



Baseline Conference

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**ECONOMIC INCENTIVES IN WATER MANAGEMENT:
EFFICIENCY, COST RECOVERY AND EQUITY**

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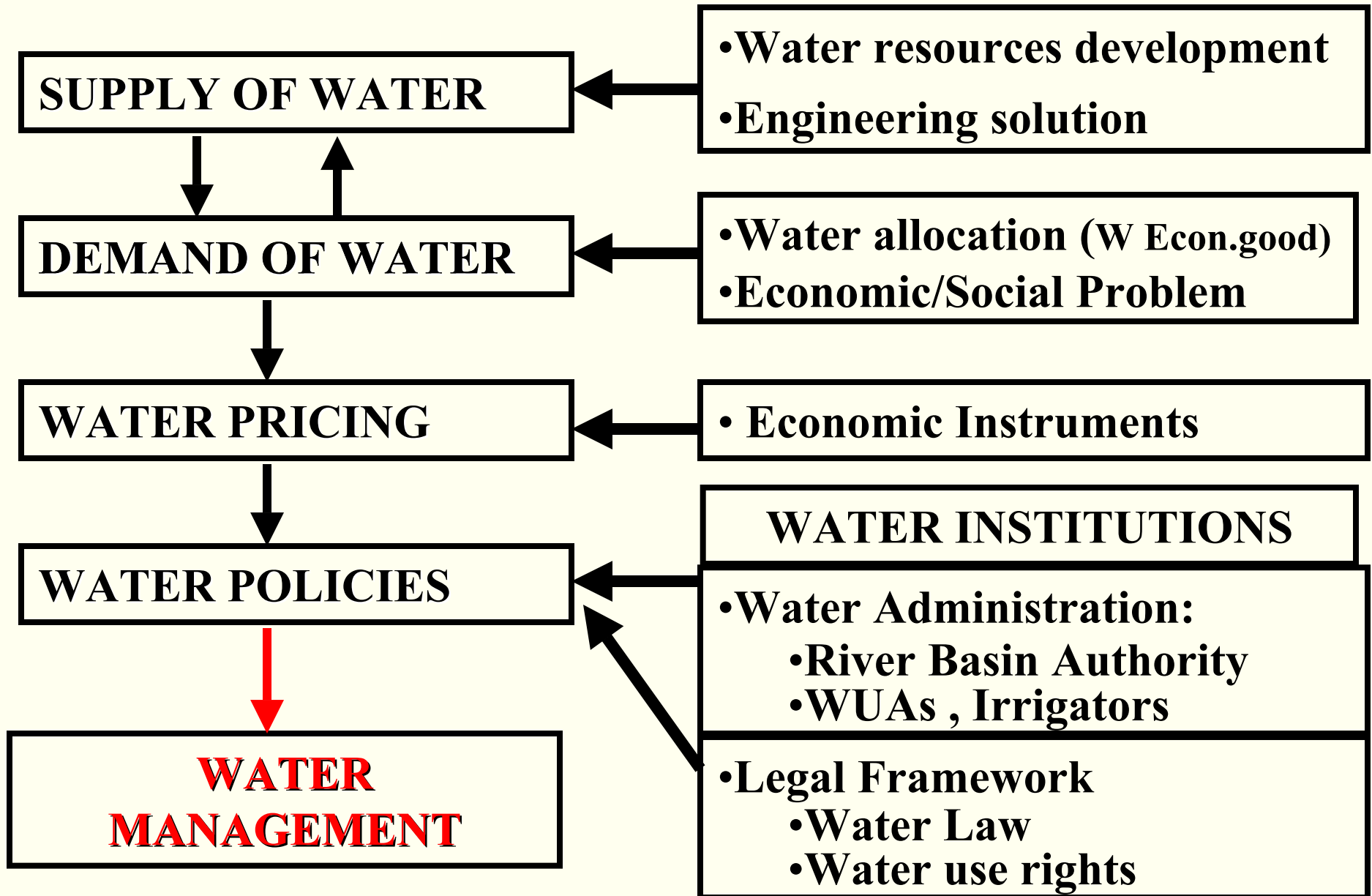
OUTLINE

1. Introduction: the new paradigm in water management
2. The role of institutions
3. Water pricing and allocation efficiency
4. Cost recovery
5. Water policies in an integrated perspective
6. Concluding remarks
7. Comments on the Research agenda for water management

