Alternate wetting and drying (AWD)

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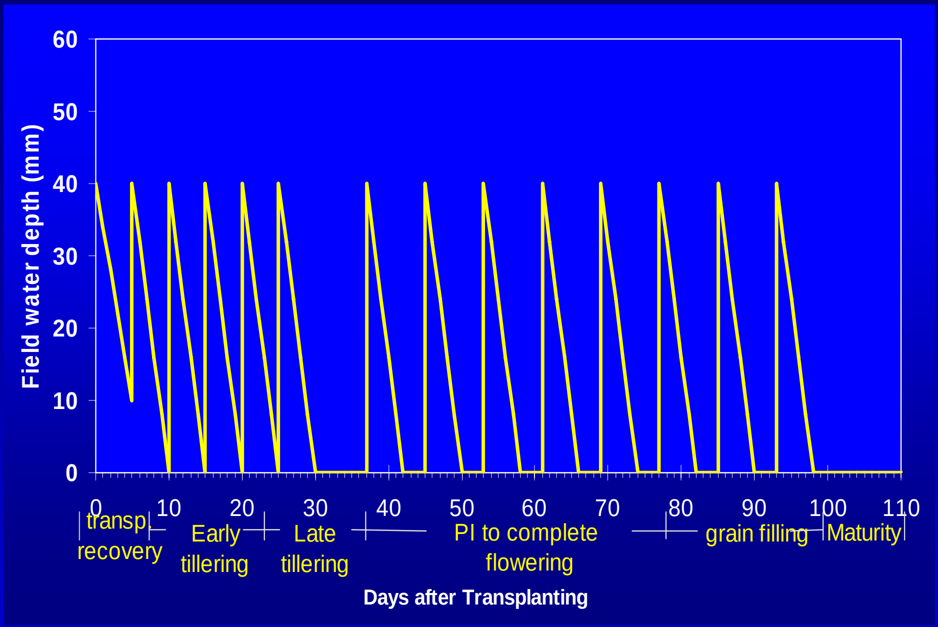
Principle AWD

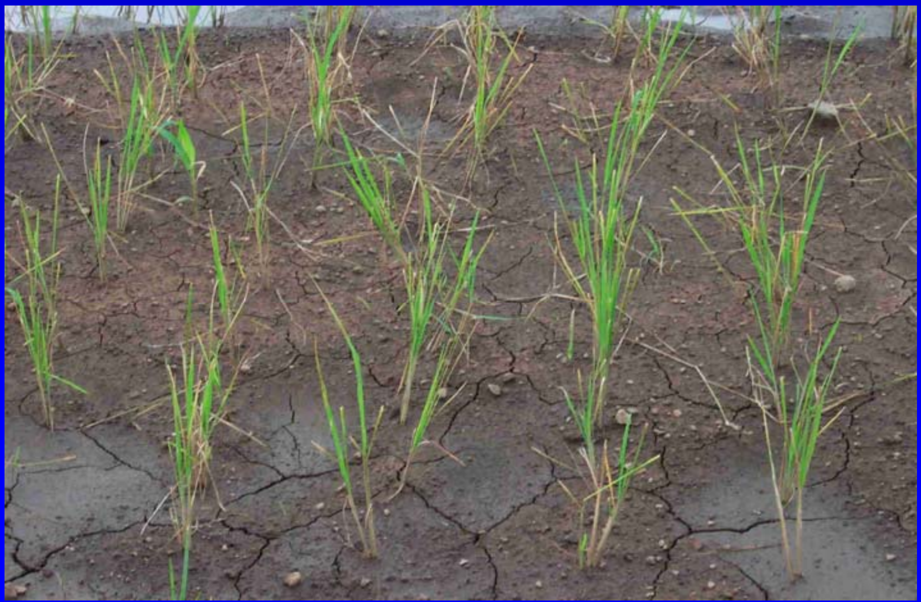
Introduce periods without ponded water before re-irrigation

During periods without ponded water:

- **No continuous percolation**
- **No continuous seepage**
- **Less evaporation**



Alternate wetting and drying (AWD)
Intermittent irrigation (II)
Controlled Irrigation (CI)
One of key components in SRI



AWD in a silty clay loam soil with 70-200 cm groundwater

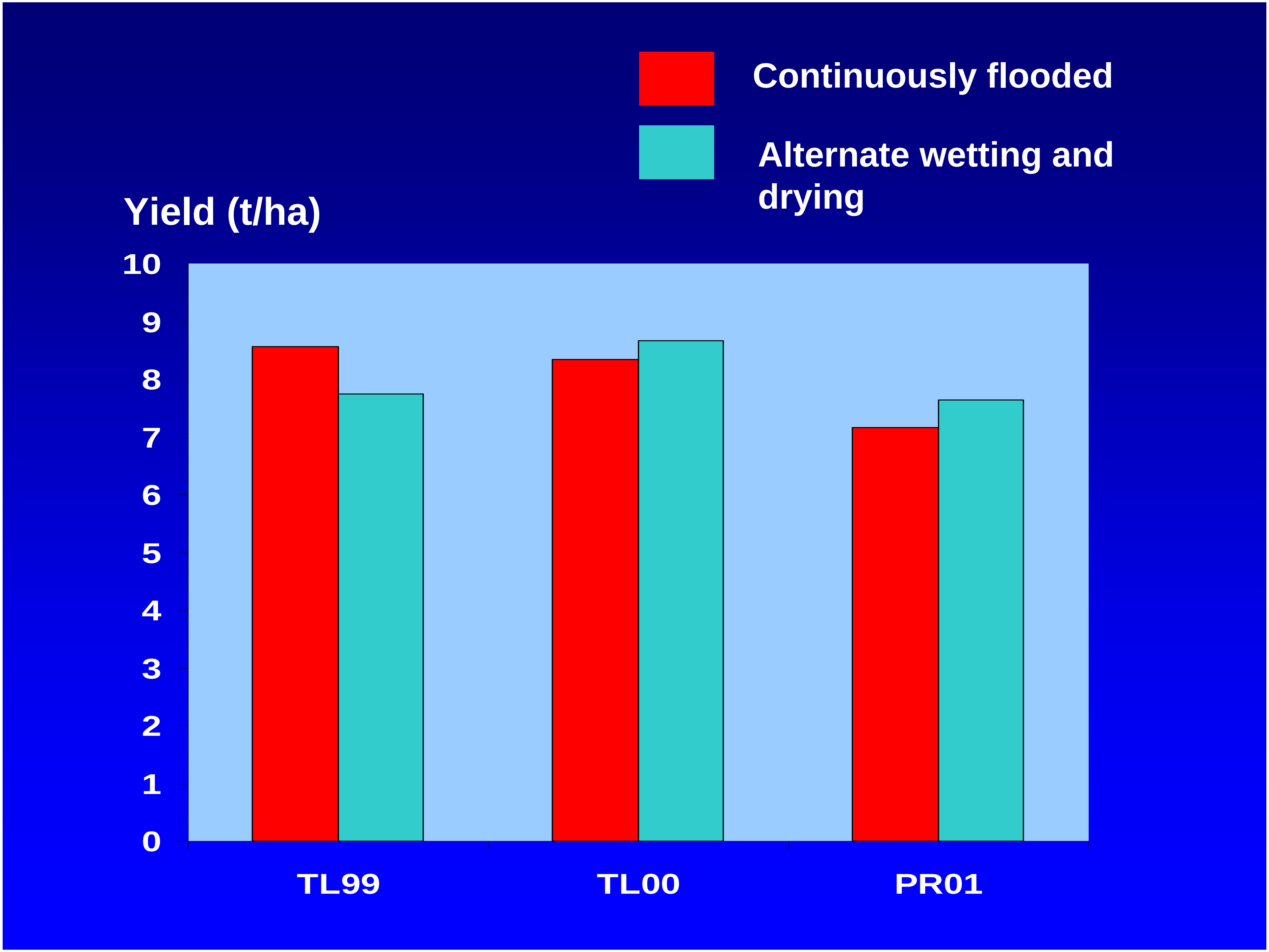
Year	Treatment	Yield (t ha^{-1})	Water (mm)	WP_{IR} (g grain kg^{-1} water)
1988	Flooded	5.0	2,197	0.23
	AWD	4.0	880	0.46
1989	Flooded	5.8	1,679	0.35
	AWD	4.3	700	0.61
1990	Flooded	5.3	2,028	0.26
	AWD	4.2	912	0.46
1991	Flooded	4.9	3,504	0.14
	AWD	3.3	1,126	0.29

