Trends in climate-related yield potential and yield gaps in irrigated rice in the Philippines

Angulo Carlos[1,2], Wassmann Reiner[1], Becker Mathias[2]

Background / Introduction

Rice plays an important role as staple food in the Philippines. The assessment of climate-induced variations in yields gains special relevance in-view of projected climate change. There is a lack of detailed studies about the current influence of climate variability on rice yield. Crop growth simulation models are a modern tool to calculate potential yields and evaluate separately climate as influencing production factor. Additionally the yield gap, obtained from the difference between potential and actual yields, can be used as an evaluation resource to target future research investments.

Yield potential of irrigated rice varies seasonally and regionally but shows no climate-related trends over the past 20 years .

Yield gaps vary between 2.1 and 7.6 Mg ha^{-1} and tend to be larger in the dry than in the wet season.

Yield gaps are higher in infra-structural disfavored regions irrespective of the climatic yield potential.

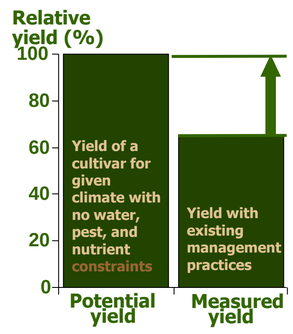
Material and Methods

Climate data of the last two decades (1985-2002) were compiled from the information system of NASA.

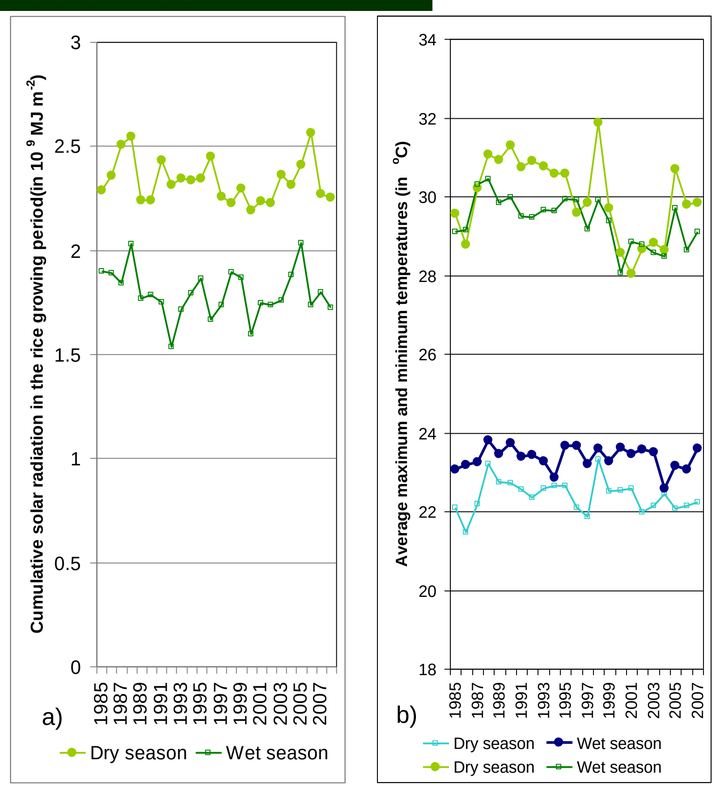
The climatic trends and the influence of climate variability on irrigated rice yield were analyzed for six representative provinces of the Philippines.

The climate information (solar radiation and temperature) were used as input parameters in the crop-growth simulation model ORYZA2000 to generate potential yields.

The simulated potential yields were compared with recorded actual yields obtained from the Bureau of Statistics of the Philippines to determine the corresponding yield gaps.