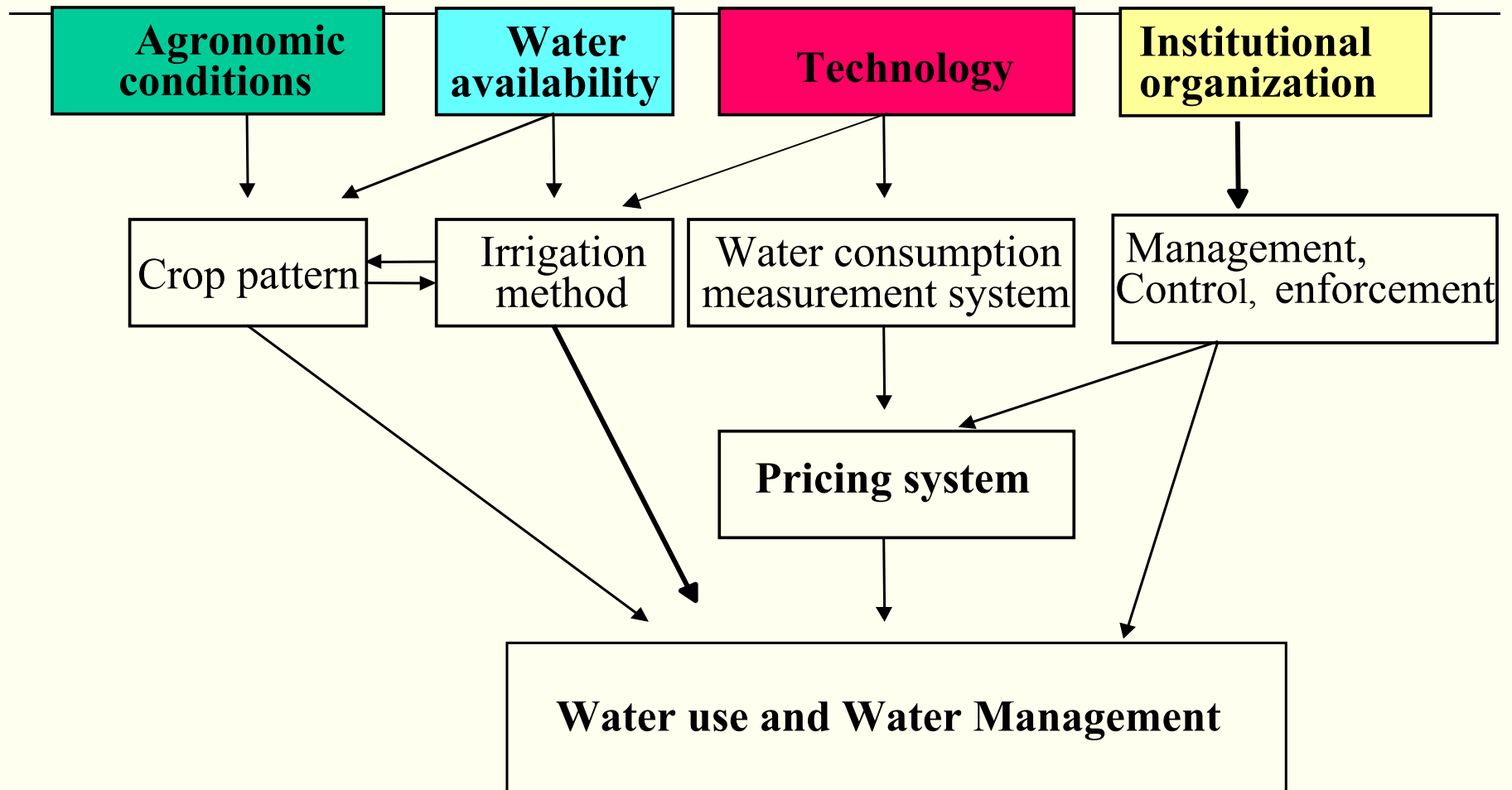
1. New Paradigm in water management

- **In the new context of increasing water-scarcity :**
- **Objective** → Efficient and sustainable water management
- Further investments in new water supplies are questioned:
 - increasing costs
 - decreasing farm income returns
 - environmental damage
- Slowdown of irrigation development at subsidized costs
 - selective investments
 - rehabilitation of existing systems
- Decentralization of irrigation management (IMT), direct participation of the stakeholders, WUAs

1. New Paradigm in water management



Integrated approach of water management



Agriculture . Agricultural policy

Technological Development

Environment: Agri-Environ. Policy

Society . Legal & Institutional sett.