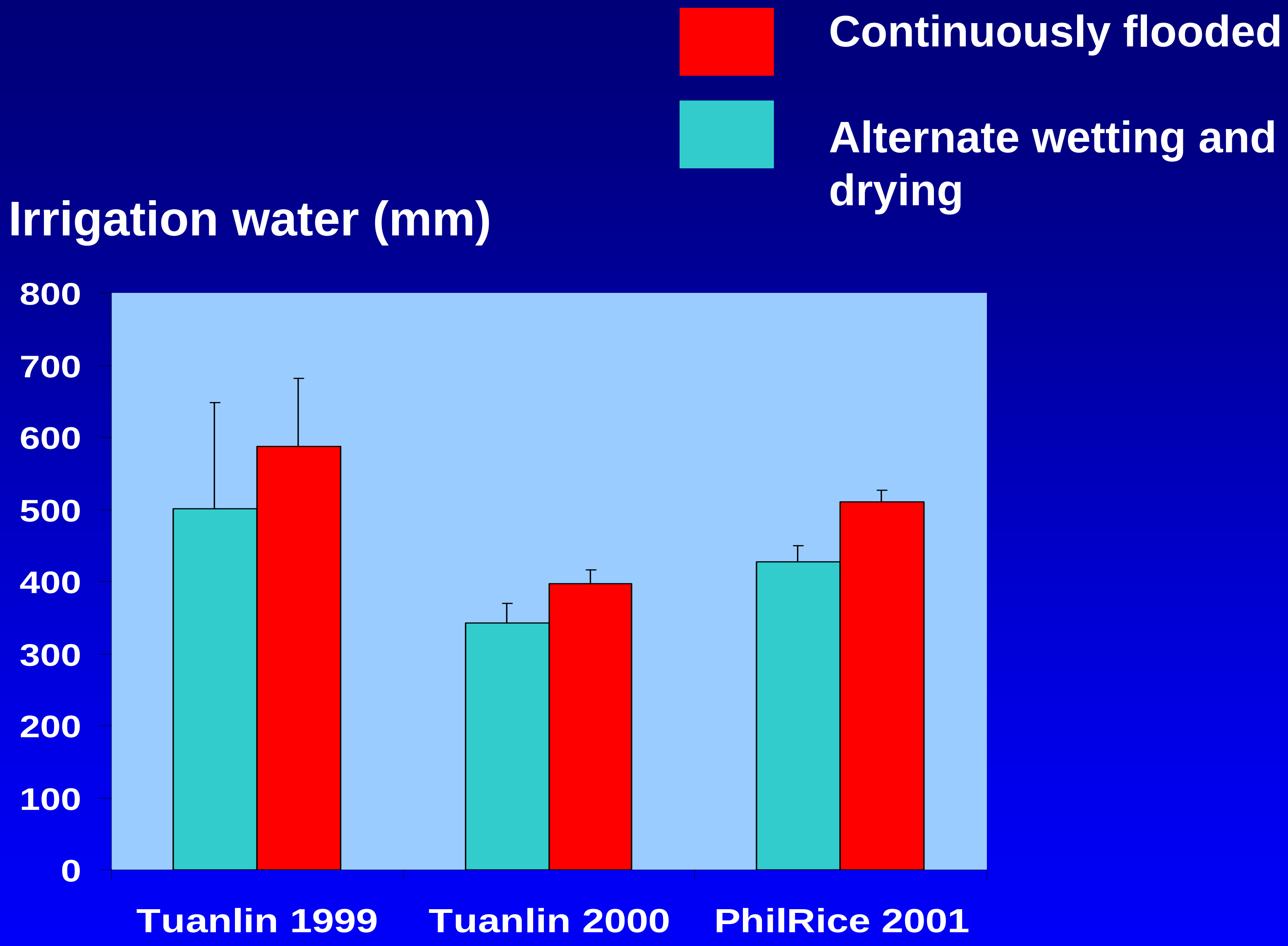
Guimba, Philippines, 1988-1991.

AWD in a heavy clay soil with 0-30 cm groundwater

Year	Treatment	Yield (t ha^{-1})	Water (mm)	WP_{IR} (g grain kg^{-1} water)
1999	Flooded	8.4	965	0.90
	AWD	8.0	878	0.95
2000	Flooded	8.1	878	0.92
	AWD	8.4	802	1.07
2001	Flooded	7.2	602	1.20
	AWD	7.7	518	1.34