Climatic trends

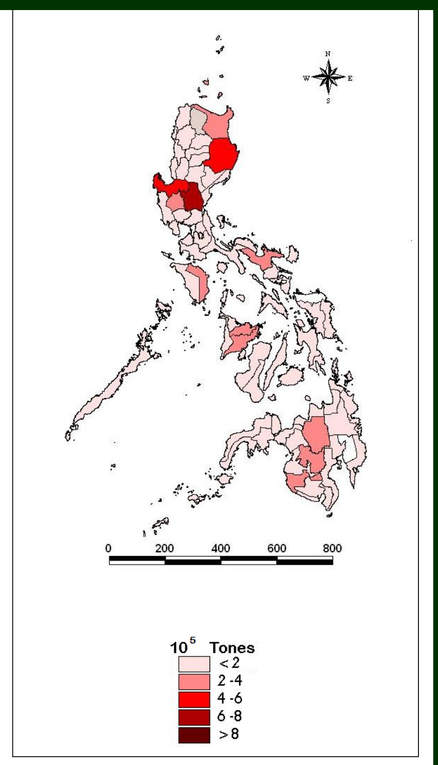


Solar radiation (a), maximum and minimum temperature (b) for the period 1985-2007 in Central Luzon, Philippines

Seasonal Yield Differences

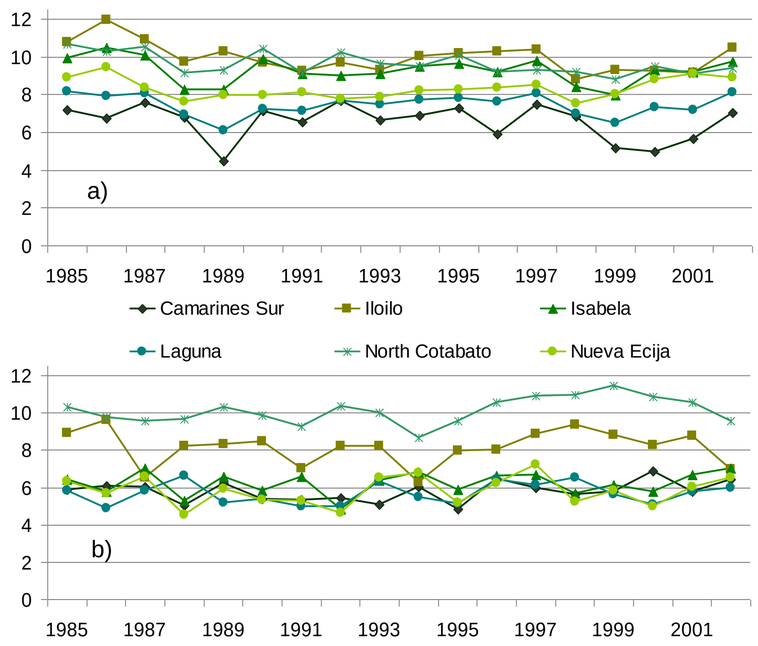
Provinces	Season	
Simulated	**DS**	**WS**
Camarines Sur	6.55	5.79
Iloilo	9.98	8.16
Isabela	9.27	6.22
Laguna	7.45	5.68
North Cotabato	9.64	10.11
Nueva Ecija	8.33	5.82
Recorded	**DS**	**WS**
Camarines Sur	2.48	2.59
Iloilo	2.39	2.86
Isabela	3.74	3.56
Laguna	3.98	3.60
North Cotabato	3.40	3.26
Nueva Ecija	4.41	3.02
Yield Gap	**DS**	**WS**
Camarines Sur	4.07	3.20
Iloilo	7.59	5.30
Isabela	5.54	2.66
Laguna	3.47	2.08
North Cotabato	6.24	6.85
Nueva Ecija	3.91	2.81

Potential and actual yield between dry and wet season.