2. The role of Water institutions

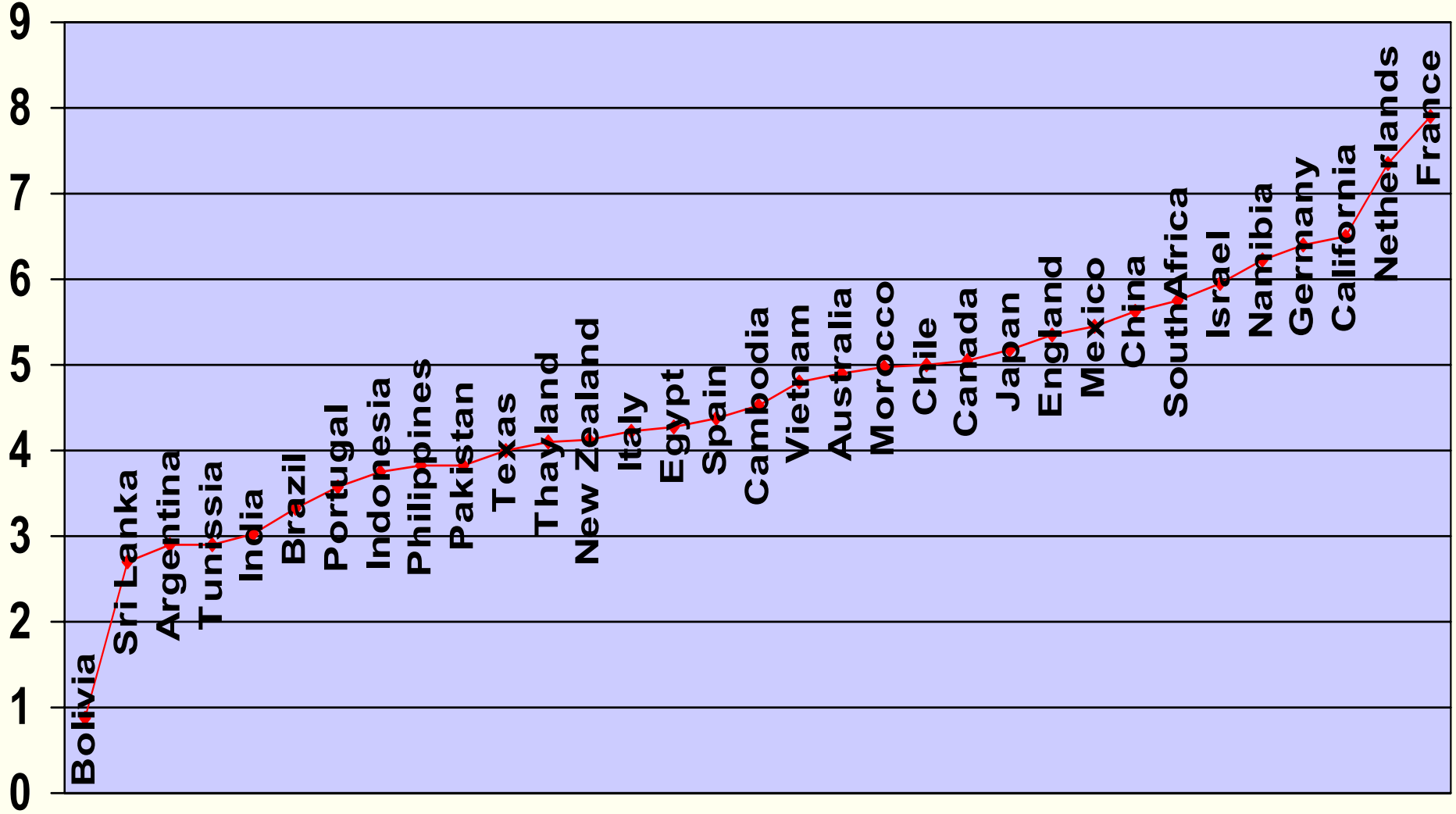
- Institutions will have to evolve to reflect the new rules of water allocation and use
- New governance structure
- → Integrated water management in public River basin organizations + private water rights system
- Political economy context fostering liberalizing trends in other sectors of the economy will be crucial to support the process of institutional change to adjust to the new realities in water management

