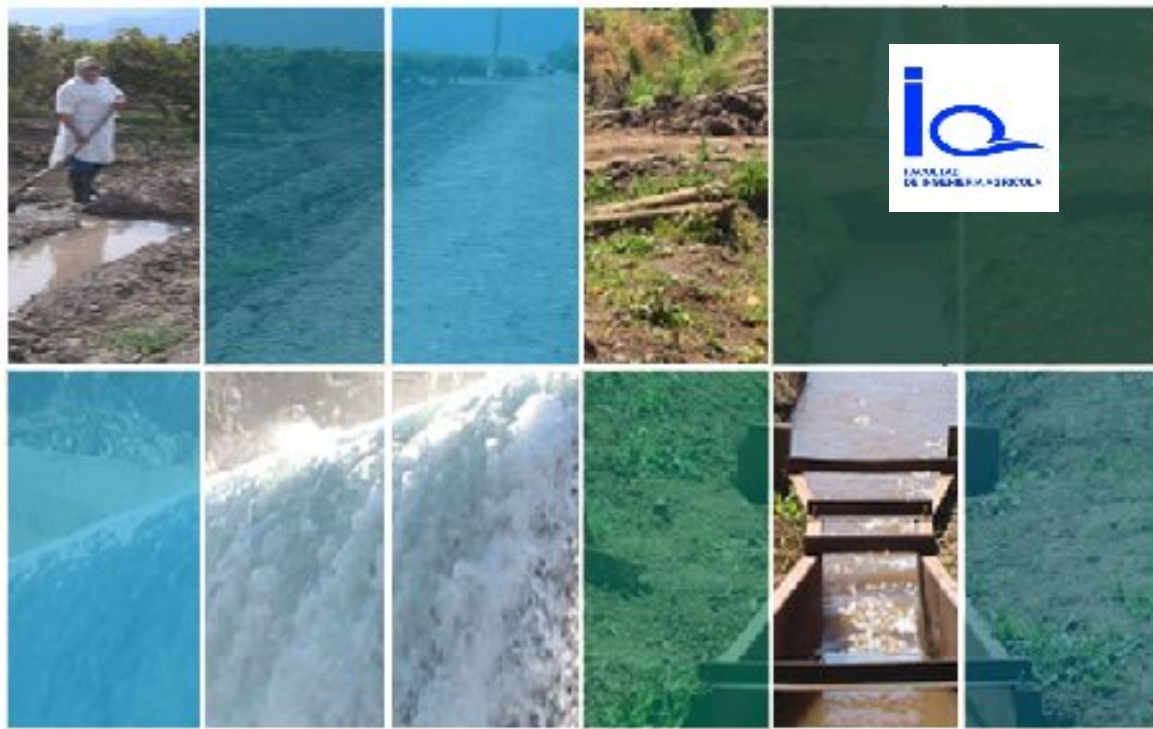


Esta presentación corresponde al estudio “Diagnóstico de Fuentes de Agua No Convencionales en el Regadío Inter- Regional” Licitado por la Comisión Nacional de Riego (CNR) y ejecutado por el Departamento de Recursos Hídricos de la Universidad de Concepción.
(2008-2009)





Water irrigation augmentation project using treated wastewater and groundwater recharge for an orchard farm in Melipilla, Chile.