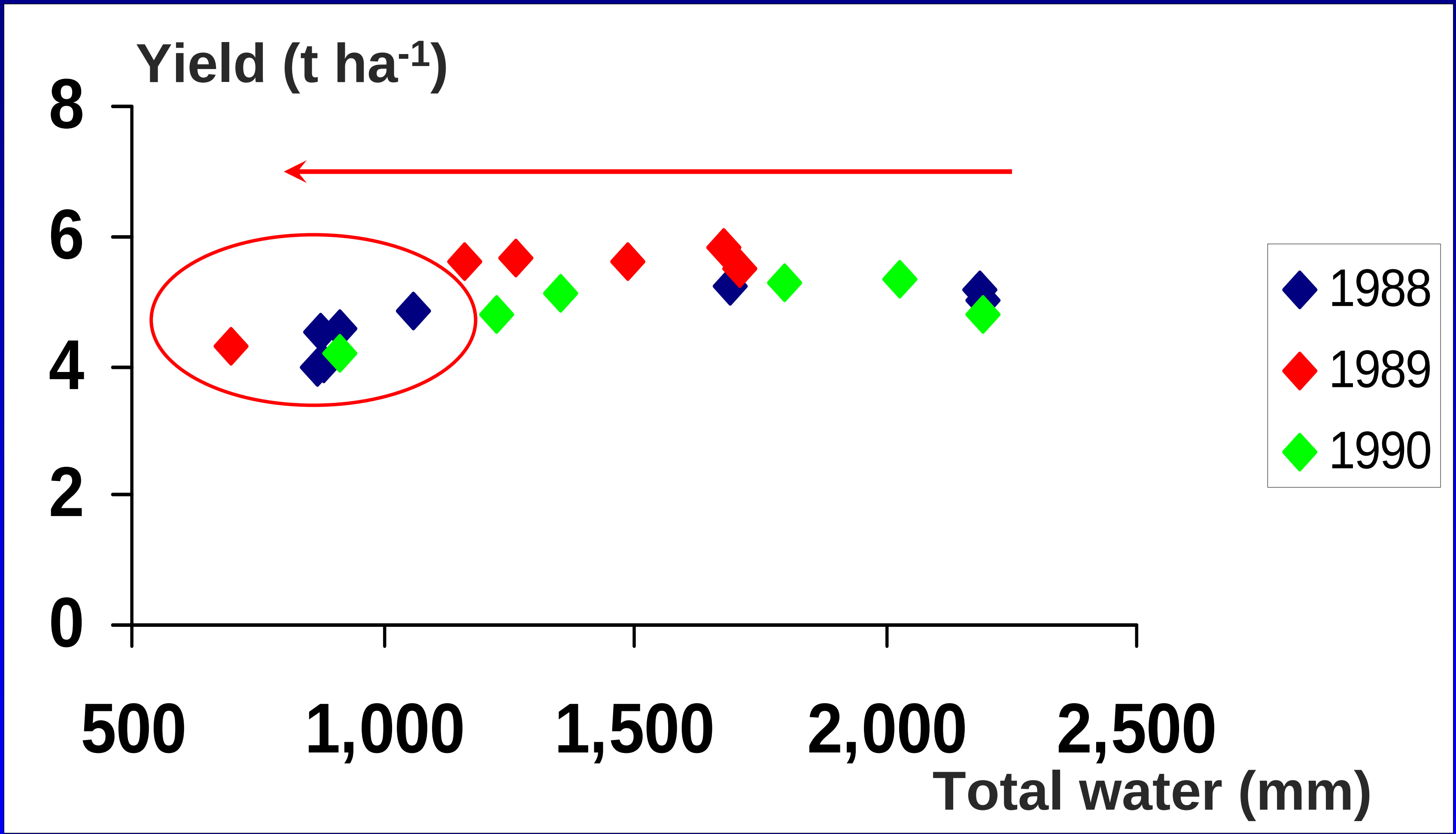
Tuanlin, China (1999-2000); Munoz, Philippines (2001)


Continuously flooded
Alternate wetting and drying
Yield (t/ha)
10
9
8
7
6
5
4
3
2
1
0
TL99
TL00
PR01



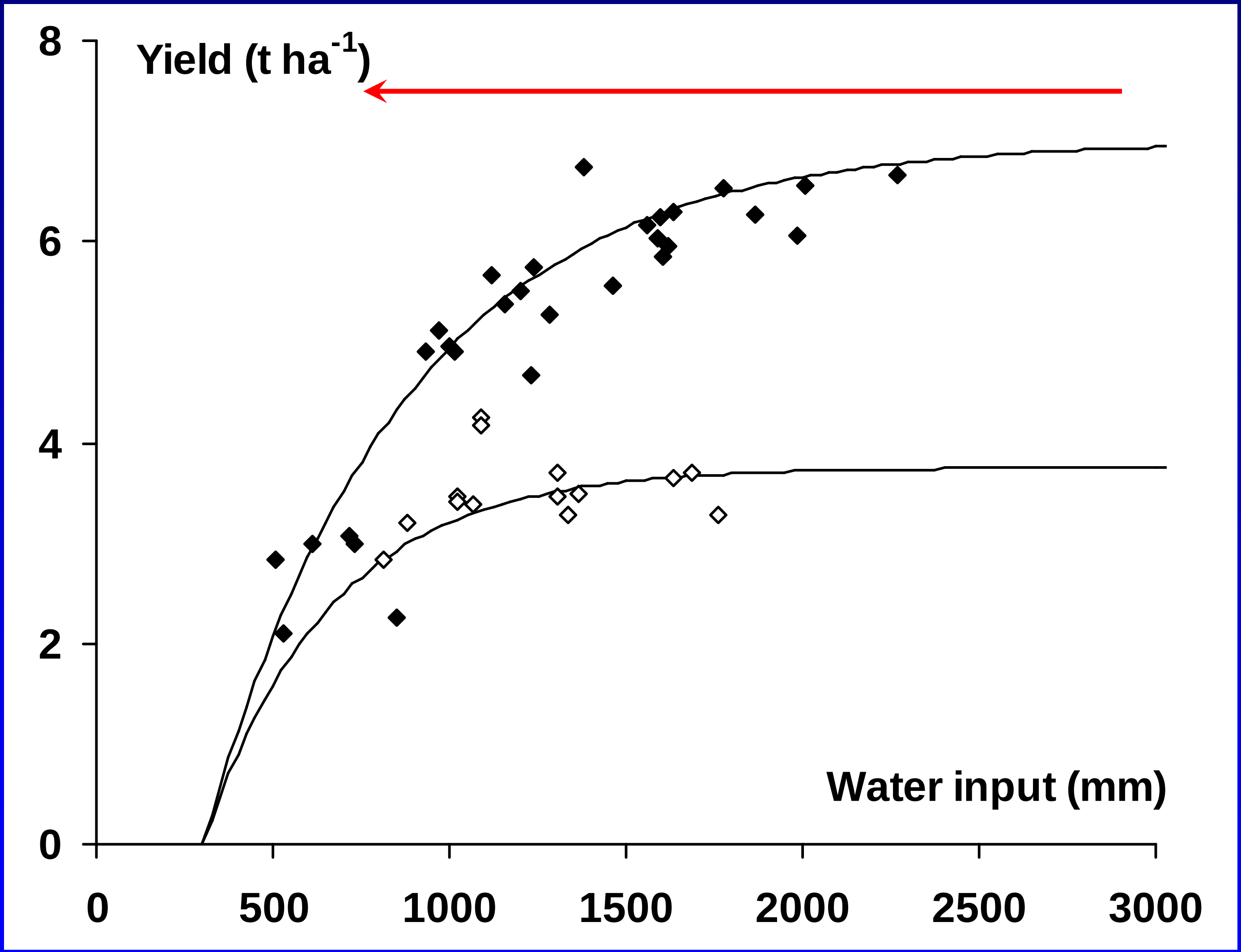
Note: heavy clay soil with shallow groundwater (0-30 cm deep)

Effect of less water (SSC => AWD$_n$)



Guimba, Philippines, 1988-1991.