Water Institutions' evolution

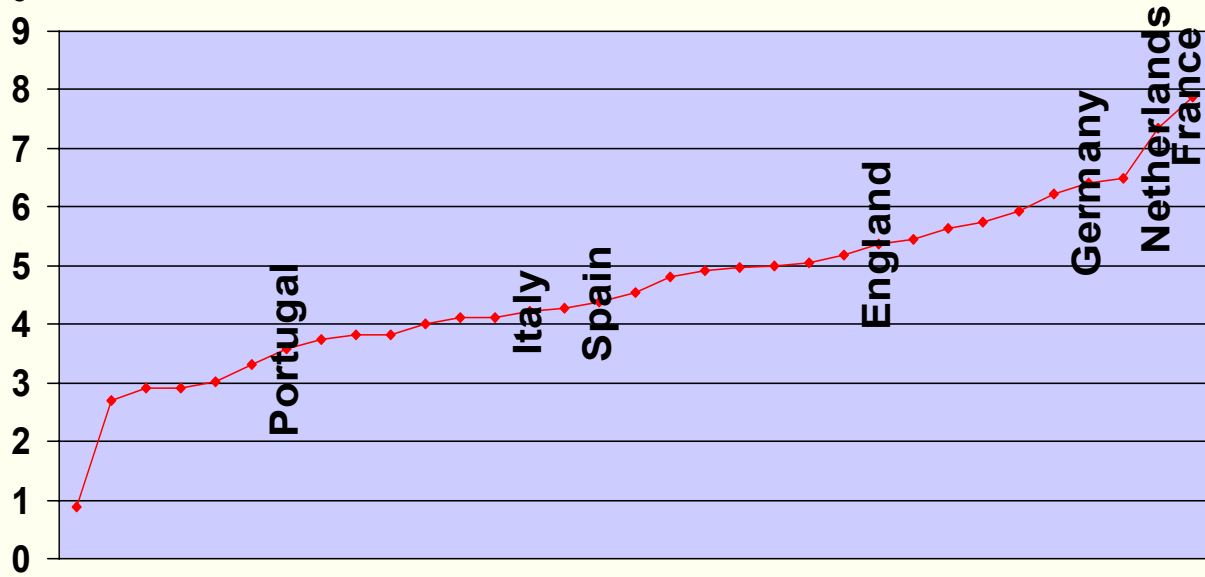
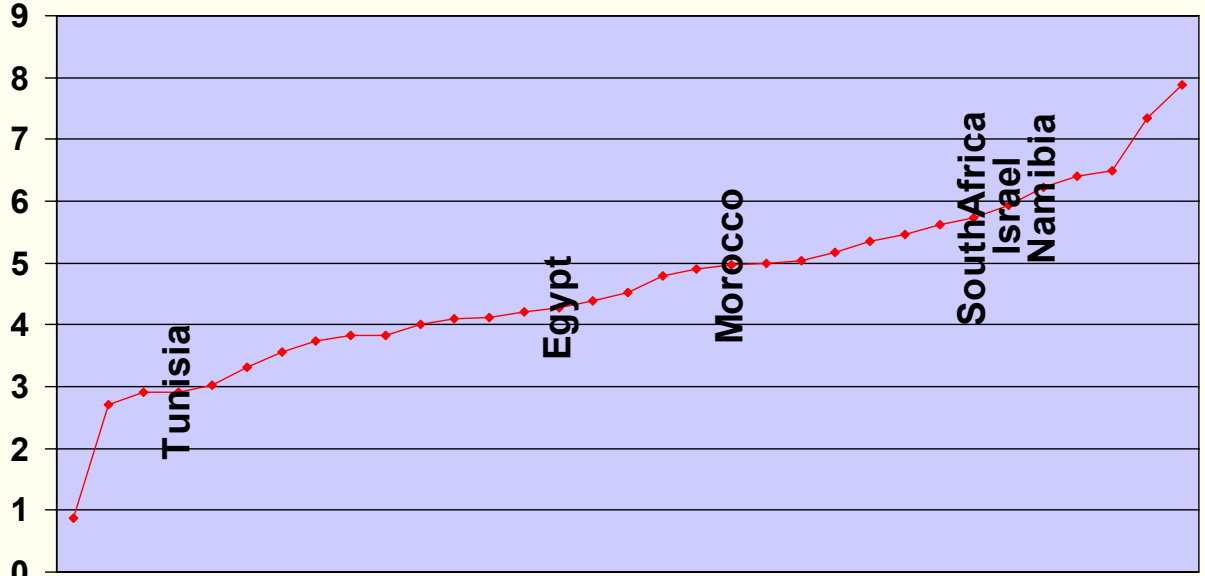
- A Water Institutions Health Index (WIHI) was constructed (Dinar & Saleth 2003) for 43 countries/regions using 16 institutional variables (legal, policy, organization, performance)
- Water institutions are evolving following diverse trends worldwide that are note related to water scarcity levels, economic development or geographical location
- Institutional development is path dependent and determined by site-specific parameters
- Analyzing how water institutions evolve is a key element for of designing water management policies and assessing their implementation costs

