Are Participants In Water Markets More Efficient In The Use Of Water Than Non-Participants?: A Case Study For Limarí Valley (Chile)

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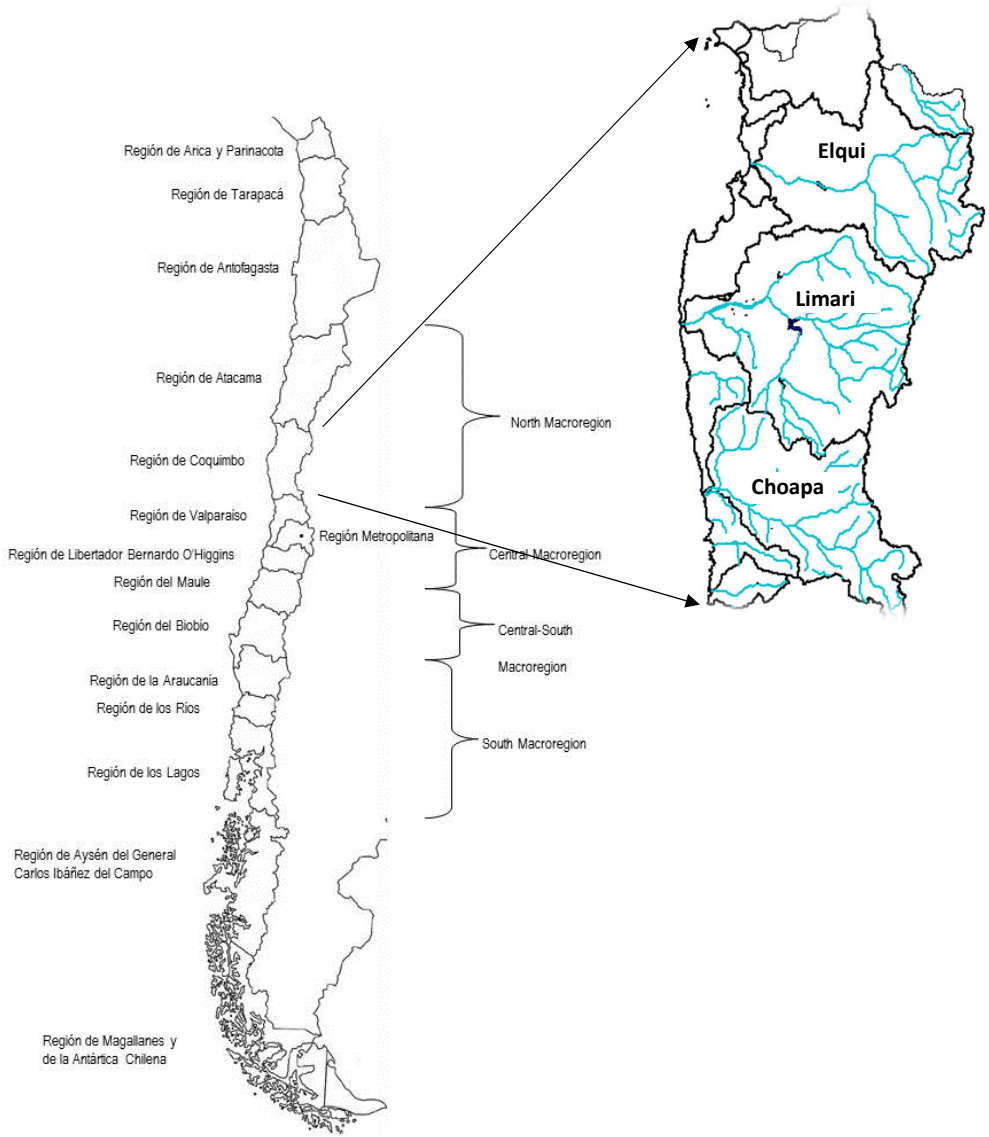