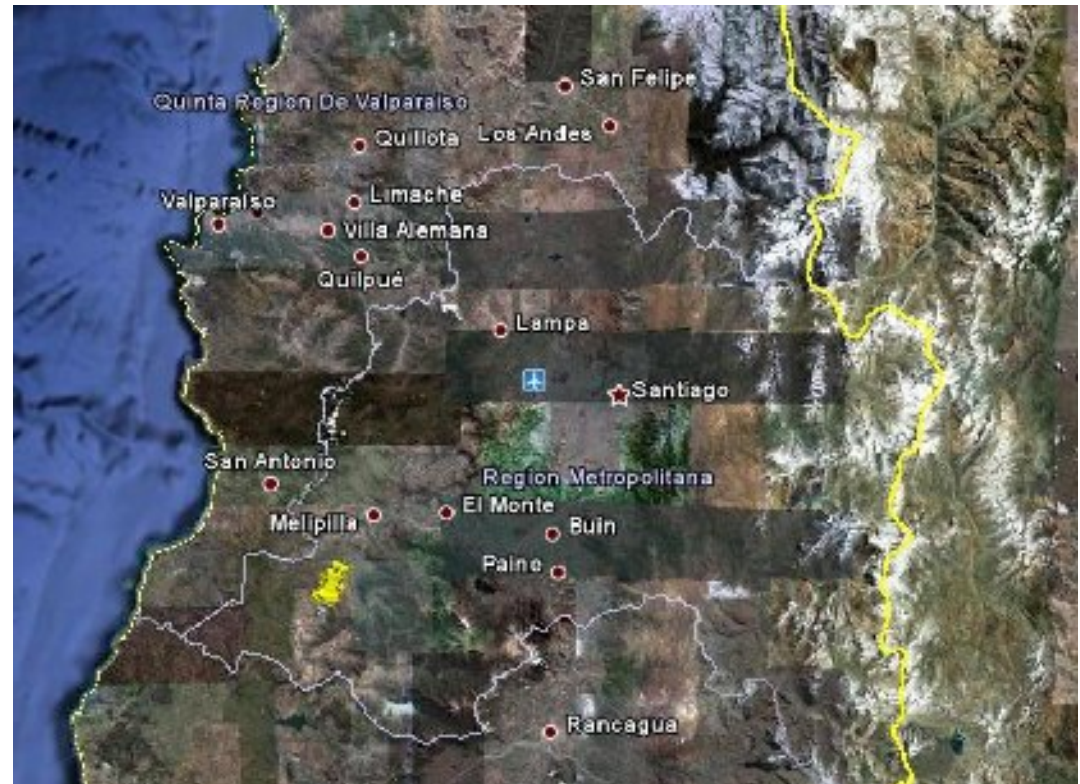
Study Context

International Conference: Arid and
Semi Arid Development Through
Water Augmentation
13 to 16 December 2010,
Valparaíso, Chile



Farm location

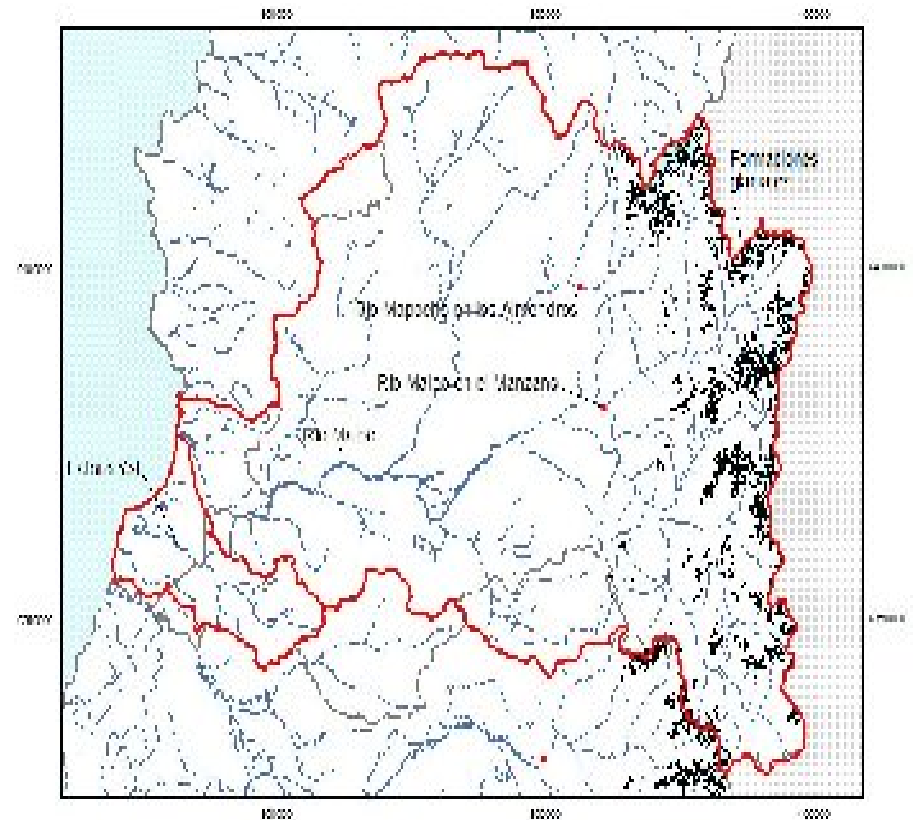
The *Rinconada* Farm
is located near
Melipilla at the *Yali*
watershed,



