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20-22 OCTOBER 2015



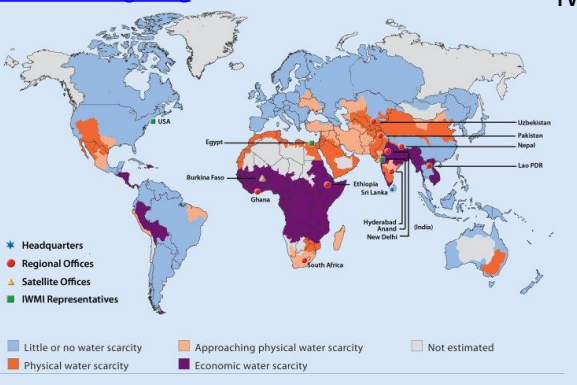
## Improving water productivity: issues and challenges for sustainable development

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## International Water Management Institute


[www.iwmi.cgiar.org](http://www.iwmi.cgiar.org)




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IWMI is also leading the CGIAR research program on Water, Land and Ecosystems(WLE), a collaboration of many partners



RESEARCH PROGRAM ON  
Water, Land and  
Ecosystems



## Improving water productivity and issues for sustainable development

### Outline

- What is water productivity (WP)?
- Definitions of WP
- Use and mis-use of WP
- How to improve WP
- Examples
- Issues and challenges for sustainable development

## Water productivity (WP) in pictures

Output per unit of water use  
(1 kg or 1 \$ per m<sup>3</sup>)



More output with same water use



Same output with less water use



Output per unit of water use  
(2 kg or 2 \$ per m<sup>3</sup>)

High value output with same water use



## WP – definitions

Physical WP

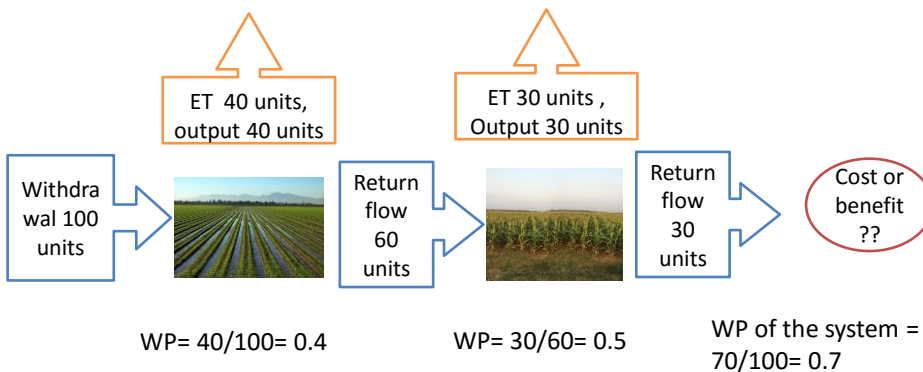
$$PWP = \frac{\text{Output (weight)}}{\text{Water use (volume)}} \text{ expressed in kg/m}^3$$