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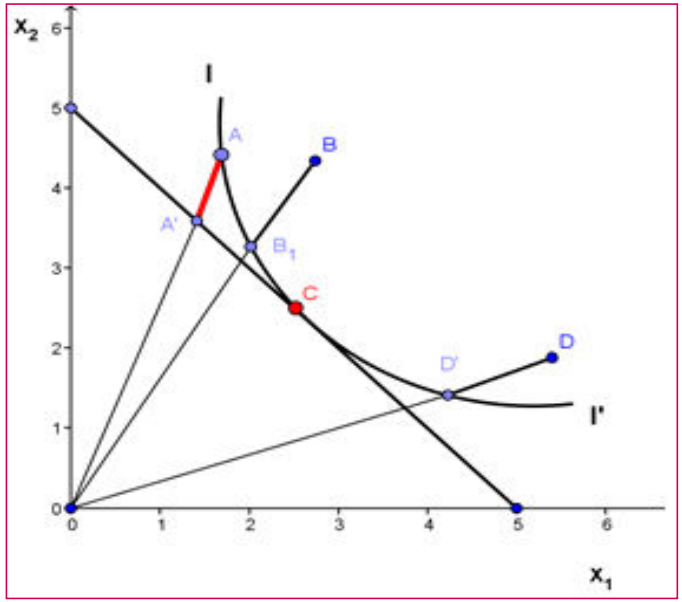
Objective

- Investigate whether there are differences in Global Efficiency (GE), Water Use Efficiency (WUE) and other input use efficiency between farmers who
  - Participate in water markets and
  - Do not participate in them.
- Empirical application focuses on a sample of farmers located in Limarí Valley (Chile)

What do we understand by efficiency?

Technical efficiency (TE): Obtain maximum production with given resources (Output oriented) or minimize input use to reach a give production level

Allocative Efficiency (AE): Reach a production level at mínimum cost or, alternativelly, maximize production for a given cost.



$$Technical\ efficiency\ B = \frac{OB}{OB_1}$$

$$Unit\ A's\ Allocative\ efficiency = \frac{OA'}{OA}$$

$\boldsymbol{Efficiency} = \mathbf{1}$, efficient unit

$\boldsymbol{Efficiency} < \mathbf{1}$, inefficient unit

Water Rights Markets in Chile

Consumptive WR transactions and prices for the period 2005-2008

Region	Total Transactions (Number WR)	WR Transactions independant of Land	WR Transaction Values (Only WR Transactions independent of Land) (10^6 US$)	Average WR Transaction price (US$/WR)
Dry Pacific	12,221	11,223	3,623	512,243
Central Chile	8,835	8,522	1,160	228,737
Southern Humid Pacific	793	784	31	50,863
Total	21,849	20,529	4,814	215,623

Source: (World Bank, 2011).

Water Rights Markets in Limarí Chile

- Active Permanent WR and Spot Water Market
- Main participants in the Limarí water rights market are farmers
  - 90% transactions between farmers.
- Consumptive permanent continuous water rights owners trade WR in permanent water market and water allocations in a spot market.
- Previous research shows that water markets in the Limarí basin have been successful in moving water and water rights from low to high-valued uses.

Methodology

- We apply the Russell model (RM) which is a non-radial and non-oriented model
  - RM approach enables estimation of
    - Global efficiency (technical + allocative effficiency)
    - Individual input use efficiency (technical efficiency)
  - GE and WUE were calculated for
    - All farmers
    - Water sellers
    - Water buyers and
    - Non-traders
- We study factors influencing efficiency scores
  - Based on a non-parametric method

Results

Mean efficiency scores for each input type and global efficiency index for farmers´ category

	Fertilizers	Pesticides	Energy	Water	Labour	RM
All sample	0.380	0.418	0.431	0.450	0.381	0.412
Water sellers	0.486	0.538	0.494	0.615	0.452	0.517
Water buyers	0.344	0.419	0.448	0.469	0.380	0.412
Non-traders	0.338	0.338	0.377	0.326	0.336	0.343

- Efficiency levels for each input, and therefore the GE for the whole group are low
- Input with the highest efficiency score was water use except for non-traders
- Global and input efficiency differences among the farmers´ groups are statistically significant according to non-parametric test of Kruskal-Wallis

Results

Summary results of water use efficiency for farmers´ groups

	efficient units	Mean	Standard deviation	Minimum	Maximum
Water sellers	21	0.615	0.291	0.115	1.000
Water buyers	9	0.469	0.215	0.223	1.000
Non-traders	2	0.326	0.157	0.102	1.000

Closing Remarks

- Farmers participating in water markets are more efficient –from a global and water use point of view
    - Water sellers are the most efficient in the use of water

- Non-parametric tests applied to analyse relationship of external factors with differences in global and water efficiency scores
    - Cultivated area, type of crop, farmers´ experience in agriculture and irrigation technology
    - These factors did not affect GE and WUE

Closing Remarks

- Policy implications
  - Mean WUE is moderate-low.
    - Hence, there are considerable possibilities to reduce agricultural water consumption, maintaining production levels.
  - Promotion of WR markets by water authorities and policy makers would lead to increases water productivity
  - As WUE was estimated at farm level, this information should be transferred to farmers with a benchmark analysis

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