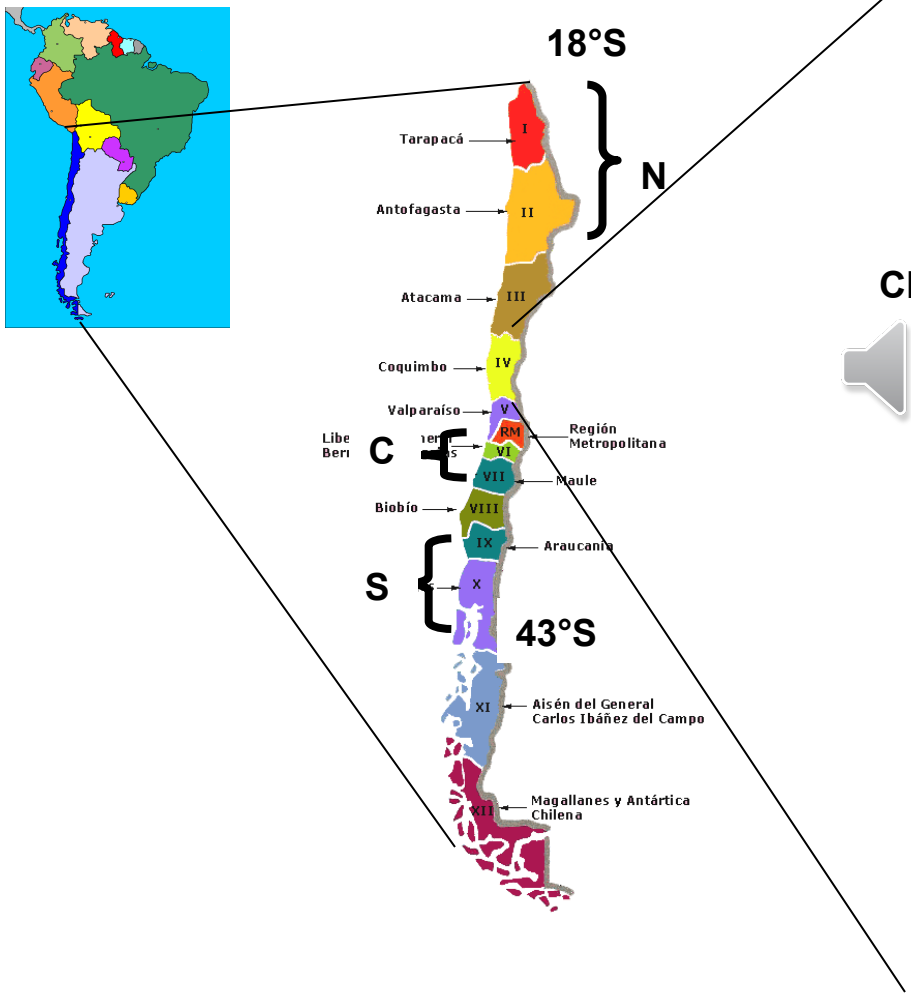
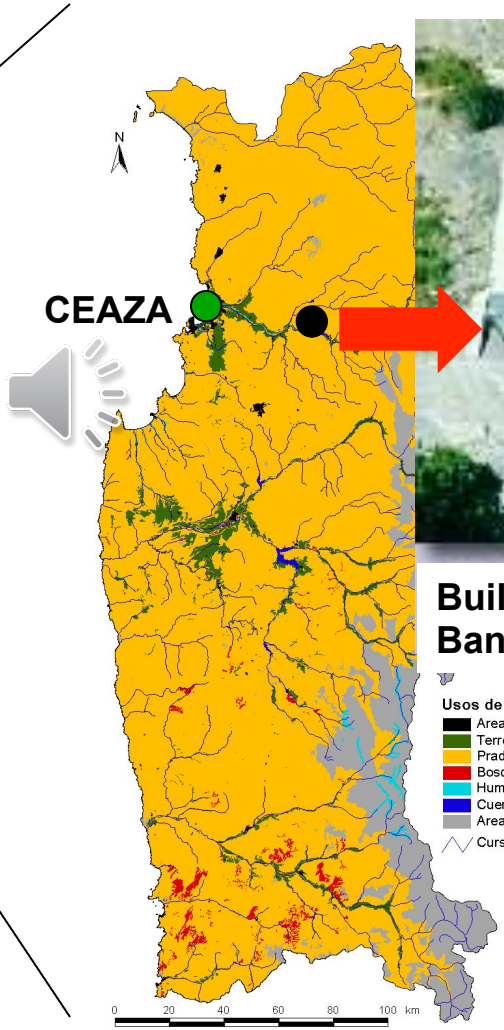
The experience of quinoa in Chile: From genes to agro ecological and agricultural studies.

Enrique A. Martínez
Center of Studies Associated to Arid Zones-La Serena-Chile
For International Quinoa Symposium, Pullman, WA, USA

Chile in South America and the location of quinoa farmers today (North, Center, South)



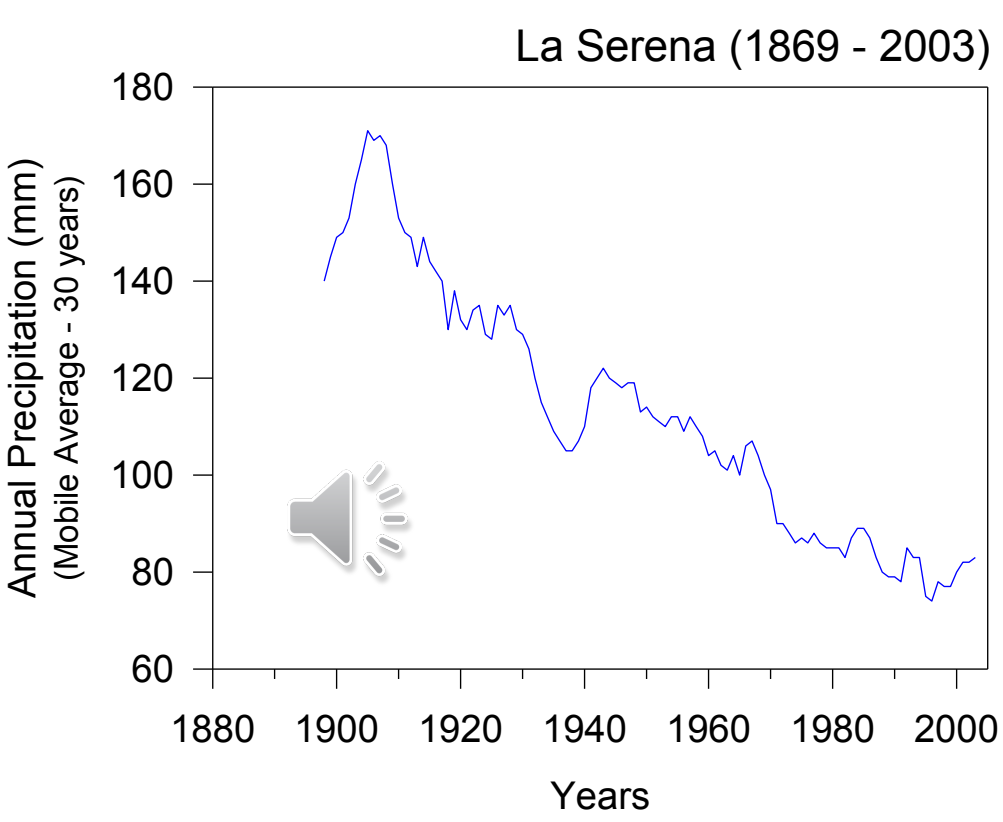


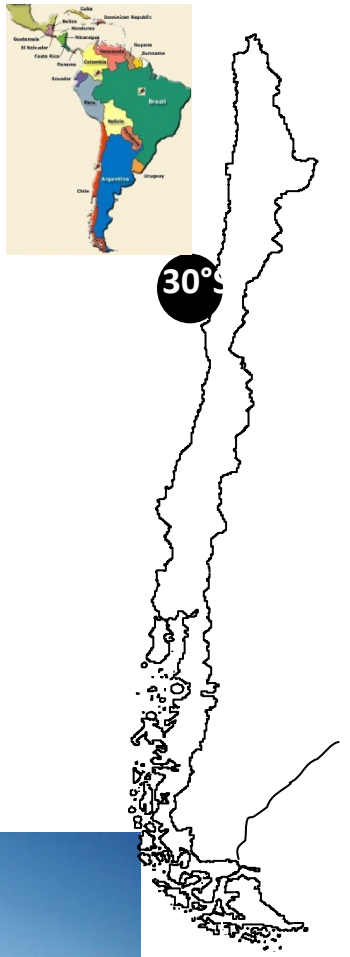
Building of the National Seed Bank in Chile (Min. Agriculture)