Farm location

The *Yali* watershed has a surface of approximately 800 km² and it belongs to the western side of the Coastal Mountains.

Rainfalls are concentrated between April to October, falling an average of 500 mm per year.



Most of the creeks that
tribute to the *Yali* River,
have flow in winter and are



Farm Production

- The *Rinconada* farm has a walnuts and almonds production very limited by water



- In the context of the CNR project we proposed two types of water augmentation techniques:
 - Use of treated wastewater and
 - Artificial groundwater recharge, using winter waters from a local creek.



• Descripción Básica del Proyecto.

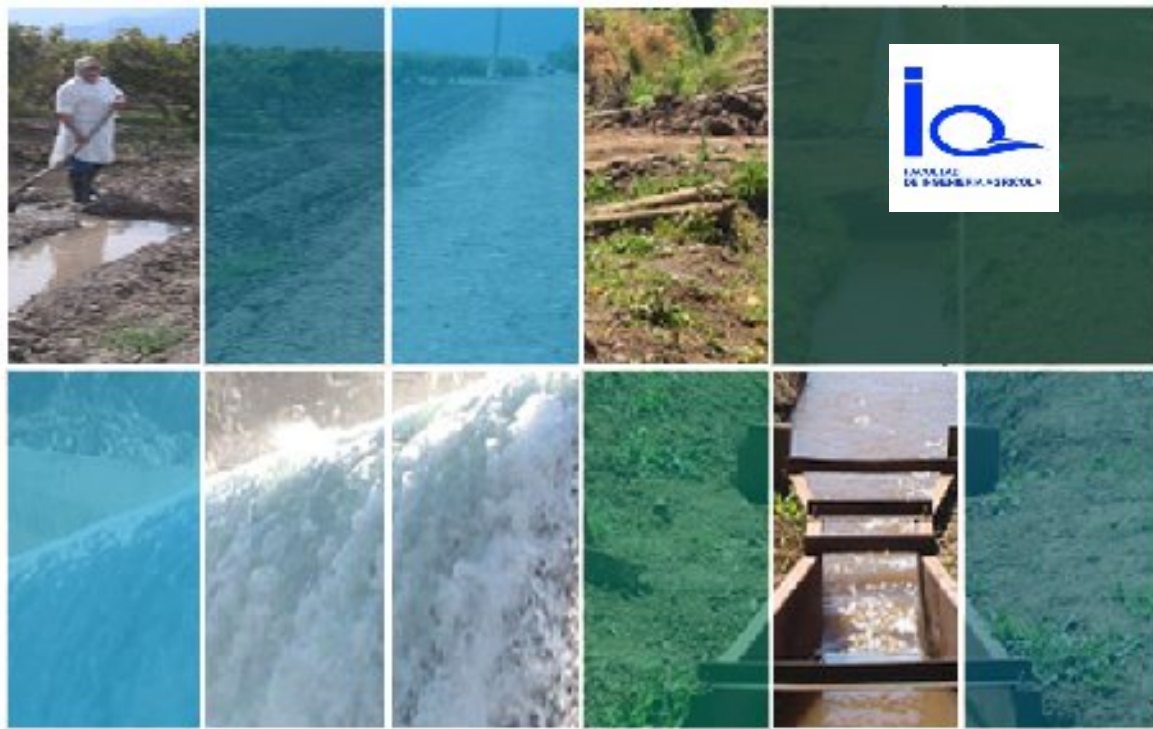
El estudio se realizó en el Fundo Rinconada de Longovilo, ubicado a 33.9033° Latitud Sur y 71.3519° Longitud Sur, en el sector hidrogeológico Las Diucas de la cuenca del estero Yali, Región Metropolitana de Chile.