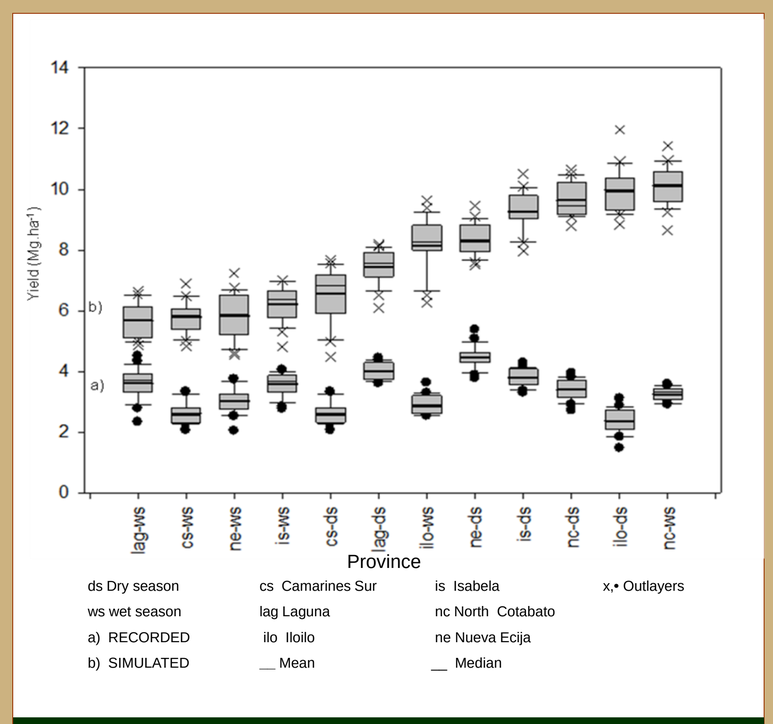


Rice production in the Philippines in 2002 (in 10^5Mg).

Potential (simulated) yields

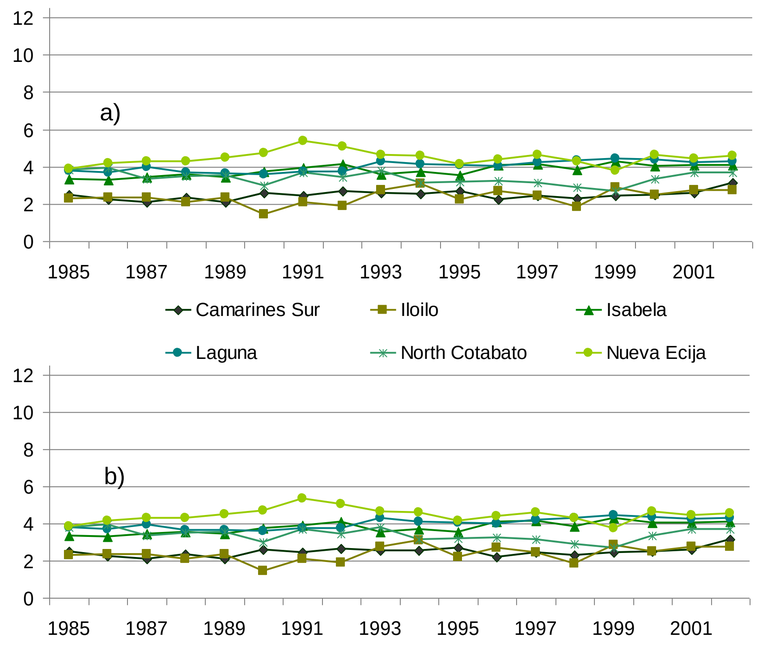


Variability in simulated rice yield on the dry (a) and wet season in six provinces for the period from 1985 to 2002.



Variability of recorded a) and simulated (b) rice yields between seasons in six provinces (1985 to 2002).

Actual (measured) yields



Variability in measured rice yield in the dry (a) and wet season in six provinces for the period from 1985 to 2002.

Outlook

- **Rice research should focus on the dry season crop particularily in infraestructurally disfavored regions of the Philippines.**

Affiliations: [1]International Rice Research Institute, Manila, The Philippines. [2]Institute of Plant Nutrition, University of Bonn, Germany.