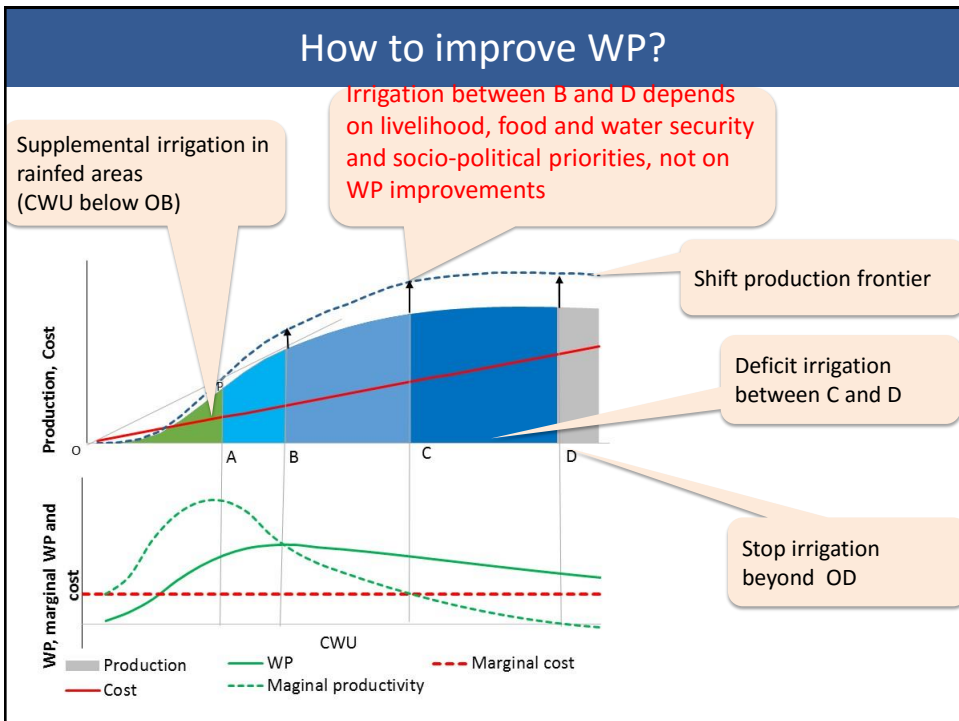
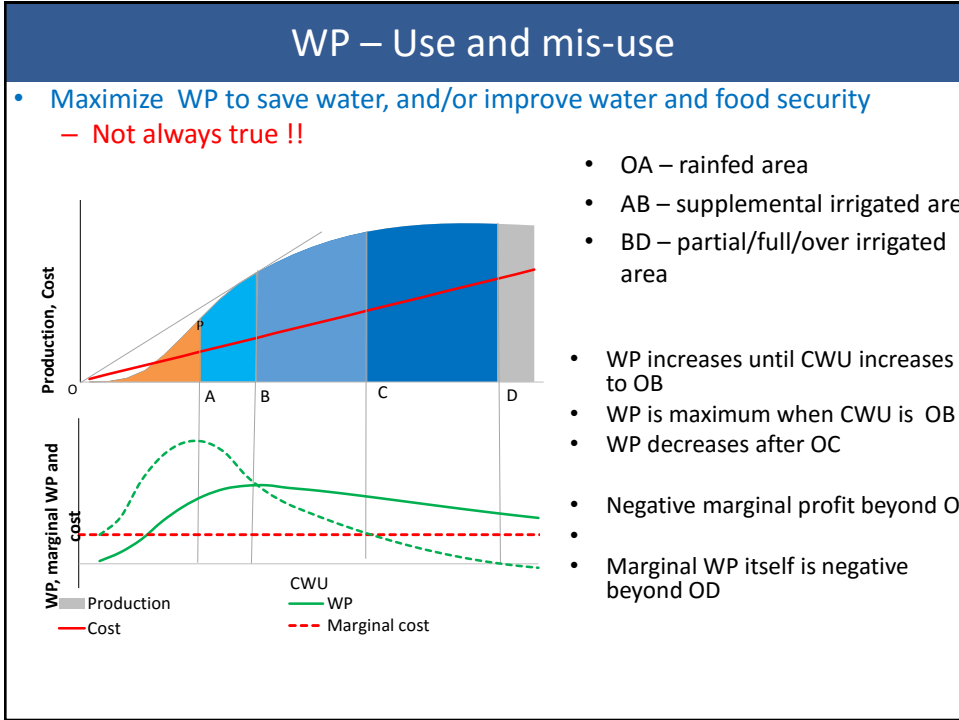
Economic WP

$$EWP = \frac{\text{Output (value)}}{\text{Water use (volume)}} \text{ expressed in } \$/\text{m}^3$$

## WP – Use and mis-use

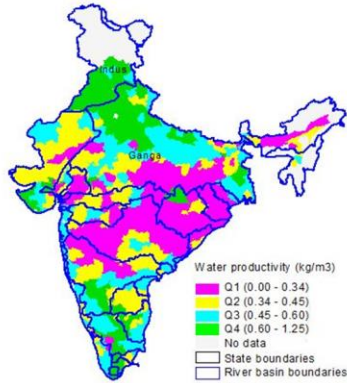
- Use irrigation withdrawals or evapotranspiration for water use in the denominator
  - Using withdrawals may ignore reuse of return flows and mislead overall WP