- (1) Uso de aguas residuales tratadas perteneciente a la empresa AGROSUPER (plantel avícola perteneciente a la empresa)
- (2) Recarga artificial de acuíferos (provenientes del Estero Las Diucas).





**Water irrigation
augmentation
project using
treated wastewater
and groundwater
recharge for an
orchard farm in
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**Use of treated
waste water for
irrigation**

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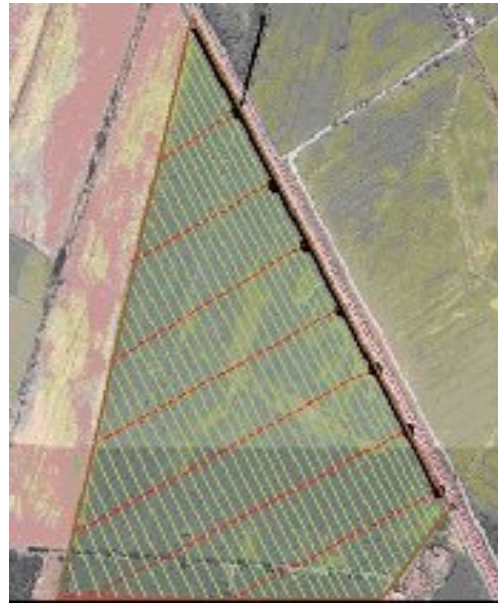
The use of treated
wastewater from
animal farms is a
common practice in
Chile.

- DS-90



We are conducting several projects to improve management practices

- Develop of nutrient balance in dairy and pig farms
- Improvement of furrow irrigation in dairy farm
- Develop of treatment technologies for animal far waste water
- Develop of environmental risk analysis methodologies
- Improvement of irrigation and nutrient management practices



Project description

- The treated wastewater came from a pig farm, located near the *Rinconada* farm.
- A pumping system is considered to elevate 20 L/s of treated wastewater from the main treatment pond to a tank. Located in the *Rinconada* farm,
- where it will mix with clean water to ensure a quality that fulfils the requirements for irrigation according to Chilean legislation. Then the mixed water will be used for irrigation at the fruit orchards of the farm by means of a pressurized system.