Effect of less water (AWD_n)



Yield versus water input in two experiments in India. Top curve data (♦) are from Cuttack, Orissa, (Jha *et al*., 1981), and bottom curve data (◊) are from Pantnagar, Uttar Pradesh (Tripathi *et al*., 1986).

Conclusions from research

Amount of water input depends on soil type and hydrology

Amount of water reduced with AWD depends on soil type and hydrology

Implementation of AWD (number of days without ponded water before re-irrigation) depends on soil type and hydrology
=> site-specific implementation

Safe AWD concept and implementation

- Multi-location field exps (Phil., India, China)
- On-farm, multi-stakeholder pilot sites
- Socio-economic evaluation at pilot sites

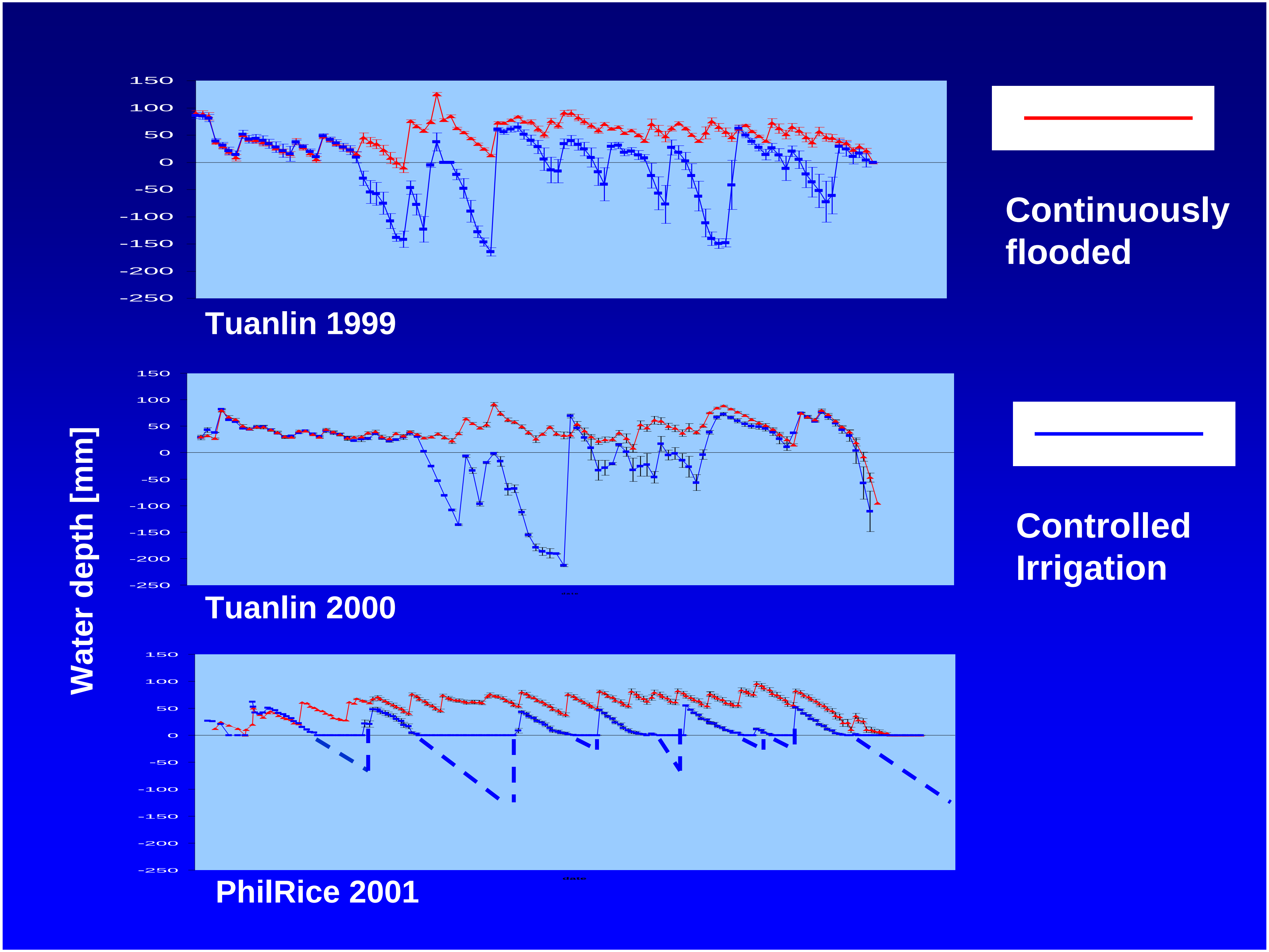
→

- Water is underground when you can’t see it
- Rice roots can tap underground water
- “Safe threshold” for underground water defined

  => reduced water input 15-30% without yield loss

- Simple key messages for farmers
- Simple tool for farmers

A practical indicator to irrigate



Water depth [mm]
150
100
50
0
-50
-100
-150
-200
-250
Tuanlin 1999
Tuanlin 2000
PhilRice 2001
Continuously flooded
Controlled Irrigation

"Safe AWD practice"

1. Irrigate when water is 15-20 cm deep (simple tool!)

2. Keep 5-cm flooded at flowering

Main idea to convey:

- Water is there even when you can't see it
- Create confidence by farmers
- Farmers then to experiment with threshold value
- No recipe for soil type, hydrology, variety, ..
- "Usual" nutrient management
- Keep first 2 weeks flooded if many weeds

Avoid deep soil cracking => bypass flow

Knowledge Transfer for Water-Saving Technologies in Rice Production in the Philippines

