# WATER PRODUCTIVITY
# Irrigation Management and Systematization for Rice Farming Systems in Uruguay

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## Introduction

**A high proportion of rice farming irrigation in the Central Region of Uruguay (87%) is done with water stored in dams (rainfall).**

**Maximizing water productivity would :**

**reduce the costs of pumping irrigation,**

**increase rice area planted annually**

**allow to irrigate other crops in a rotation**

**improve economic results and sustainability of the rice sector.**

**Implementing crop irrigation systems involving savings in water input means a greater risk and would only be adopted by farmers on a larger scale if they determine:**

**More or Equal Rice yield per Hectare with less Water**

## Objective

**The aim of the experiment is to determine irrigation management practices and systematization field layout techniques that increase Water Productivity, contemplating the economic and environmental sustainability of rice farming systems in Uruguay.**

## Methodology

**A split plot experimental design trial was conducted in Tacuarembó Experimental Station (32.18S, 55.17W). Treatments included two types of systematization with different vertical interval between levees (big plots)l: I. Conventional (VI-8cm) and II. Alternative (VI-4cm) and three irrigation management practices (small plots): 1.Continuous (C), 2.Intermittent until panicle initiation (IP), and 3.Intermittent during all crop cycle (I). In C a water layer of 10cm is maintained after flooding throughout all the crop cycle. In IP and I the water layer alternates between 10 and 0cm and is re-established when the soil is still saturated. The results of the joint analysis of the previous three seasons (2012-2013-2014) were evaluated by analysis of variance and mean separation test of Fisher 5% using statistical package InfoStat (www.infostat.com.ar).**


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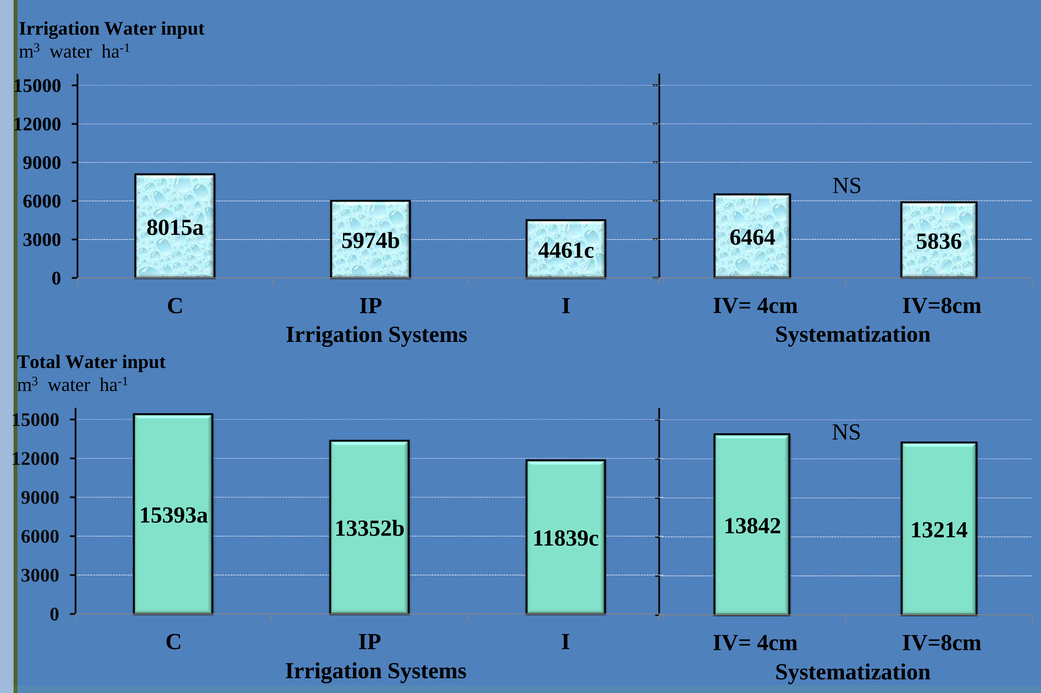
## Results

Intermittent irrigation systems led to significant water inputs savings in relation to continuous irrigation C, 2041 and 3554 m3 water ha-1 less for IP and I respectively (Figure 1) (P<0.05). There were no differences in rice grain yield between irrigation treatments (P< 0.05) (Table 1).

Figure 1. Irrigation Water Input and Total Water Input (Irrigation plus Rainfall) for different irrigation systems and systematization, Tacuarembó, Uruguay (average 3 seasons 2011-14).




Means followed by different letters are significantly different at P < 0.05. NS: non-significant differences . LSD ( least-square difference ) for Irrigation Systems = 460 m3 water ha-1 and LSD for Systematization LSD =1284m3 water ha-1 . CV (Variation Coef.) for Irrigation = 7.3% and for Systematization CV = 3.3%

Table 1. Rice Yield, Grain Quality and Water Productivity compared with three irrigation systems and two types of systematization, Tacuarembó, Uruguay 3 seasons 2011-14).

| Site= Central Region, Tacuarembó. | Rice Yield (kg ha$^{-1}$) | Industrial Quality | | Water Productivity (WP) g grain kg-1 | |
|---|---|---|---|---|---|
| | | White Grain % | Whole Grain % | Irrigation | Irrigation + Rainfall |
| Irrigation Systems | | | | | |
| 1.Continuous (C) | 7850 | 69.22 | 62.73 a | 0.99 c | 0.52 c |
| 2. Intermittent until panicle initiation (IP) | 7446 | 69.17 | 62.17 ab | 1.31 b | 0.57 b |
| 3. Intermittent during all crop cycle (I) | 7843 | 69.08 | 61.94 b | 2.00 a | 0.68 a |
| MDS (P<0.05) | NS | NS | 0.63 | 0.17 | 0.04 |
| Systematization - Field Layout | | | | | |
| I. Conventional - VI=8cm | 7735 | 69.2 | 62.61 | 1.57 | 0.60 |
| II. Alternative - VI= 4cm | 7691 | 69.1 | 61.95 | 1.30 | 0.57 |
| MDS (P<0.05) | *NS* | *NS* | *NS* | *NS* | *NS* |
| CV % | *12.12* | *0.71* | *1.95* | *22.44* | *12.16* |

Different letters in the same column are significantly different with a probability less than 5% (P<0.05 ) LSD : least square deviation. NS: non significant differences. CV : coefficient of variation

## Conclusions

**Intermittent irrigation in low-infiltration rate soils (planosols), allowed for significant savings in water input of 35% on average without reducing rice grain yield relative to continuous irrigation, thus determining a significant increase in water productivity (P <0.05).**

**In relation to industrial quality, intermittent irrigation (I) determined a lower percentage of whole grain in relation to continuous irrigation C (P <0.05).**

**There were no significant differences in water input, grain yield, industrial quality and water productivity between the different systematizations-field layouts treatments(P <0.05).**