Usos del Suelo
- Areas Urbanas e Industriales
- Terrenos Agricolas
- Praderas y Matorrales
- Bosques
- Humedales
- Cuerpos de Agua o Aguas Continentales
- Areas Desprovistas de Vegetación
- Cursos de agua

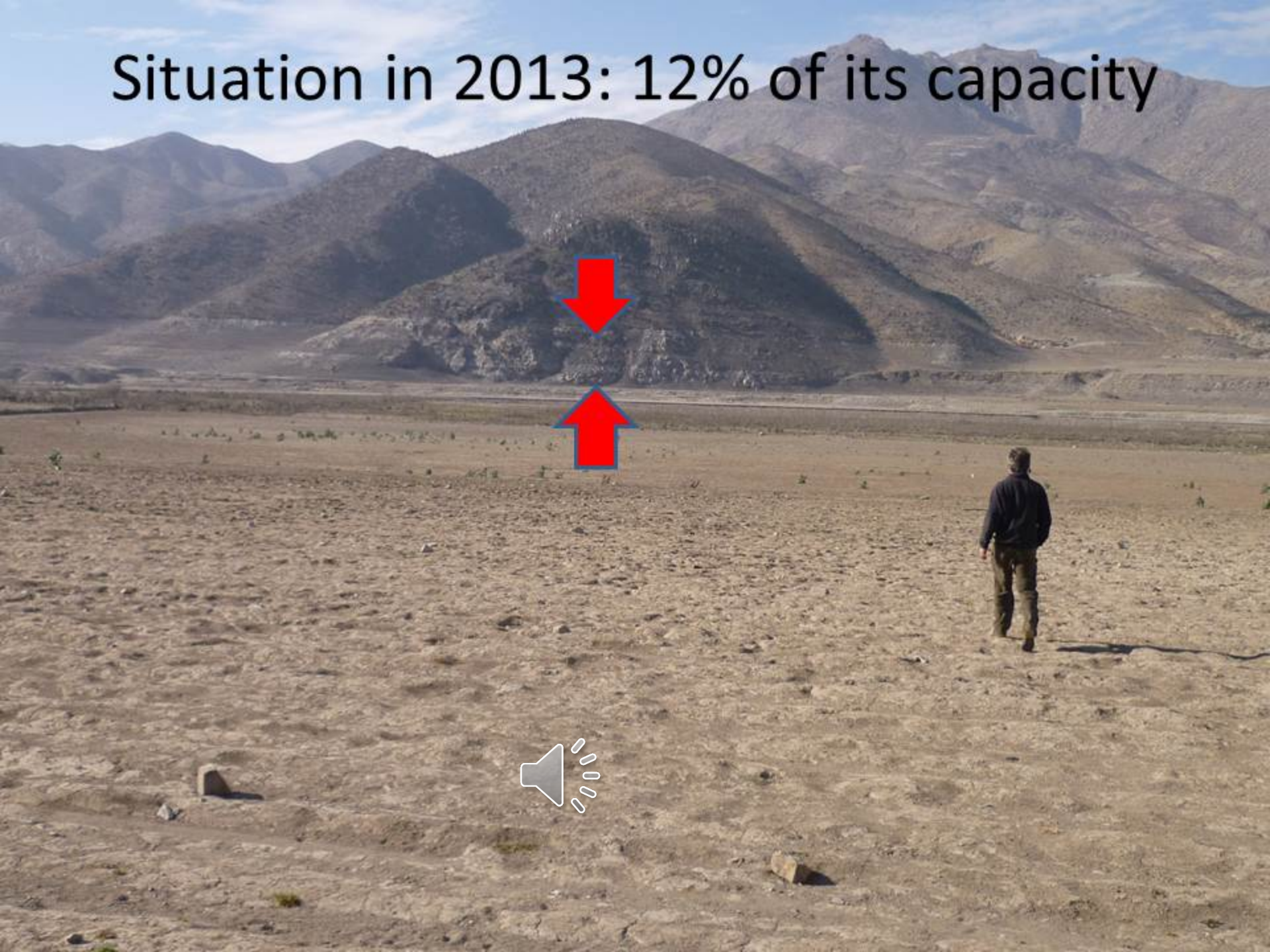
Rainfall in La Serena-Chile at 30°S from 1869 to 2003 (30-years smoothed means, in mm).

Dam built in 1998.