The treated wastewater came from the pig farm

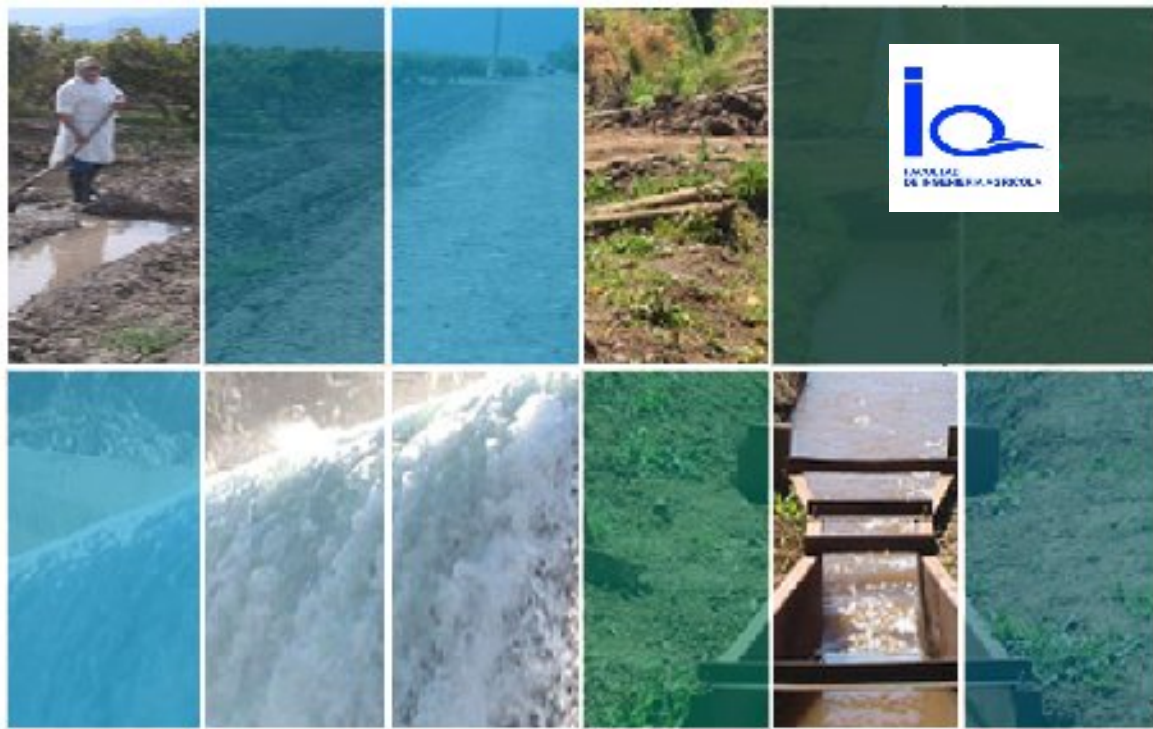
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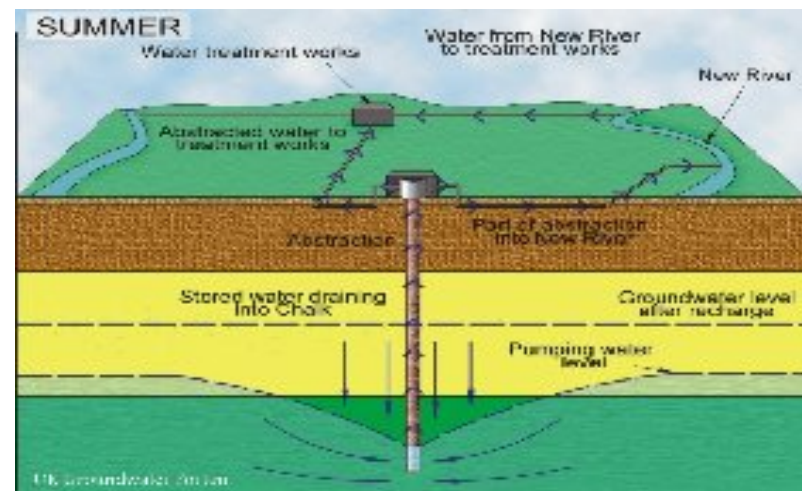
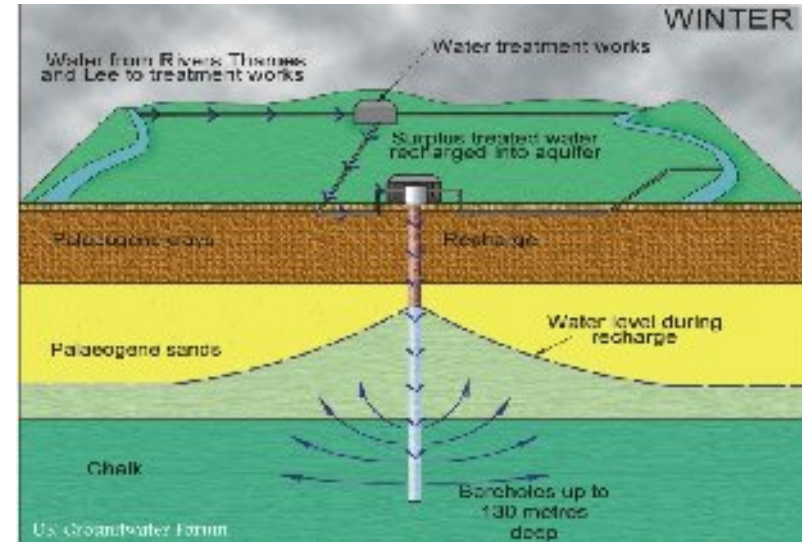