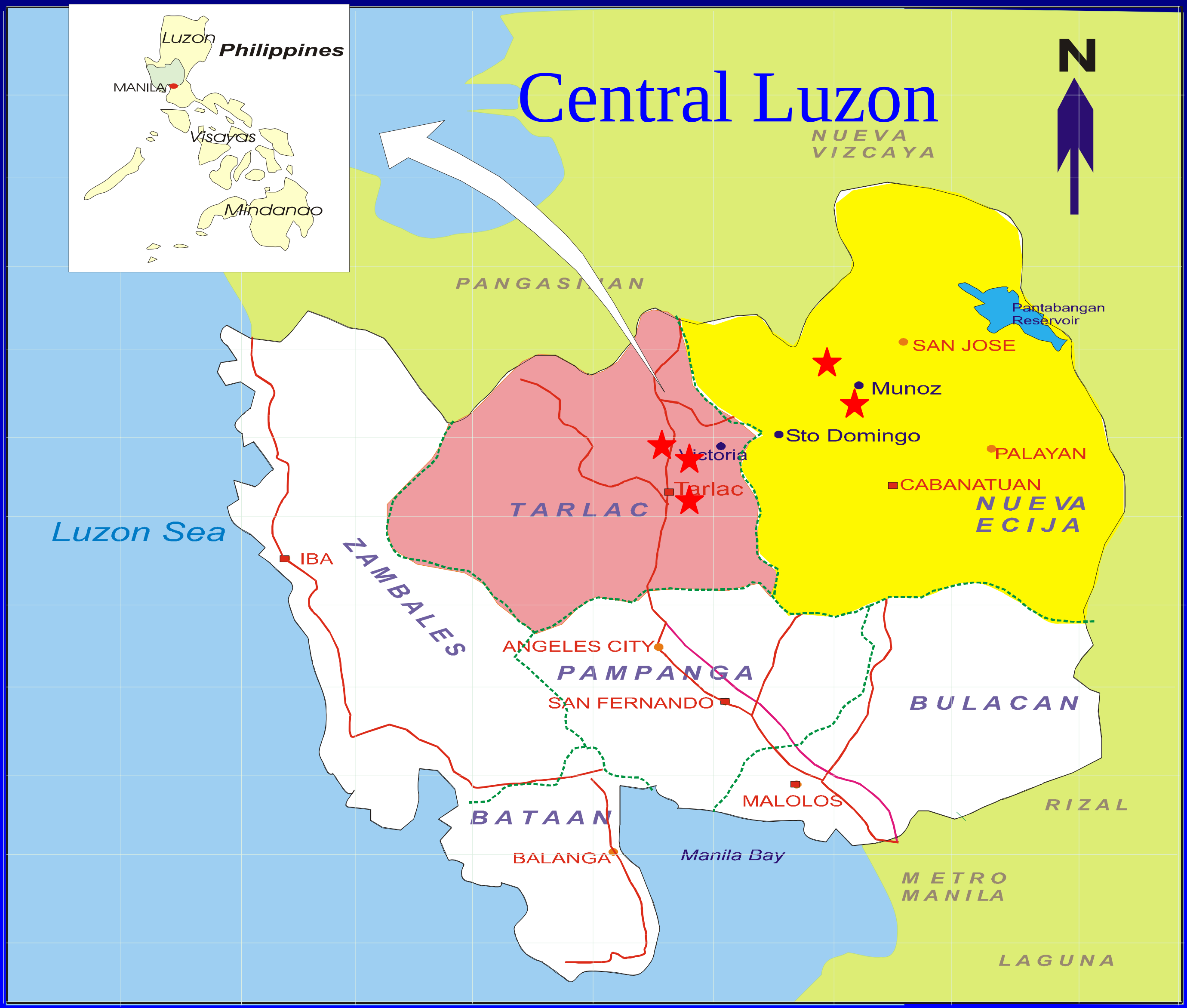
B.A.M. Bouman[1], R.M. Lampayan[1], J.L. de Dios[3], A.T. Lactaoen[2], A.J. Espiritu[3], T. M. Norte[2], E.J.P. Quilang[3], D.F. Tabbal[1], L.P. Llorca[1], J. Soriano[2], A.A. Corpuz[3], R.B. Malasa[3] and V.R. Vicmudo[2]

[1]: International Rice Research Institute, Los Baños, Philippines

[2]: National Irrigation Administration, Groundwater Irrigation System Reactivation Project, Tarlac, Philippines

[3]: Philippine Rice Research Institute (PhilRice), Muñoz, Philippines

Main TTWS pilot sites



Tarlac:
- Canarem
- Pansi
- Dapdap

Nueva Ecija:
- Dolores
- Gabaldon

Pump systems: paying for the water

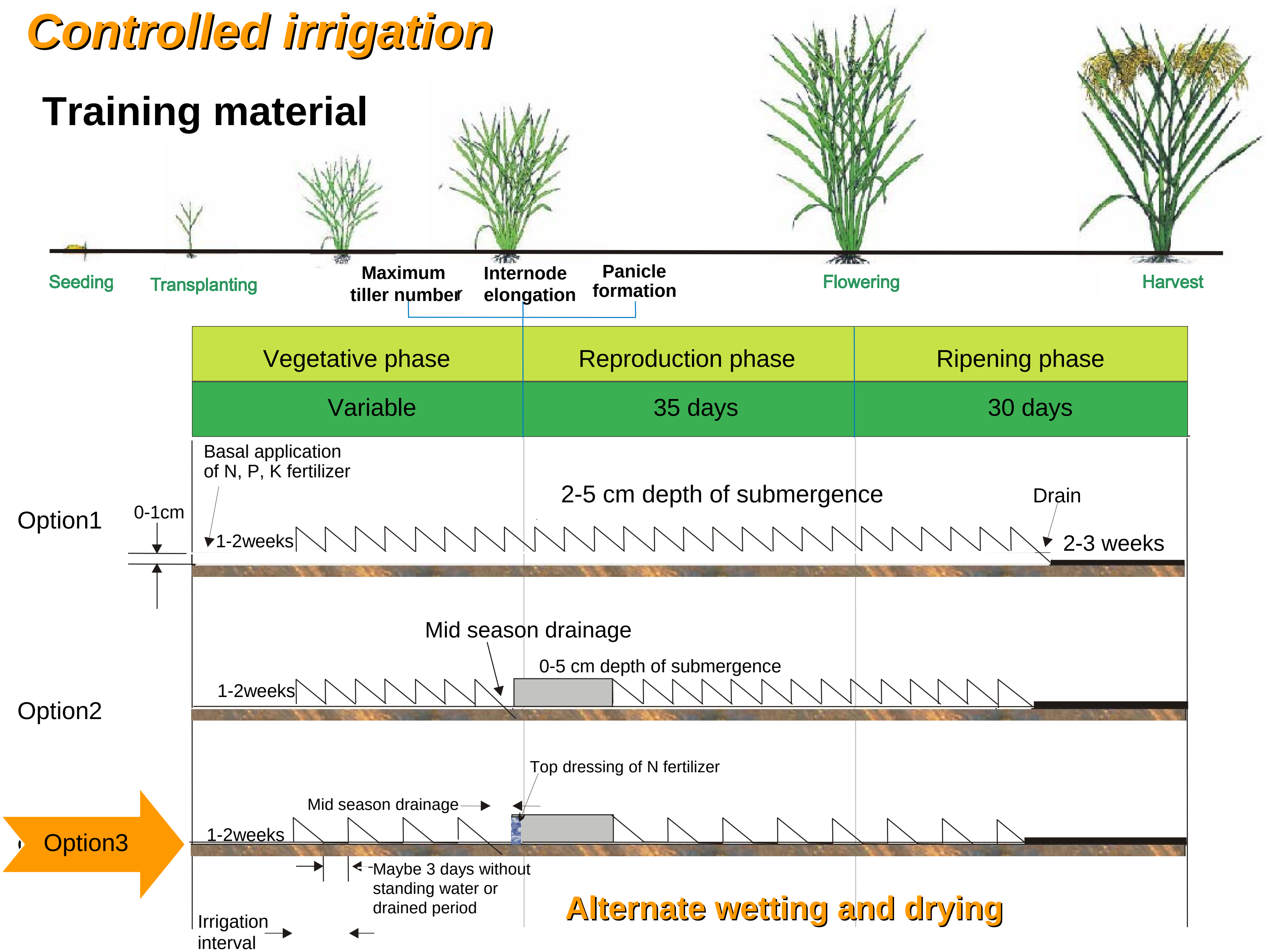
Shallow tubewells
- **Dolores**
- **Gabaldon**