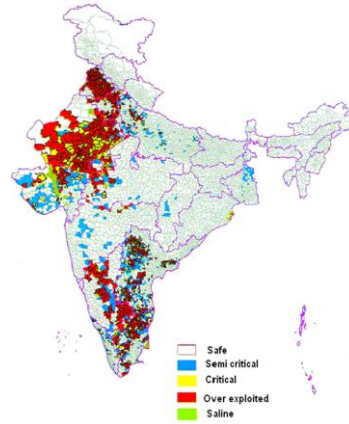


## Examples

### WP of food grains in India



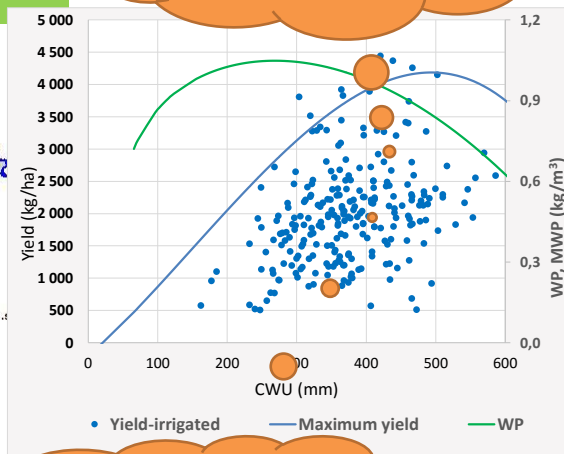
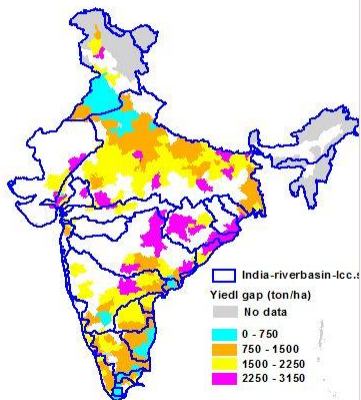
### Groundwater over abstraction



- High WP in irrigated regions,
- Low WP in rainfed areas
- Un-sustainable groundwater use is high WP areas

## Examples

### Yield gap of foodgrains in major irrigated areas



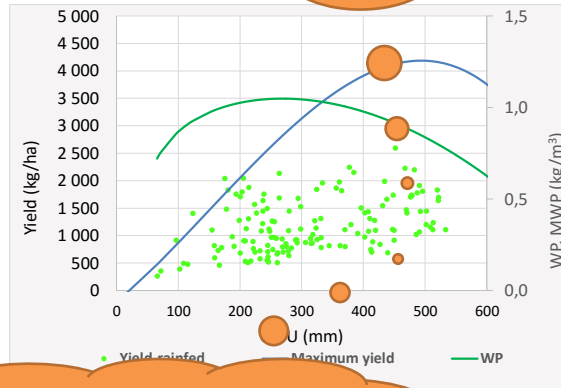
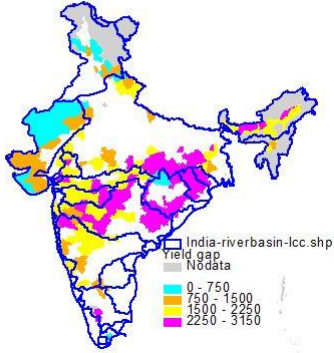
- Better water management to reduce CWU
- Crop diversification

- Better management of water to facilitate other high value inputs

## Examples

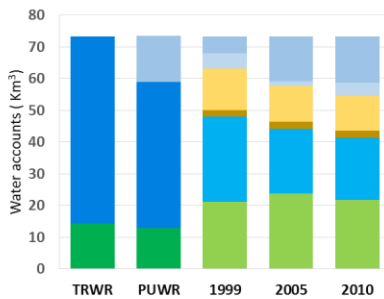
Yield gap of foodgrains in major rainfed areas

- Meet the critical water needs to reduce risk
- Diversify crops

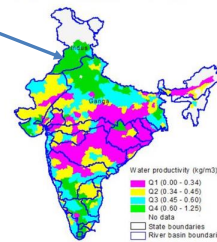


- Reduce gap with better input management
- Supplemental irrigation

## Un-sustainable water use in the Indus basin

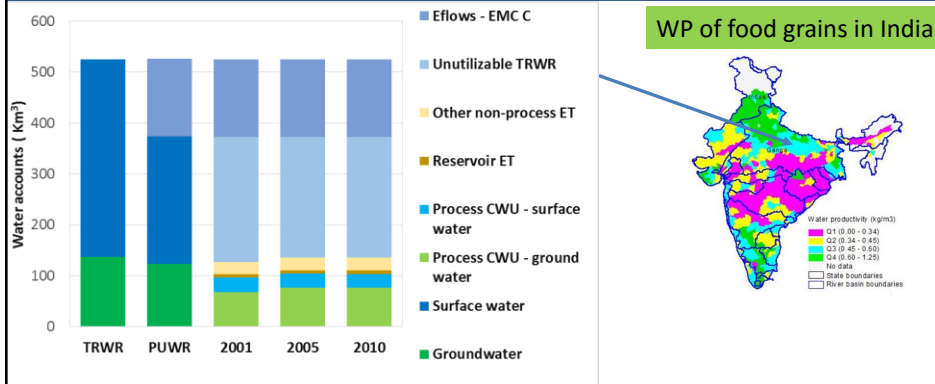


WP of food grains in India



- Most of the water is depleted now
- Substantial over-abstraction of groundwater
- Diversify crops to increase economic WP

## Water accounting in the Ganga basin



- Substantial uncommitted water supply
- Substantial pockets of low WP
- But low surface water storage potential
- Increase GW irrigation but within sustainable limits

## Conclusions

- Many mis-understanding of water productivity and improvements
- Improving WP is possible, but maximizing WP is not always a potential option
- Improving physical WP in water scarce basins could hurt some users
- In water scarce areas increase economic WP
- Maintain physical WP within the sustainable limits of water use
- Many interventions for improving WP are outside the water sector

Thank You