**Artificial
Groundwater
Recharge**

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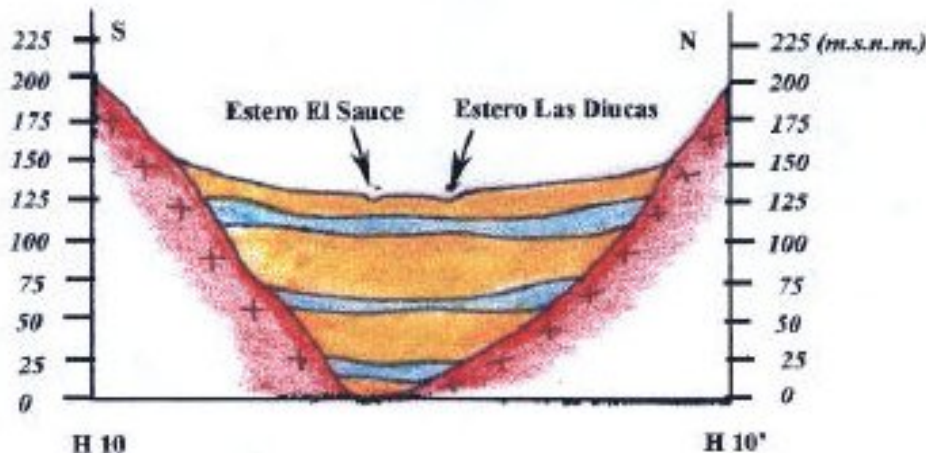
- The Artificial groundwater recharge system will consist of injecting water in two wells located near the well that is actually in use for irrigation.
- Injection will be done during winter, because at that time there are excess of water at the local creeks.



- We select the use of injections wells because the formation feasible of being recharge is located at 15 meters depth

DESDE	HASTA	Material
0.0	0.9	: limo, arena.
0.9	15.20	: Maicillo, arcilla.
15.20	18.70	: Arena gruesa, ripio, bolones 6".
18.70	21.10	: arcilla gruesa
21.10	23.50	: Arena media, gruesa y ripio.
23.50	30.20	: Arcilla, limo, poco maicillo compacto.
30.20	33.30	: Arena, maicillo, grava, ripio.
33.30	35.60	: Arcilla, limo, maicillo (compacto).
35.60	36.80	: Arena media, gruesa y gravillas.
36.80	39.00	: Limo, arcilla compacta.
39.00	46.50	: Arena gruesa, maicillo, gravas, bolones 5"
46.50	52.90	: Arcilla, limo.
52.90	61.50	: Arena gruesa, gravas, ripio, bolones 7"
61.50	70.00	: limo arcilloso compacto.
70.00	71.50	: Arena media gruesa, maicillo algo grava.
71.50	102.00	: Limo compacto, varios colores.

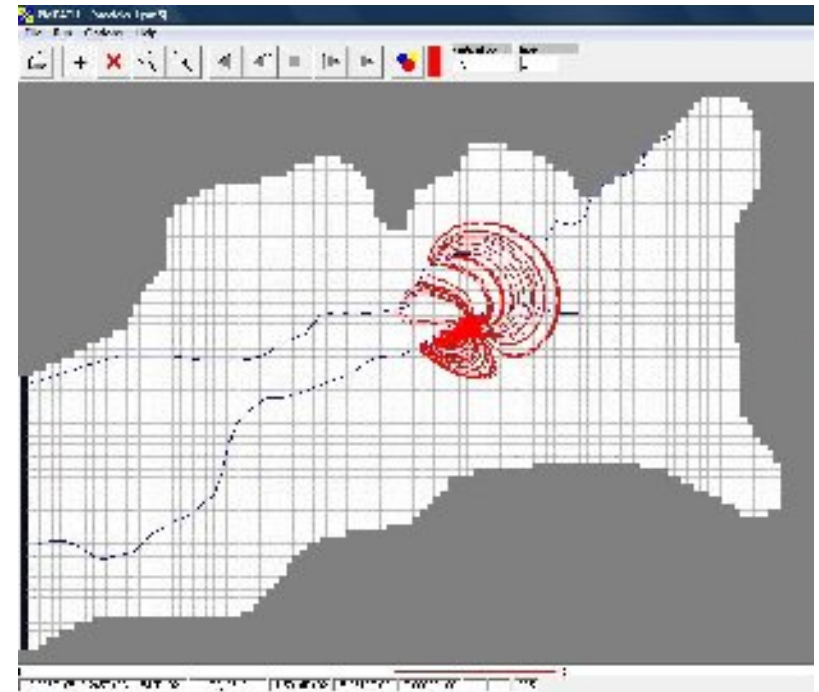
Subsecuencia Esteros Las Diucas y El Sauce