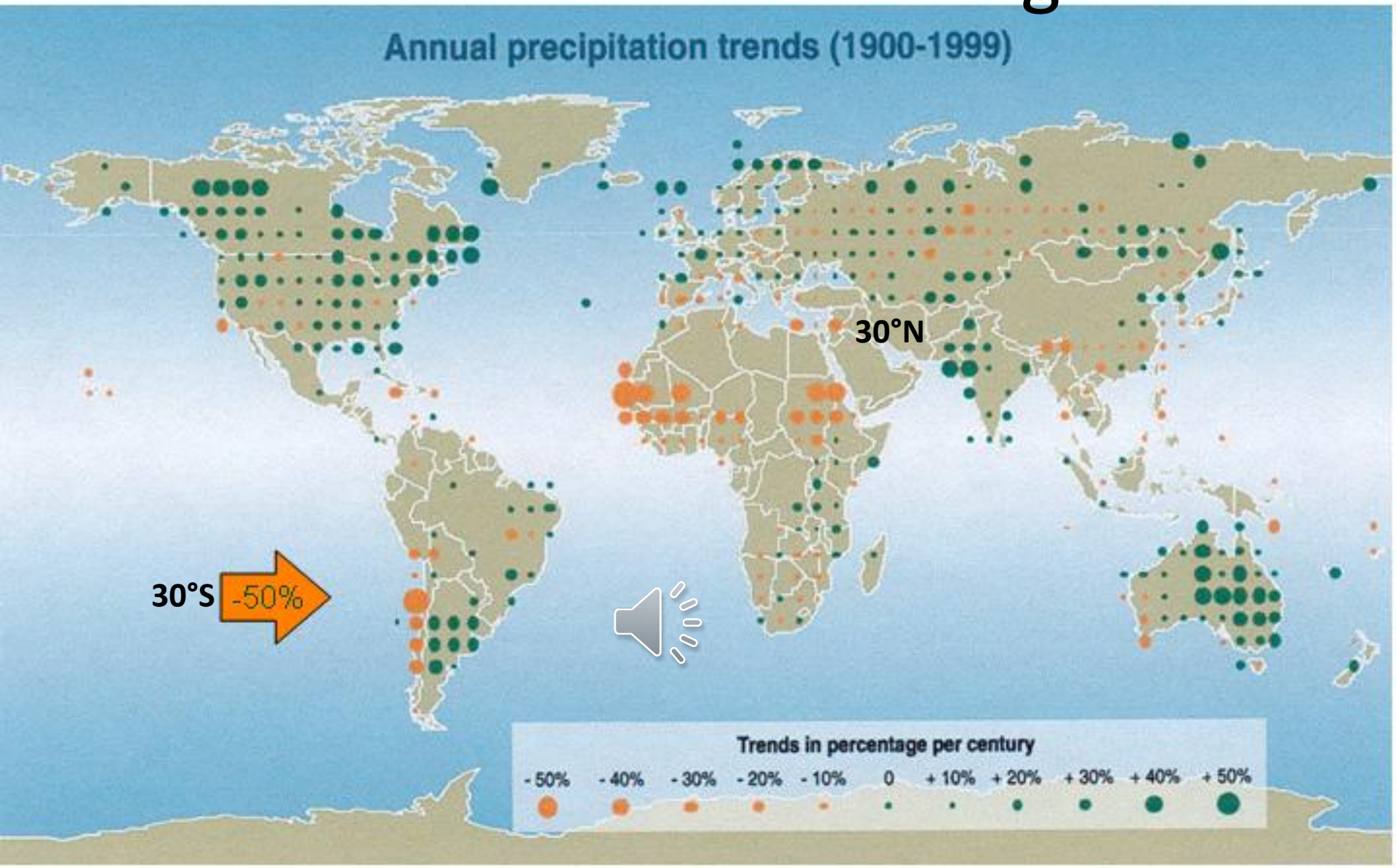





Seven years drought.
February 2012: 25% of its capacity


Situation in 2013: 12% of its capacity

Shared trends of drought



Source: IPCC Synthesis Report

Situation under drip irrigation

Situation for small scale farming

Situation for artisanal goat growers

Situation for family farming:

>50% population lives in urban areas

(FAO focus for 2014)

Quinoa an opportunity to keep agriculture alive

FAO: 2013 International year of Quínoa

Work at CEAZA Step 1: seed collection for the seed bank

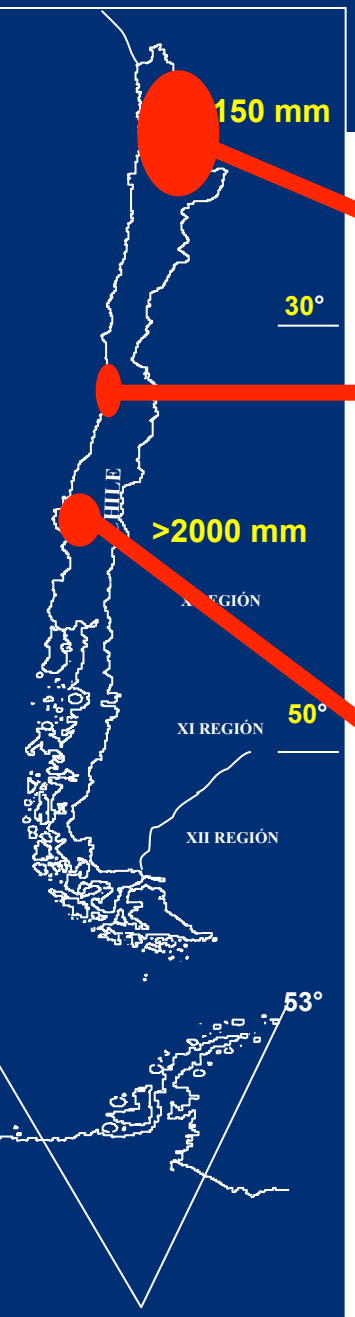
< 1500 ha
and
< 300 farmers
(INE, 2007)

High Andes
(Aymaras & Quechuas)
4500 m

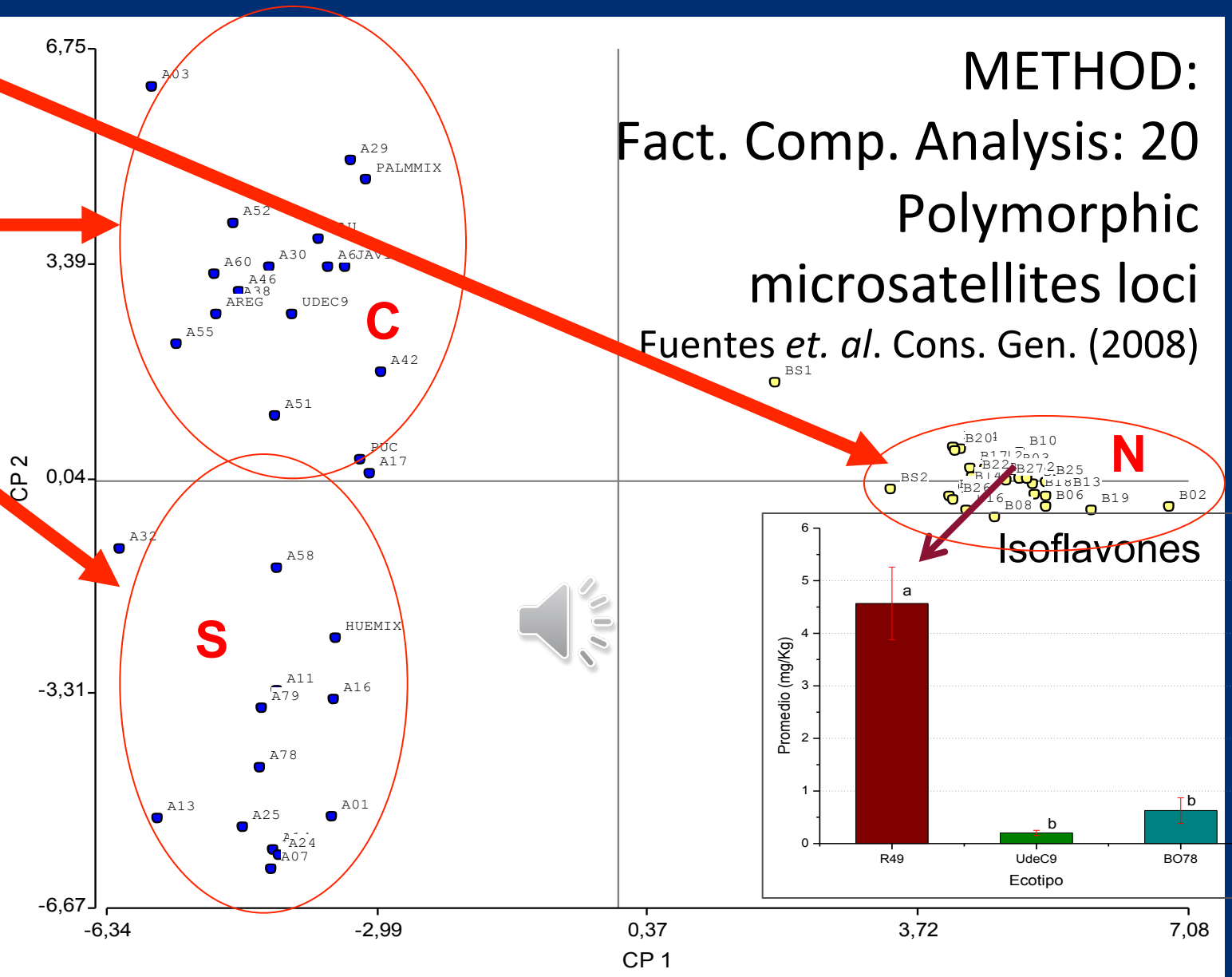
Central coast of Chile (example Cáhuil)

Southern Chile
(example Calafquén-Mapuche region)