Water Institutions Health Index

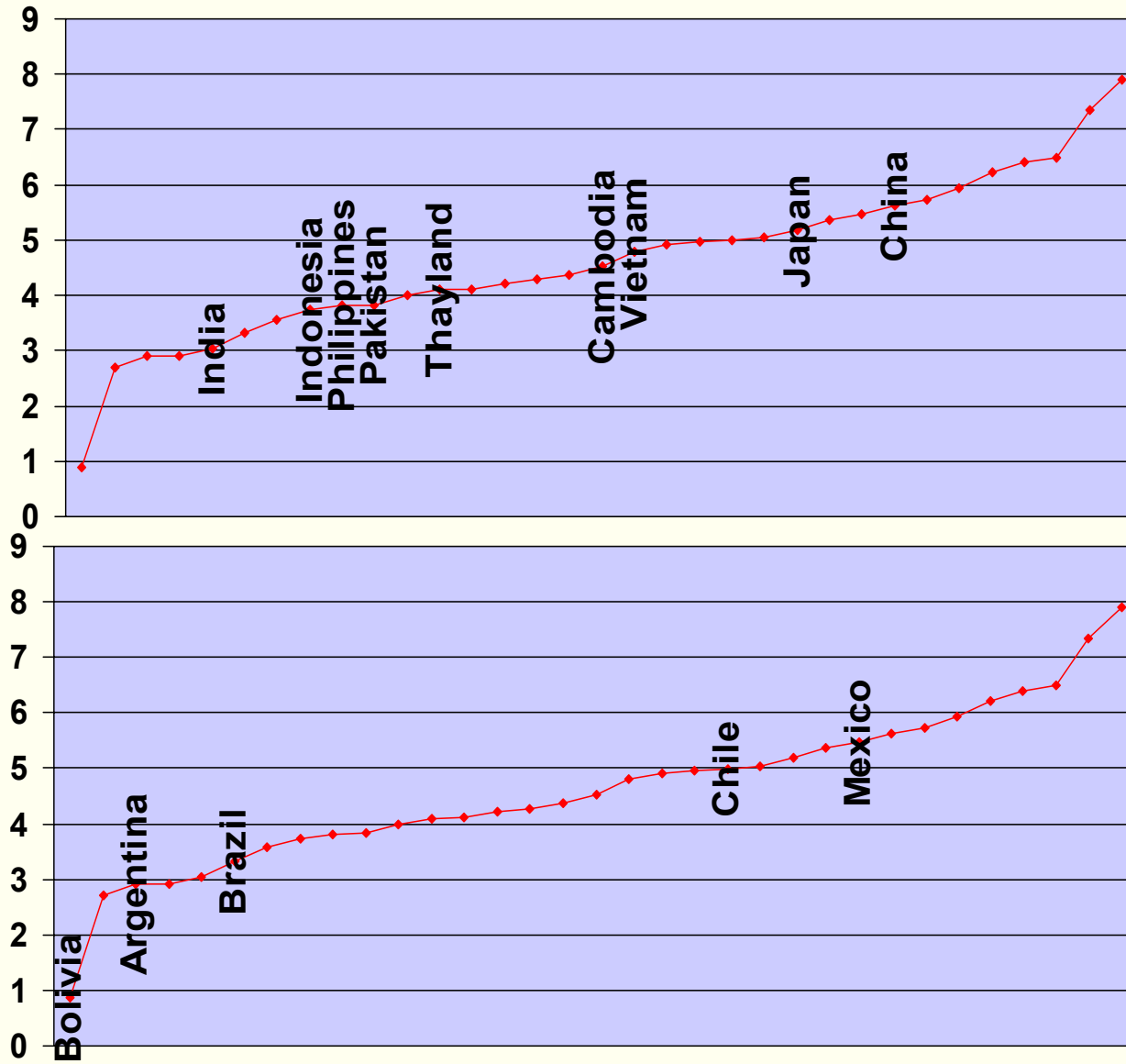
Dinar & Saleth (2003)