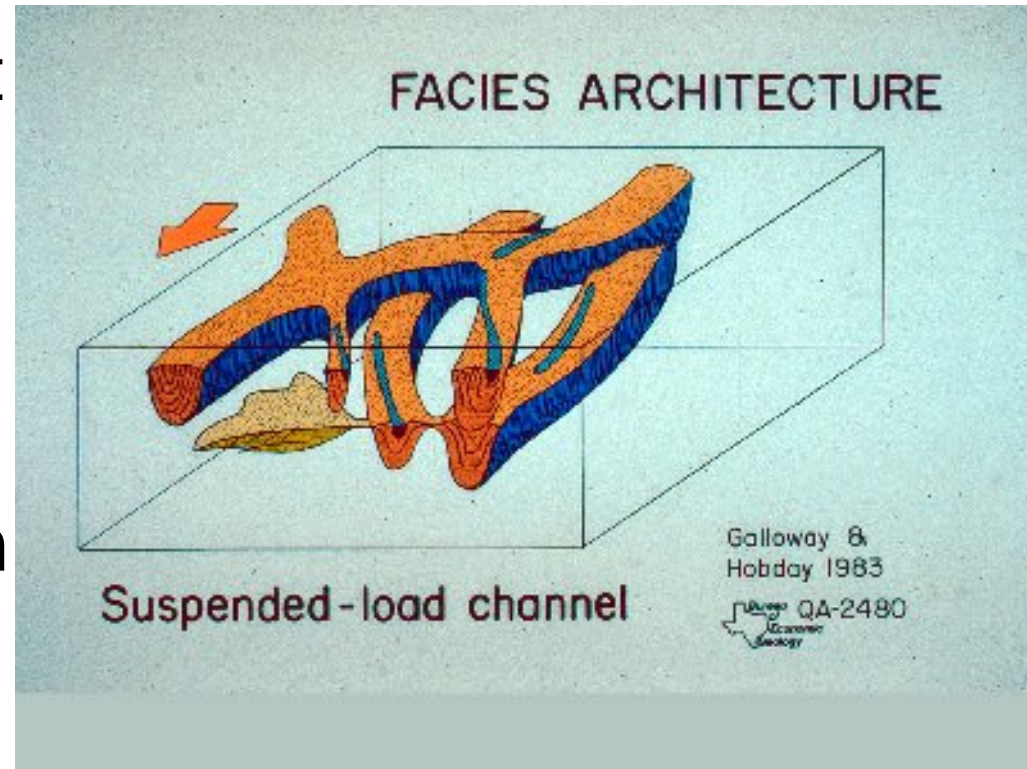
- Water will be diverted from the creeks to the reservoir, then conducted to the injections wells, where it will be filtrated
- The difference of elevation allowed the injection without pumping.



- Recharge flow and the location of the injection wells where evaluated using MODFLOW.
- We determined that is feasible to recharge 10-20 L/s in three injection wells located up-gradient that the pumping well.