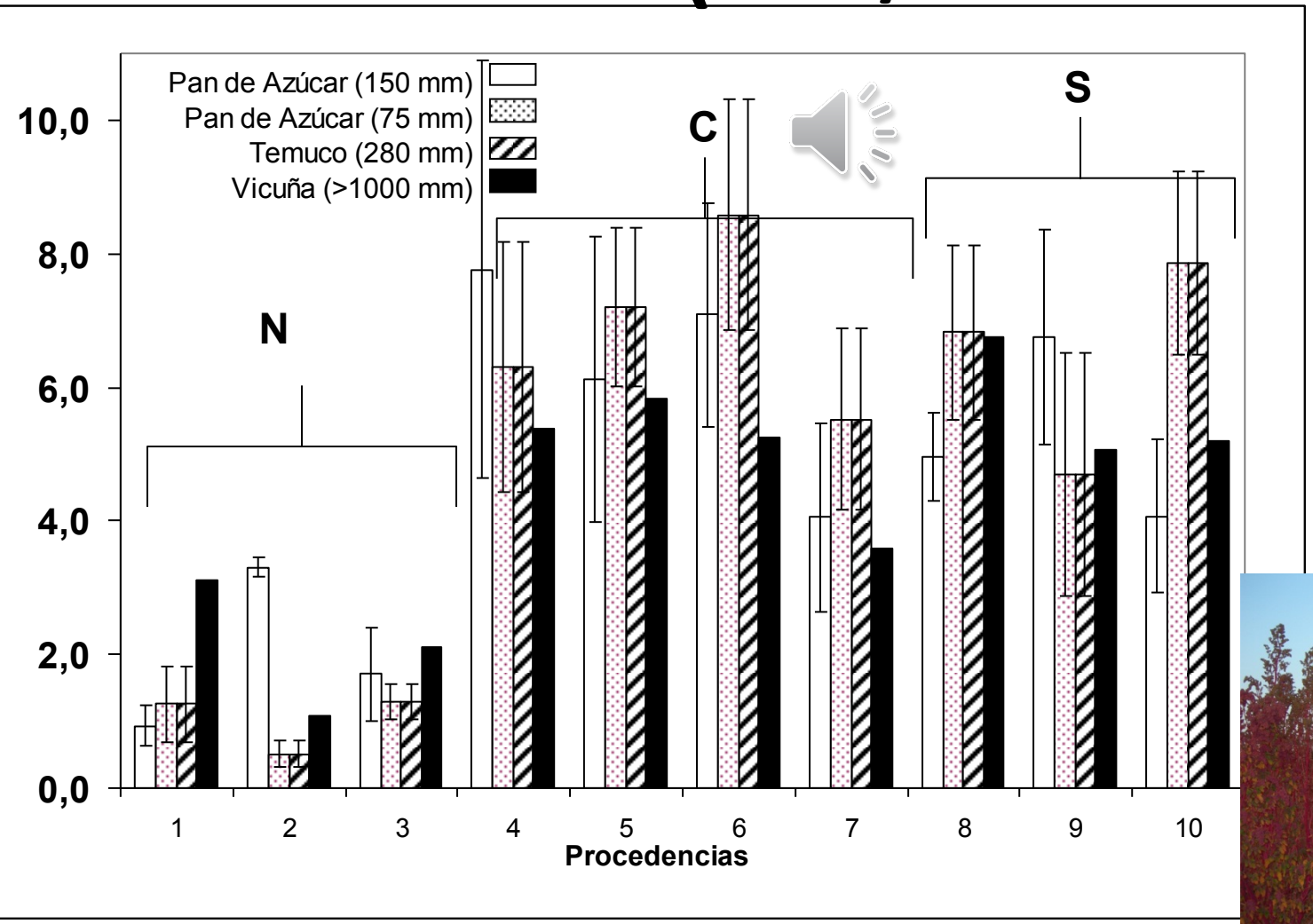
Step 2: study of genetic diversity

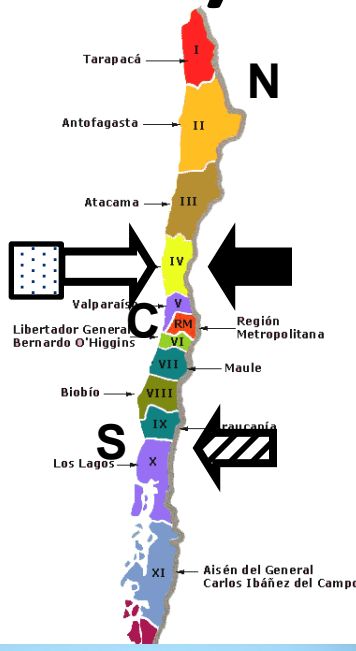


METHOD:
Fact. Comp. Analysis: 20 Polymorphic microsatellites loci
Fuentes *et. al*. Cons. Gen. (2008)



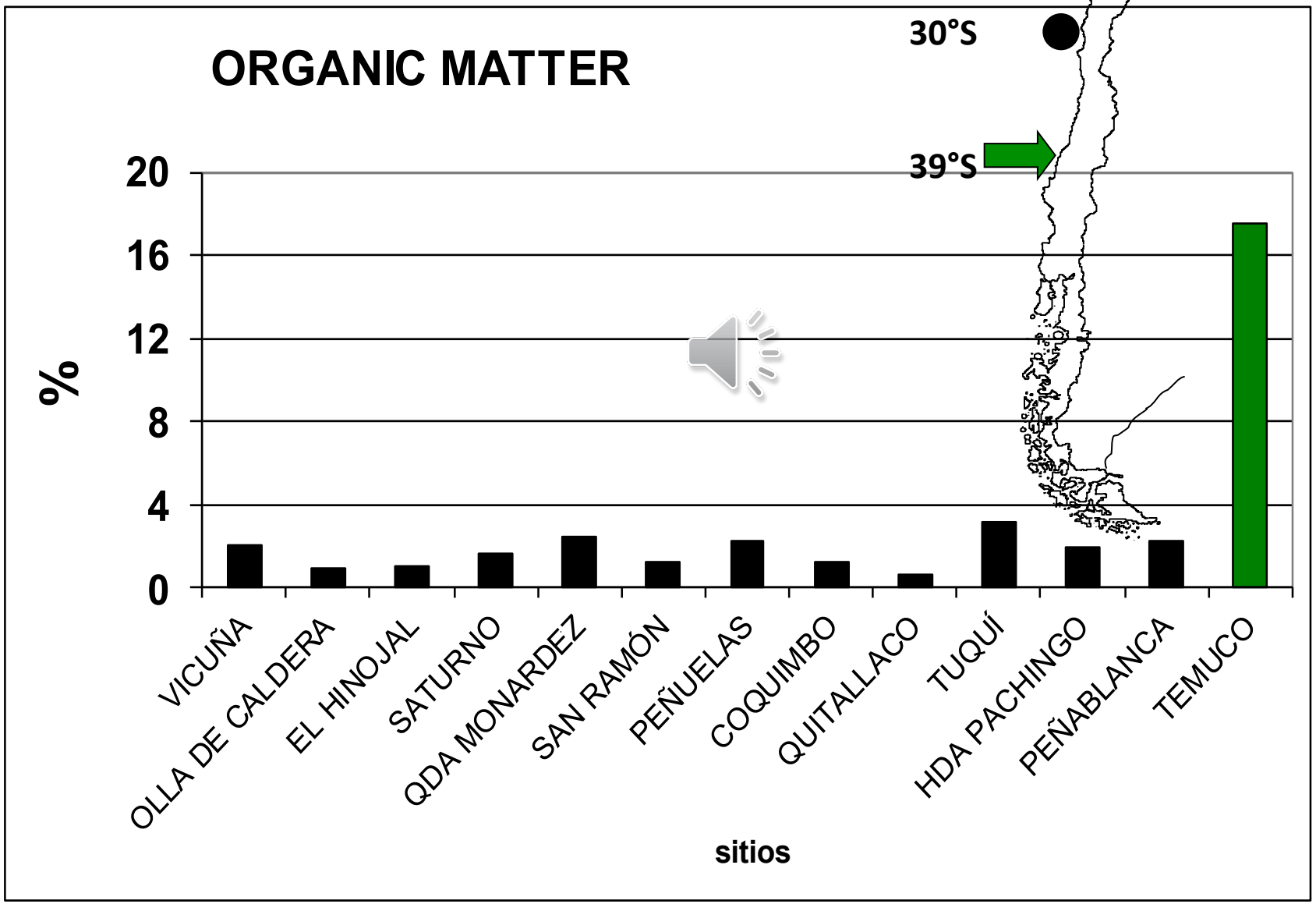
Step 3: Study of comparative yields for 10 landraces (Tons/ha in small parcels)