Deepwell systems TGISRP
- **P38 – Canarem**

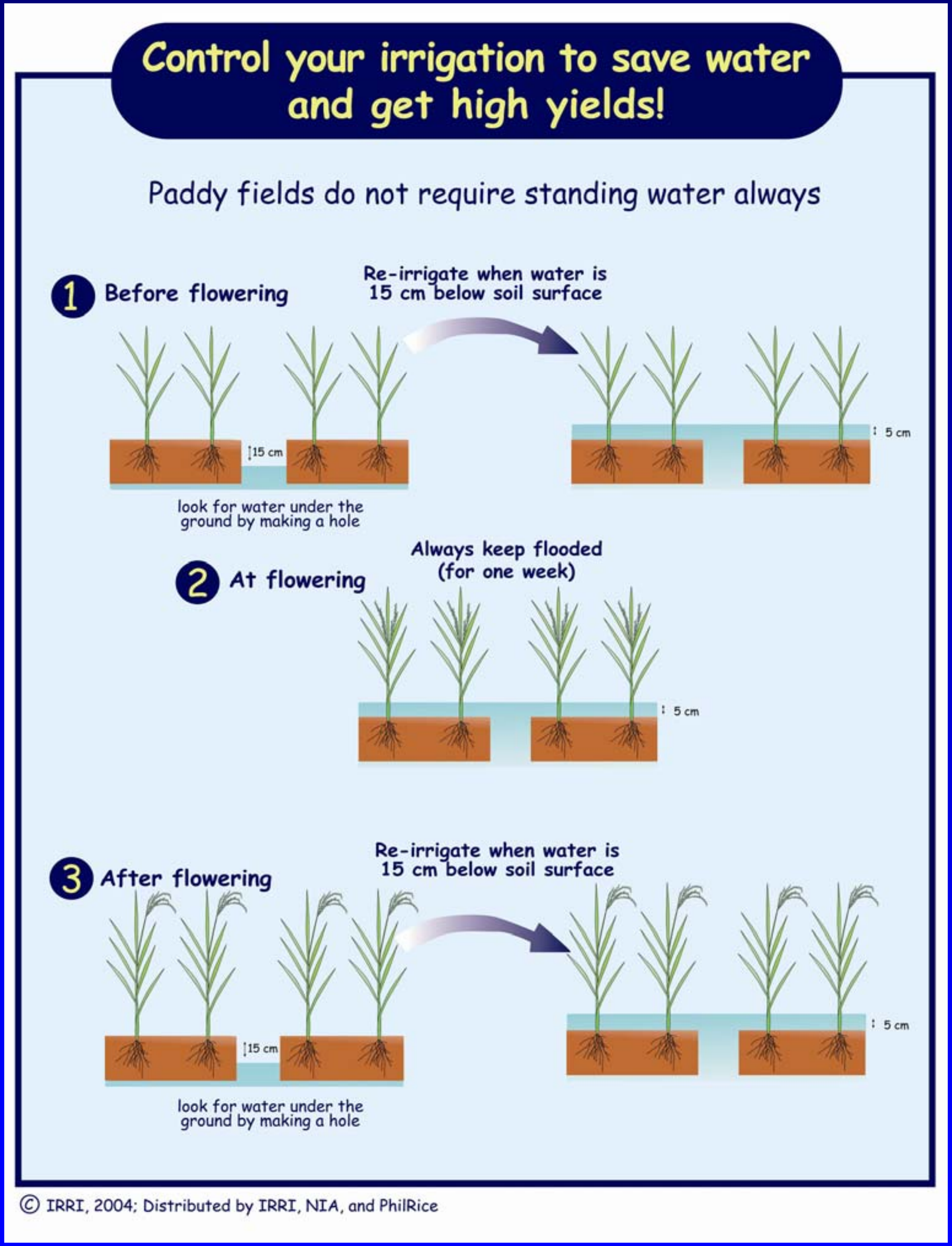
Technology extension (popular seminars)

Controlled irrigation

Training material



Alternate wetting and drying



Key message on posters and brochures

Use of same posters in Mekong delta, Vietnam (2006)

Use of extension leaflets in Mekong delta, Vietnam (2006)

FARMER-COOPERATORS

Demonstration and evaluation

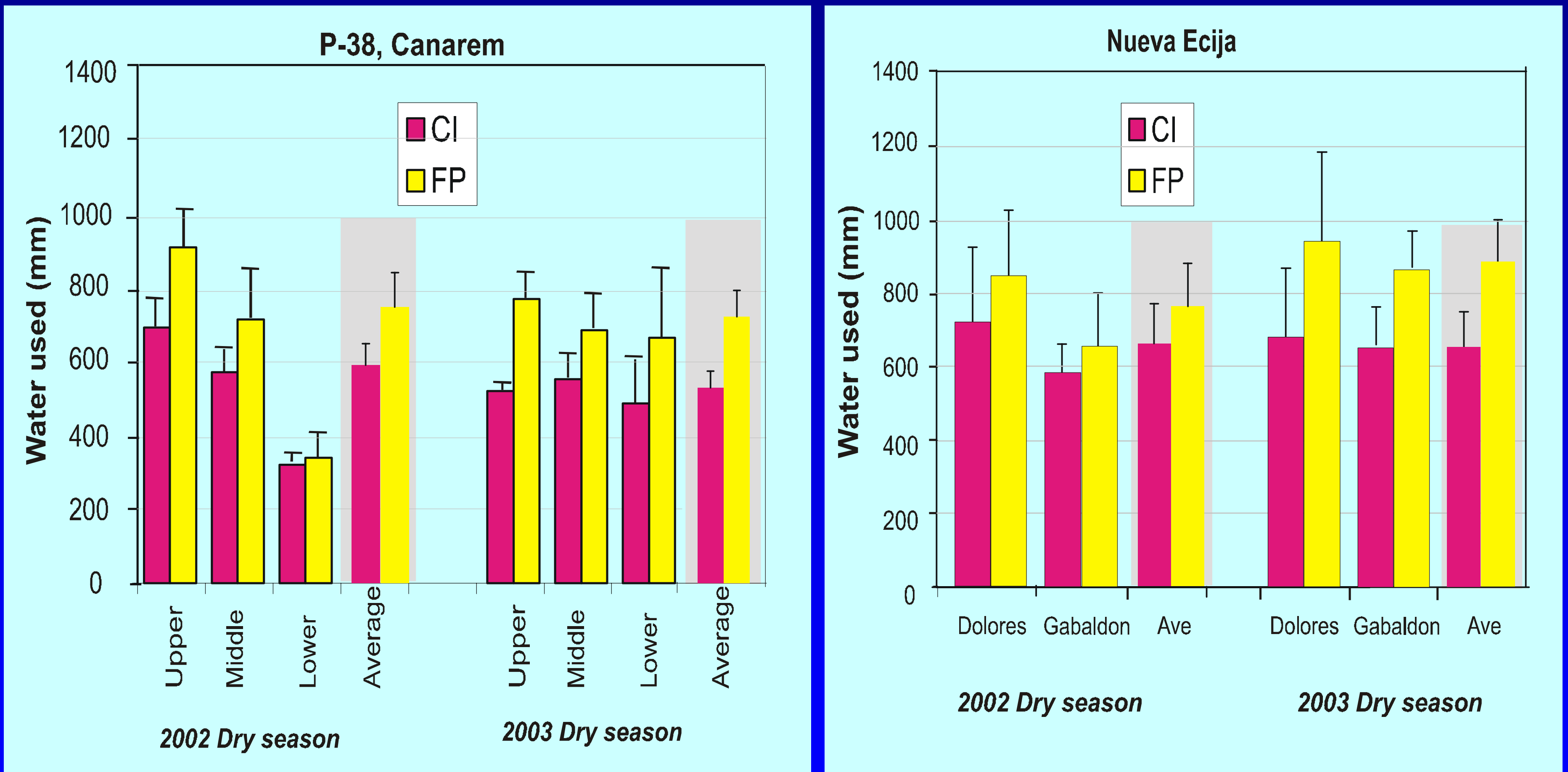
Monitoring inputs: irrigation water, seeds, fertilizer, pesticides, labor use, etc.
And outputs: grain yield and quality