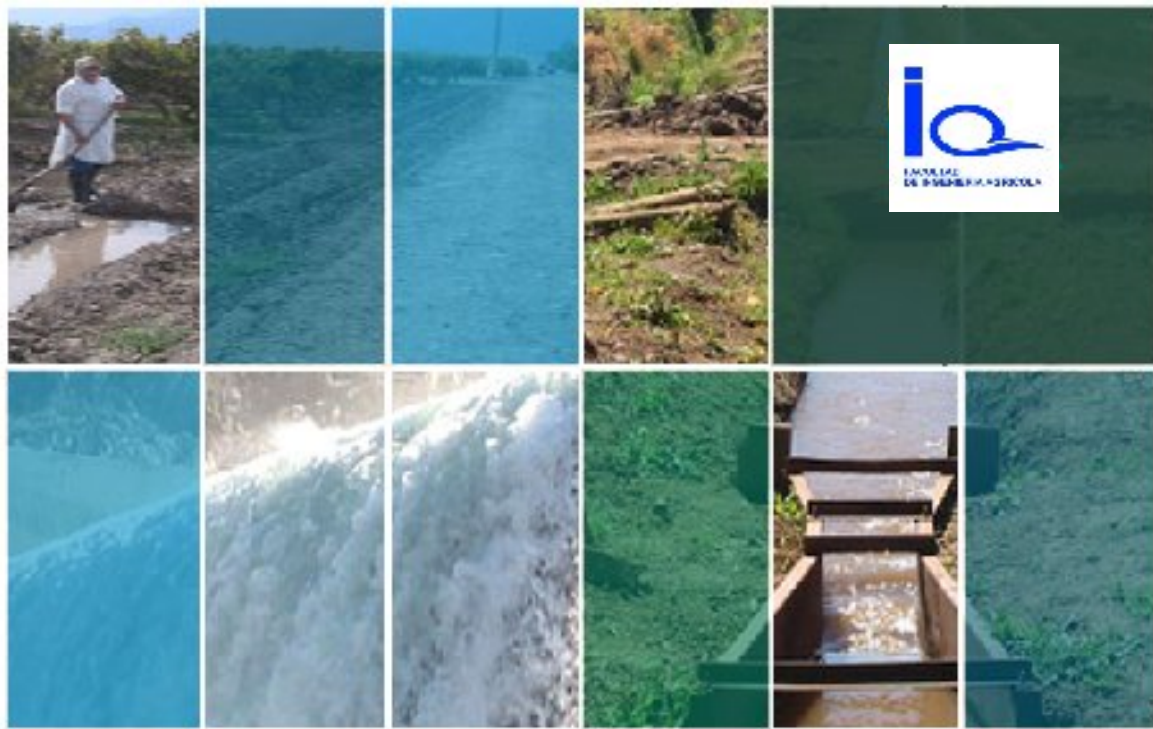


- However we do not know the aquifer configuration
- We need to do more field research



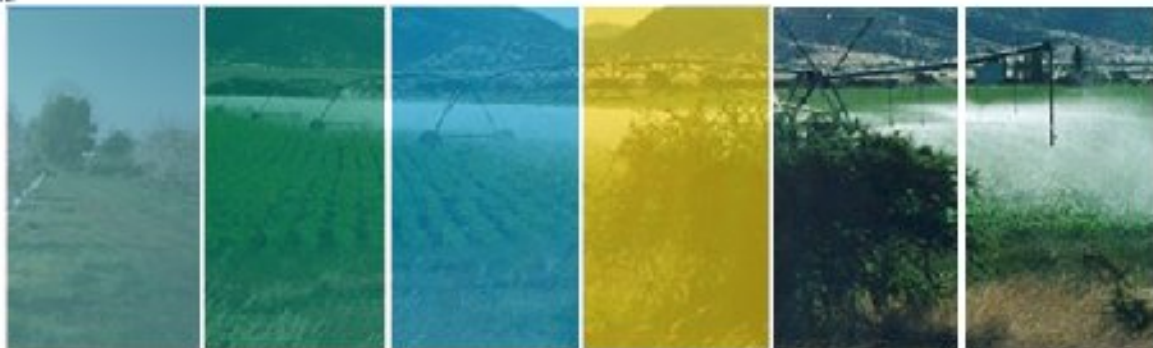


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Results

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- Because water is the main limitation to the develop of agriculture in the “*secano interior*” any water augmentation project will be economically profitable
 $IRR = 46,62\%$
 $VAN = \$ 3.686.121.198$



- Farmers built two injections wells, however the earthquake damage the reservoir and the drought of this year did not allow to have water to inject at the aquifer.
- We need to continue the research through a Fondef project
- We are developing a Corfo-Innova project to develop the irrigation using the treated wastewater.



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