Martínez et al., 2007

Step 4: Agro ecological adaptations



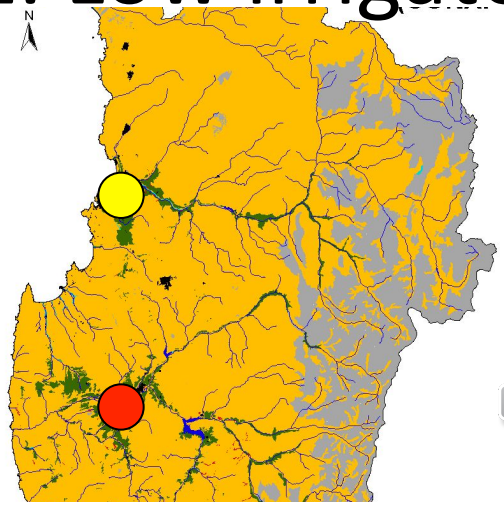
Paradoxically, in our arid regions tons of organic matter are wasted at daily bases

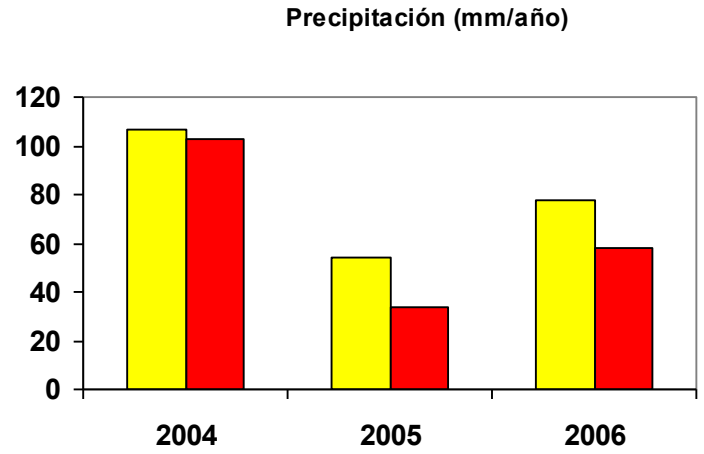
Organic matter from marine wastes: Cultivation of scallops

TONS OF FOULING ORGANISMS CARBON+PROTEINS (but also salts)

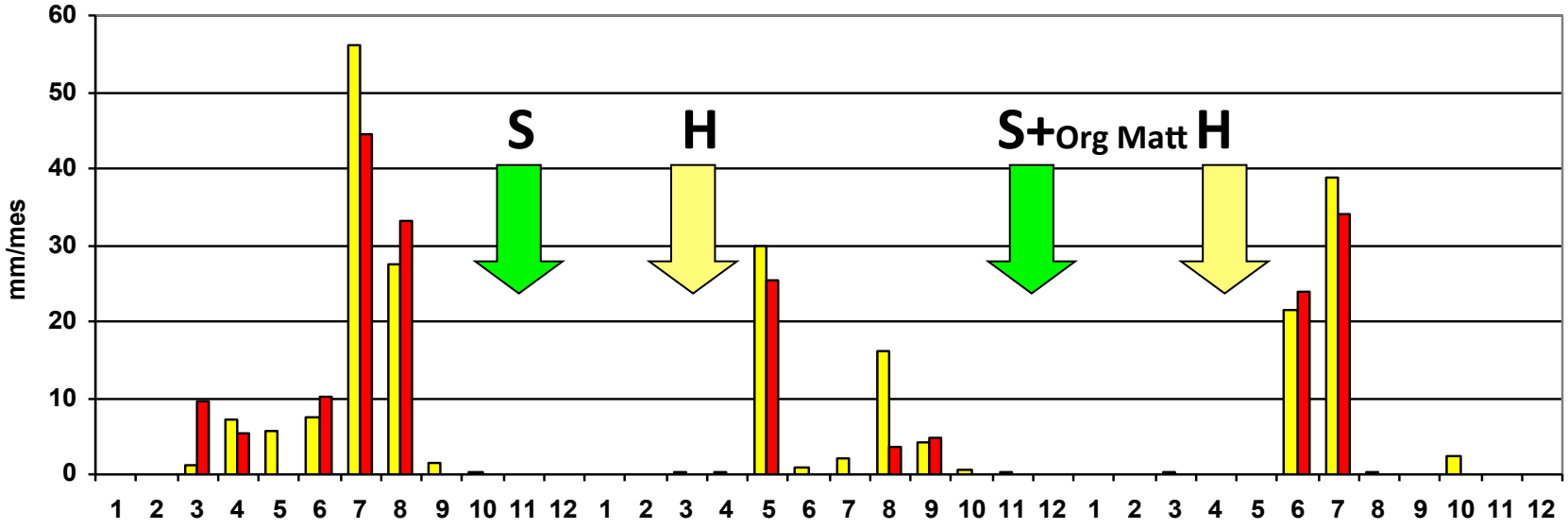
Three Experiments:

1. Low irrigated Quínoa: 40-->250 mm+OM

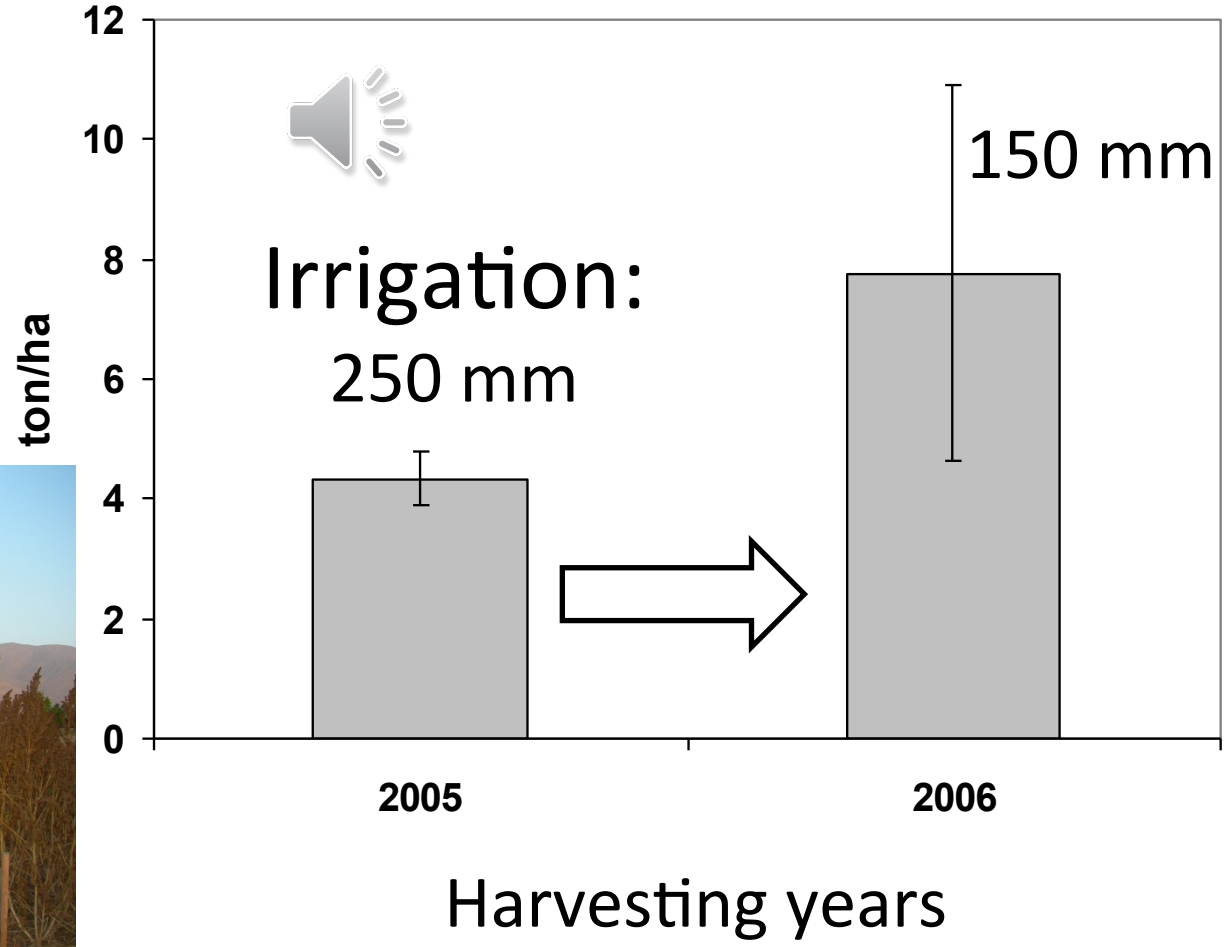




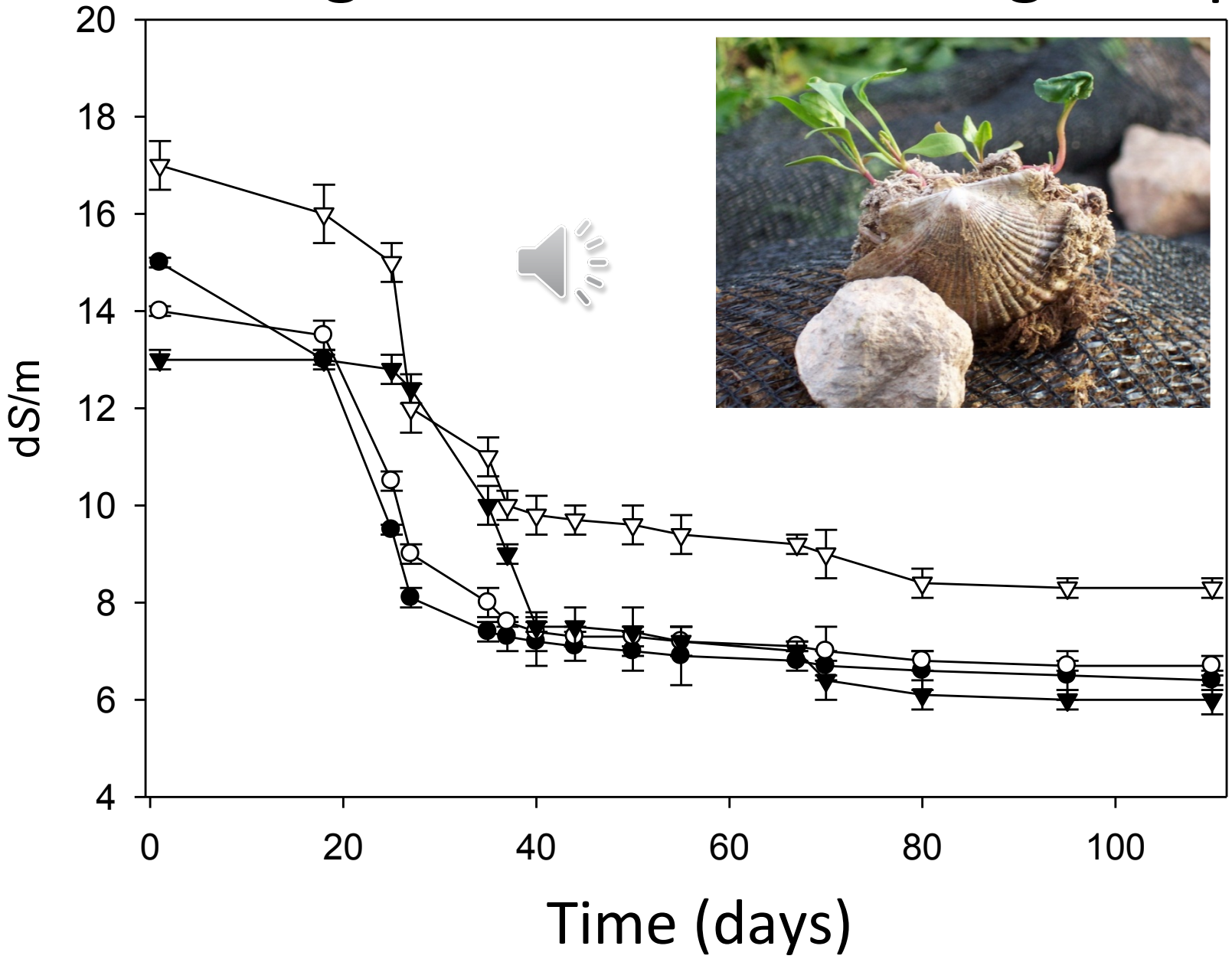
Annual PPT (mm)



Results for quínoa yields:
Improved in 2006, after the addition of 20 T/ha of worm-compost and less irrigation.



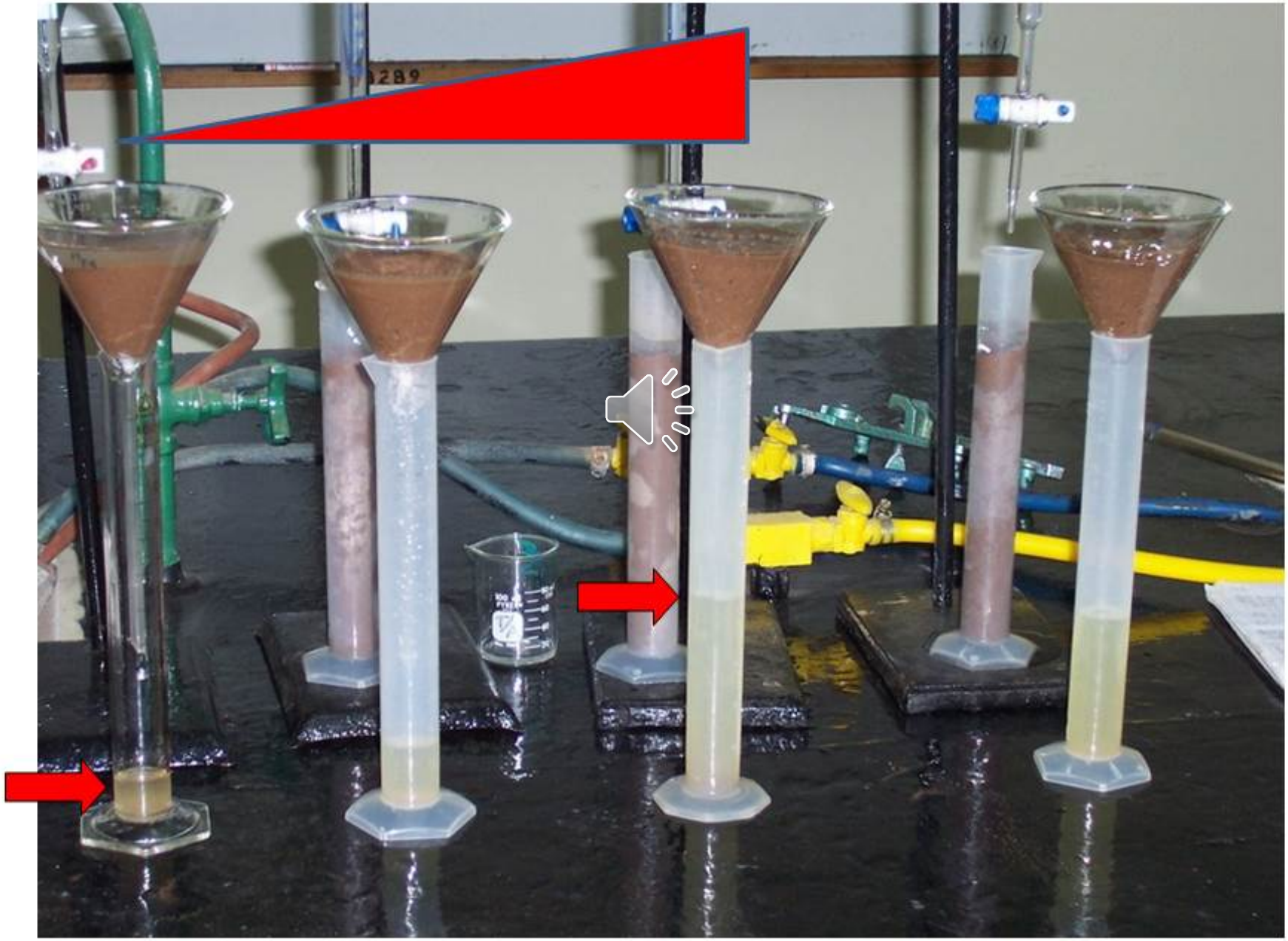
2. Lowering EC in marine fouling compost