Controlled irrigation vs. Farmers' practices

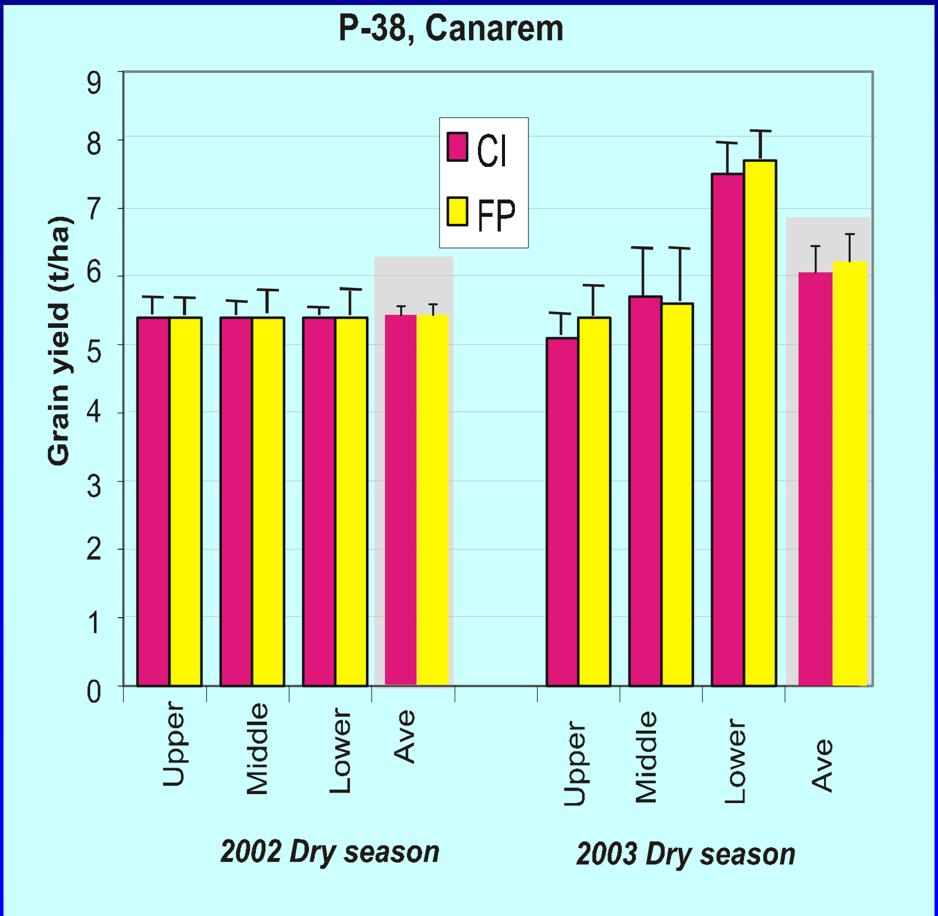
The "Lighthouse": Centre for technology diffusion

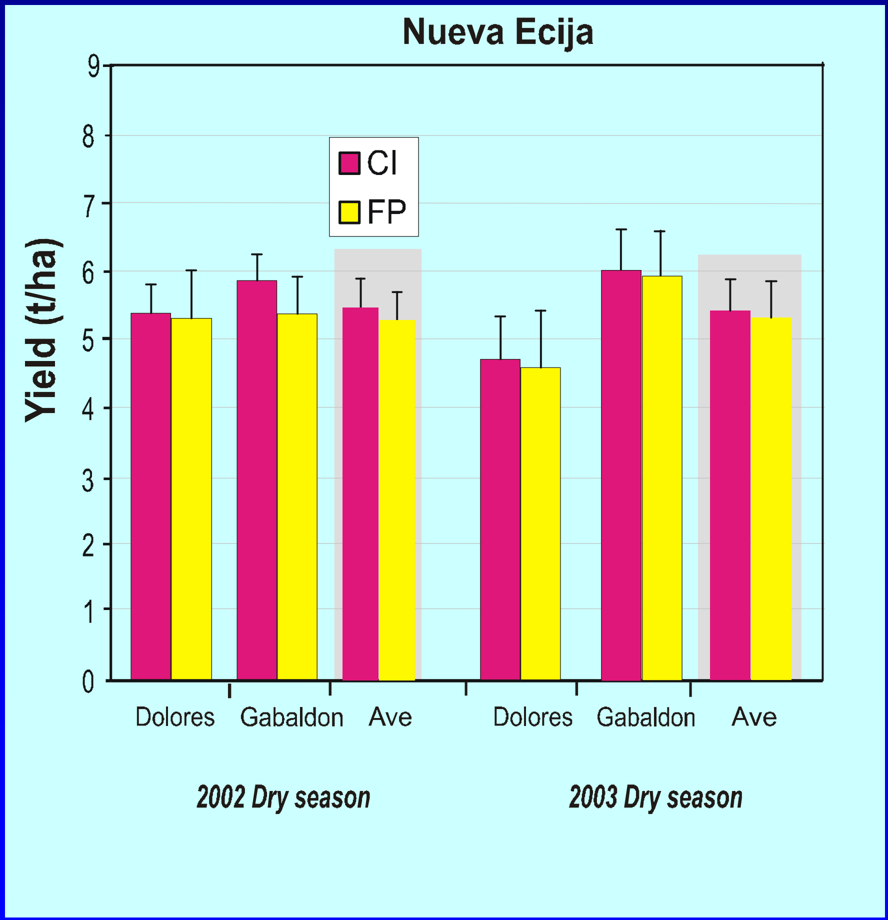
Farmer school days
100-200 participants (2/year)