Results: Improved grain yields (ton/ha) for different doses of fouling compost

- To (0%): 1,74
- T1 (5%): 2,76
- T2 (10%): 2,85
- T3 (20%): 2,87

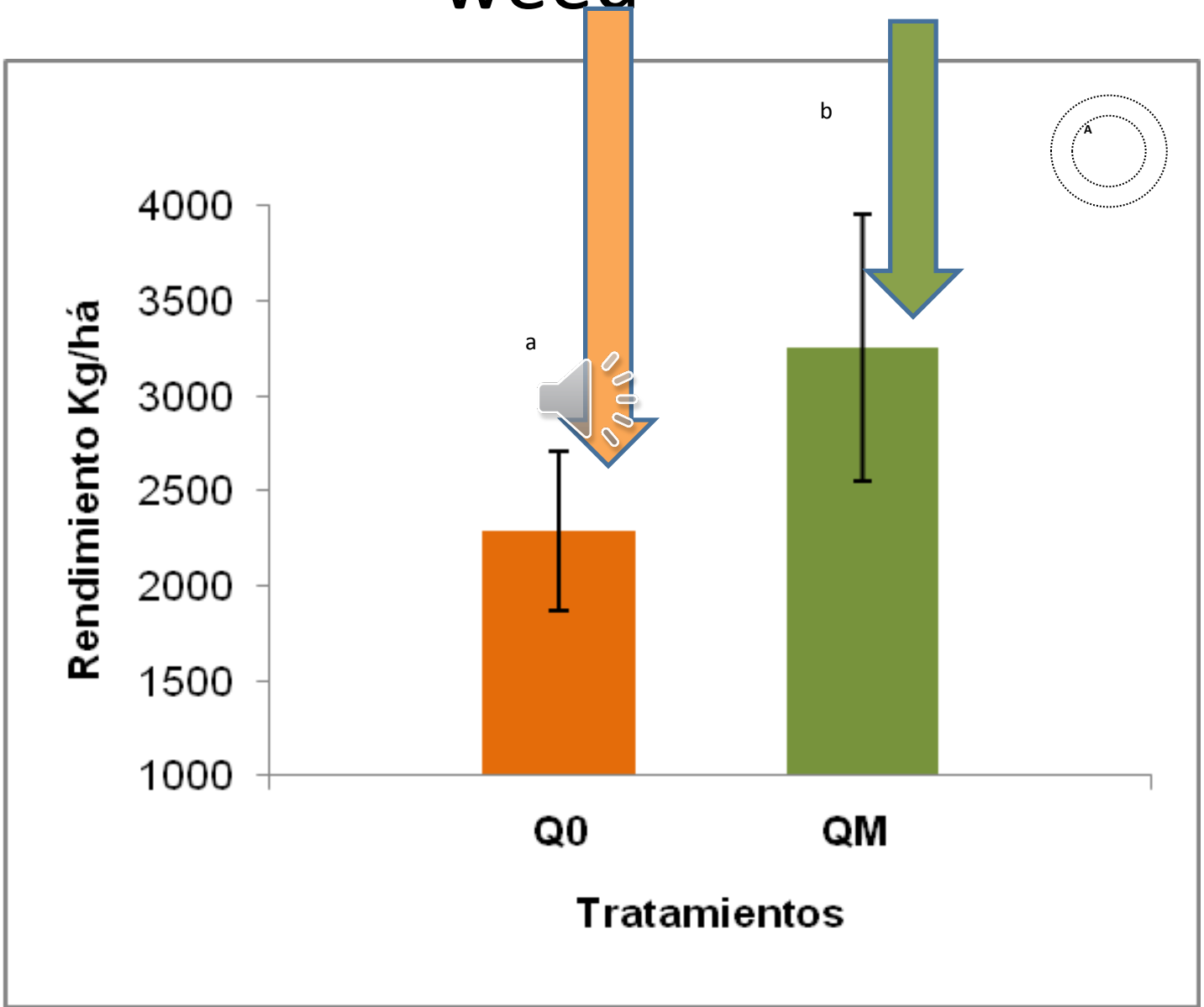
Higher Org. Matter= better porosity:



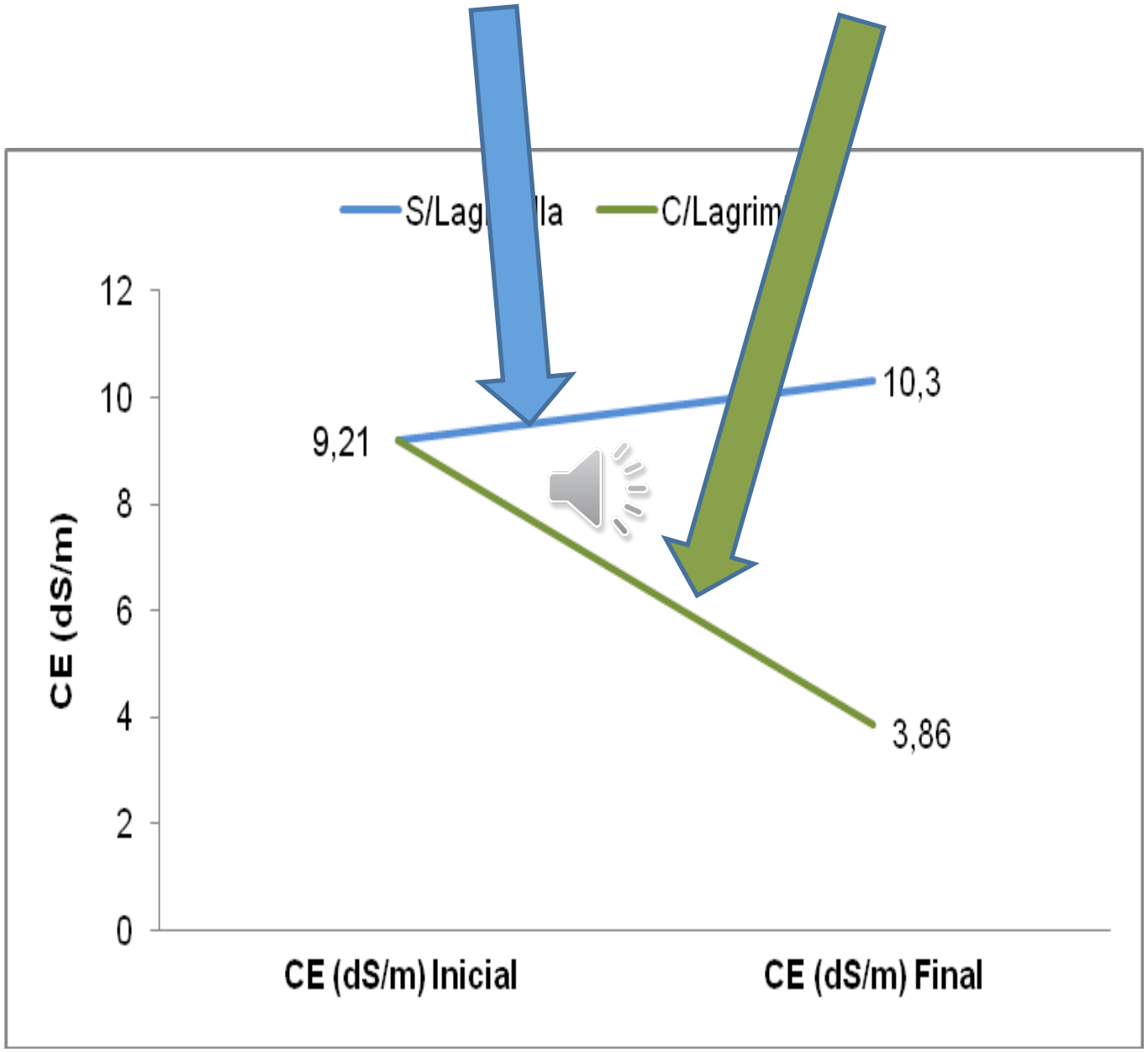
3. Quinoa cultivation with the “weed” *Mesembryanthemum crystallinum*:

Mulch effect of a creeping weed with low water demand and high salt uptake:

Quínoa yields without and with the weed



Differences in EC without and with the weed



OTHER QUINOA STUDIES IN CHILE:

1. **Agro-physiological responses and nutrition quality (since the seventies) by staff from Universities *de Concepción*, *de Chile, Arturo Prat de Iquique in the north, de La Serena, Cet Sur (ONG).***
2. **Seed dynamic among farmers by the Internat. Center of Agronomic Research and Development (Dr. D. Bazile, CIRAD, France+UV).**
3. **Archaeological studies in old remains, ancient DNA (Dra. M. T. Planella).**
4. **Effect of its consumption in animal models and humans (Catholic Univ. Coquimbo and CEAZA).**

CONCLUSIONS:

1. Chile has a rich genetic diversity of quinoa, but in danger due to too few farmers cultivating it.
2. For small scale farmers of arid zones there is an opportunity of improving their soils and yields and using compost and less water.
3. 3. In addition integrated cultivation in arid lands is another possibility of agroecological solutions.
4. 4. Political decisions are needed in Chile for making tons of wasted organic matter more available for its use.

Do not forget:
"Political decisions" start…
…..at home

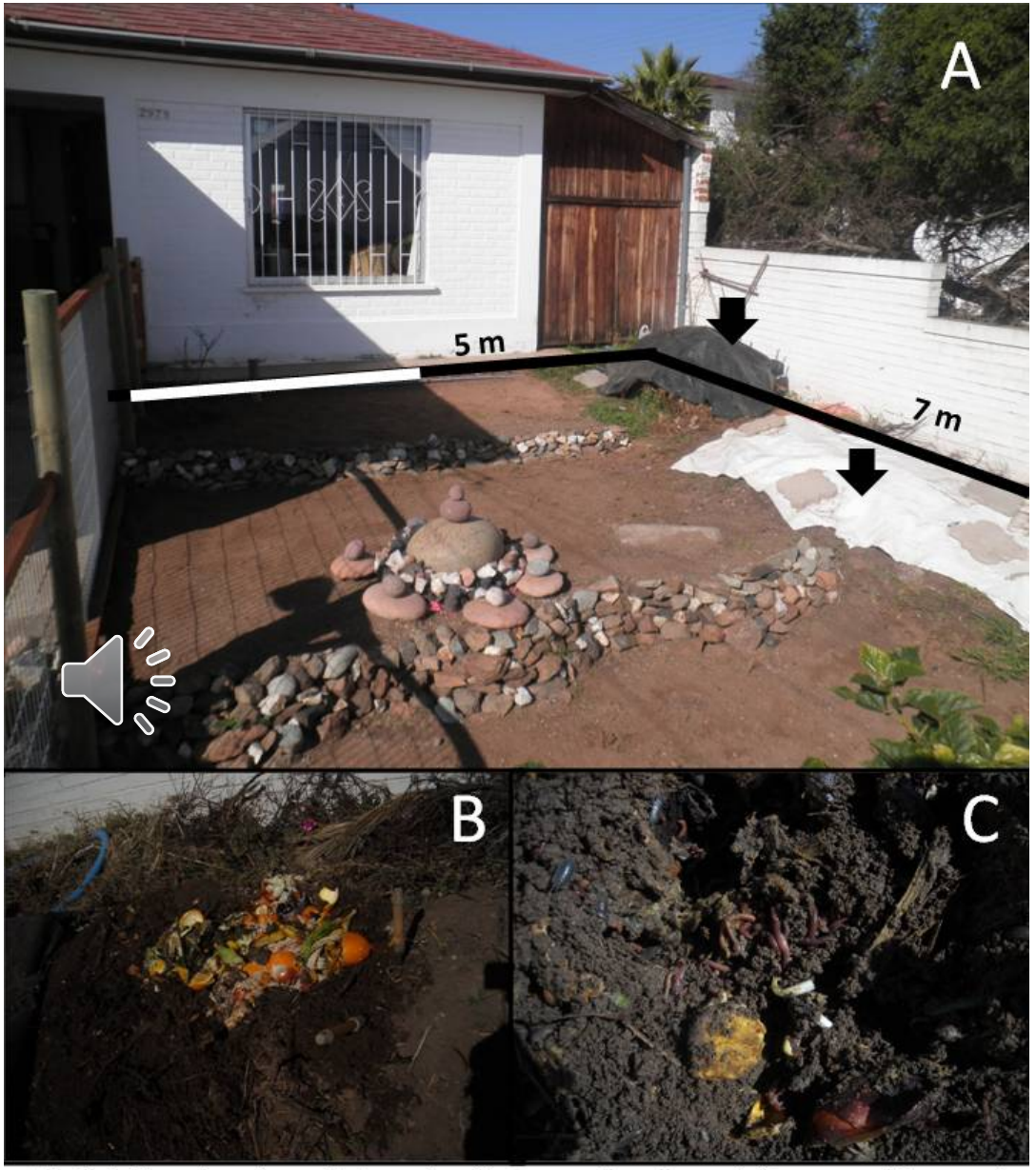


Fig. 1. A: Recycling of vegetable wastes at home small garden-scale (arrows point covered compost, 3 m^2). Surrounding terraces allow plant cultivation. **B**: Initial condition of wastes disposal. **C**: Result after two weeks of earthworms work, with presence of isopods too. Notice different color of a soil with poor content of organic matter (light brown terraces) and dark vermicompost, rich in humus compounds.

Under harsh conditions…
even enemies can become friends

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