Irrigation water used (mm)

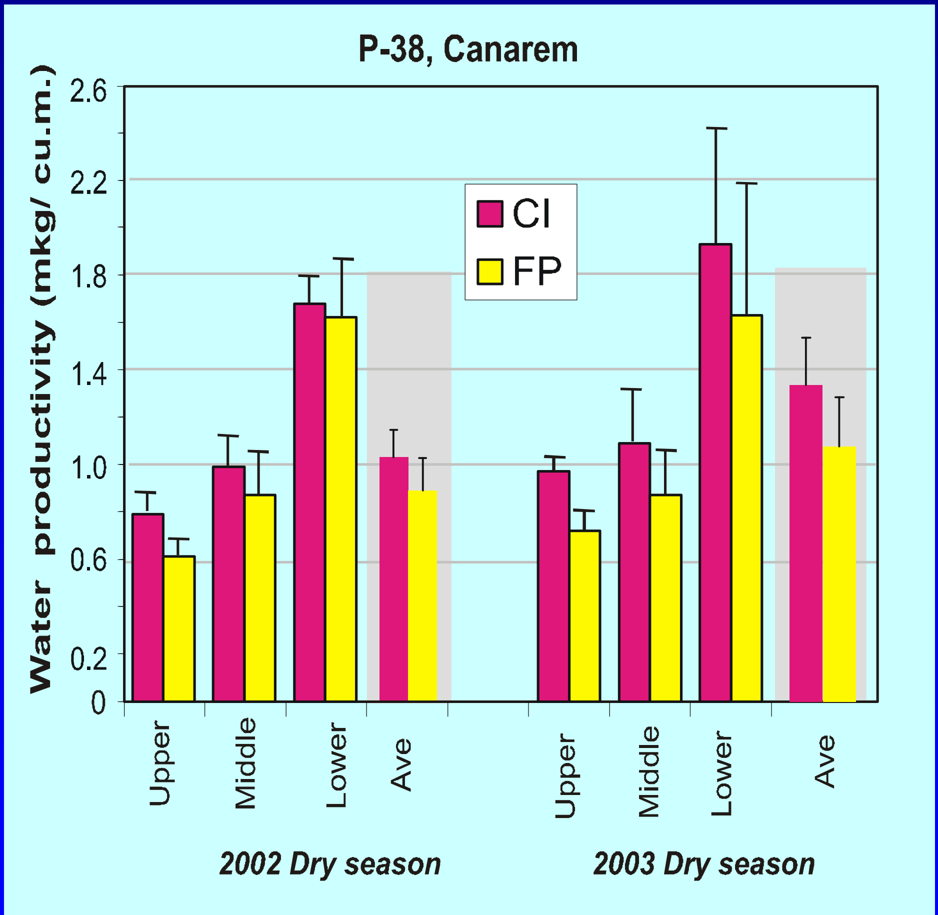


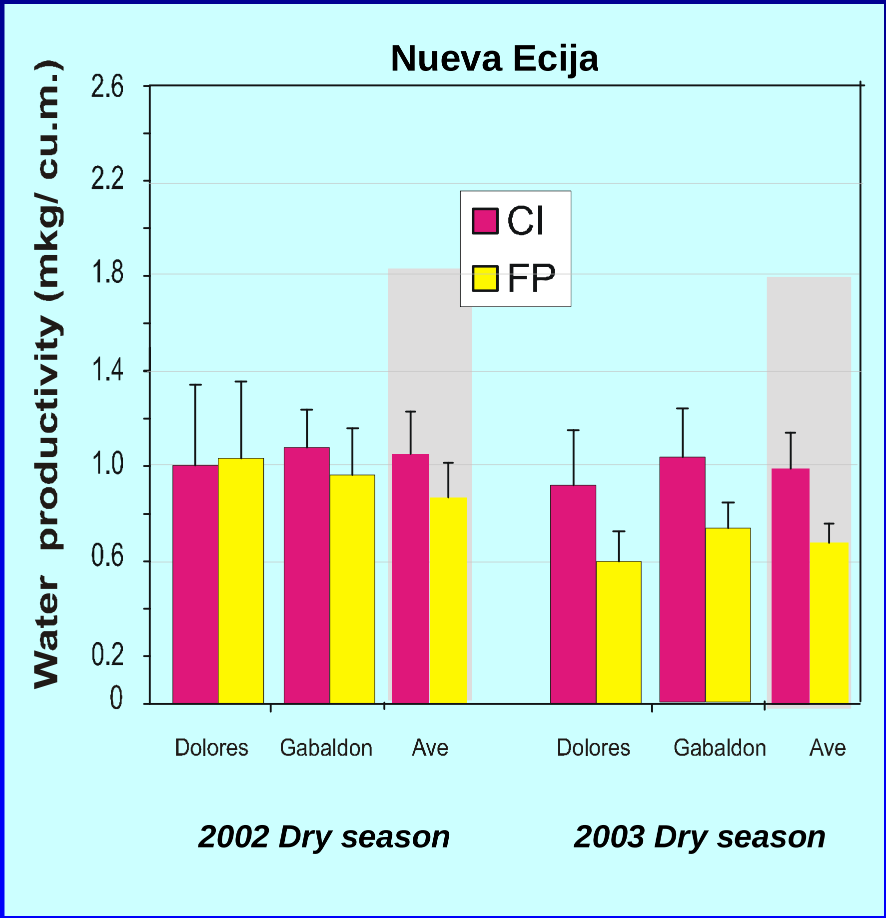
Grain yield (t/ha)





Water productivity (kg/m^3)





Average cost and returns

Dry season 2002:

ITEM	Canarem (Deepwell)		Gabaldon (Shallow tubewell)		Dolores (Shallow tubewell)	
	Farmers practice	AWD	Farmers practice	AWD	Farmers practice	AWD
Gross return ($/ha)	1026	1026	1301	1421	1181	1147
Total production cost ($/ha)	485	364	987	937	659	658
Net profit ($/ha)	541	662	314	484	522	489
Difference	121		170		(33)	

Conclusions for AWD

- ✓ An average water savings of about 20% was attained in both deepwell and shallow tubewell systems.
- ✓ No significant yield difference has been observed between AWD and FP plots.
- ✓ Farmers achieved an average increased net profit of about $65 per ha in deepwell and shallow tubewell systems.
- ✓ Community benefits: more water available for irrigation and less social tension when water is scarce!.