WIHI : Africa & ME - UE



WIHI : Asia – Latin America



3. Water pricing

Government intervention

- The economic nature of water is complex
- Water is often recognized as a common pool resource, several users benefiting from its consumption (public ownership)
- Many water activities have a public good dimension and require some form of government regulation to secure individual rights of access to water resources
 - 1. Market imperfections and monopolies (control of a water source)
 - 2. Protection of users rights
 - 3. Equity issues
 - 4. Resource conservation issues (environmental regulations)
 - 5. Economic and social issues (development policies, spatial development, population,.....)
 - 6. High cost in water resource development and technical complexity
- The state grants permissions to the users to use the resource by means of water user rights (non- tradable, tradable)

Water pricing and allocation

- Pricing of water can take place
 - non-competitive, centralized system: administered pricing (most countries)
 - competitive, de-centralized system: water markets
- Allocation criteria:
 - Efficiency in allocating irrigation water is accomplished when marginal benefits of a unit of water equate marginal costs of supplying that unit
 - Equity of water allocation is related to the fairness of allocation across economically diverse groups in society and may not be compatible with with efficiency objectives

Types of water tariffs

- There are different ways to price water depending on technical (meters) and institutional (organization) elements
 - 1. Area Pricing (more than 60%) (study of 12Mha)
 - 2. Volumetric pricing (aprox. 25 %)
 - 3. Tiered pricing (Block-rate)
 - 4. Two-part tariff (Fixed + volumetric) (less than 15 %)
 - 5. Output pricing (rare)
 - 6. Input pricing (rare)
- The efficiency of the different pricing methods is relative and depends on several technical and institutional factors

Types of water tariffs

In theory:

- **OPTIMAL WATER TARIFF** (volumetric)
Water Price = MG cost of supplying the last unit of water
- **WATER PRICING METHODS** depend also on:

Implementation costs

- institutions (central or basin authority, irrigation districts..)
- Administration and monitoring
- Establishment and control of metering devices
- fee collection
- enforcement, conflict resolution

Therefore:

- $C \text{ of water supply} = \text{Delivery cost} + \text{Implementation cost}$
- When Implementation costs are more than 10% of Total costs of water supply, then volumetric pricing is not optimal and area pricing (with low implementation costs) will be preferable

TYPE OF TARIFF	OBJECTIVES						
	Equity ^(*)	Stability of Revenue Collection	Flexibility	Lower costs of implementation and control	Encourage water use efficiency	Simplicity	Facilitate cost recovery
Area tariff	+	+++	+	+++	+	+++	+
Volumetric tariff	++	+	++	+	++	++	++
Tired (Block- rate) tariff	+++	+	++	+	+++	+	++
Two-part tariff	++	++	++	++	++	+	+++
Tired two-part tariff	+++	++	+++	+	+++	+	+++

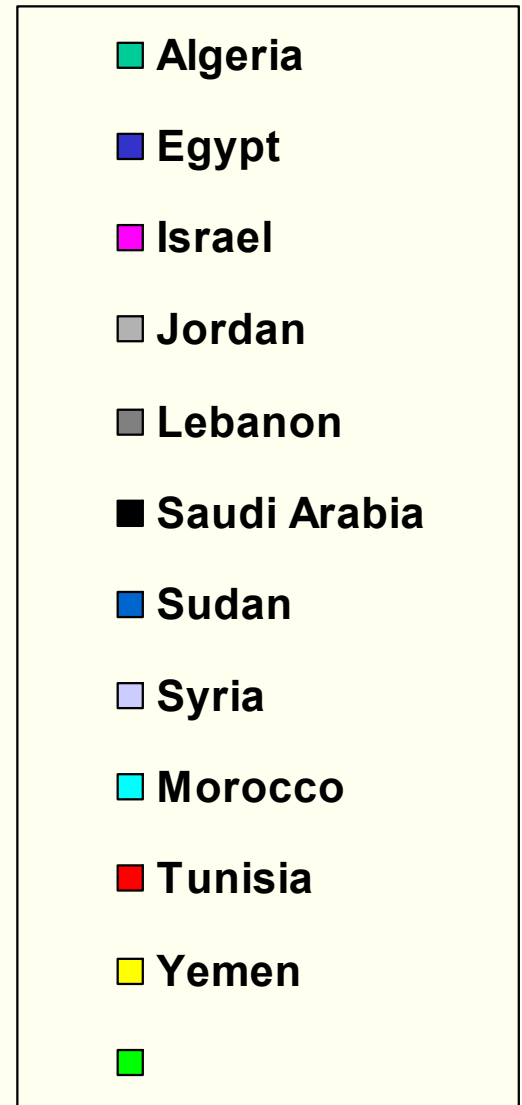
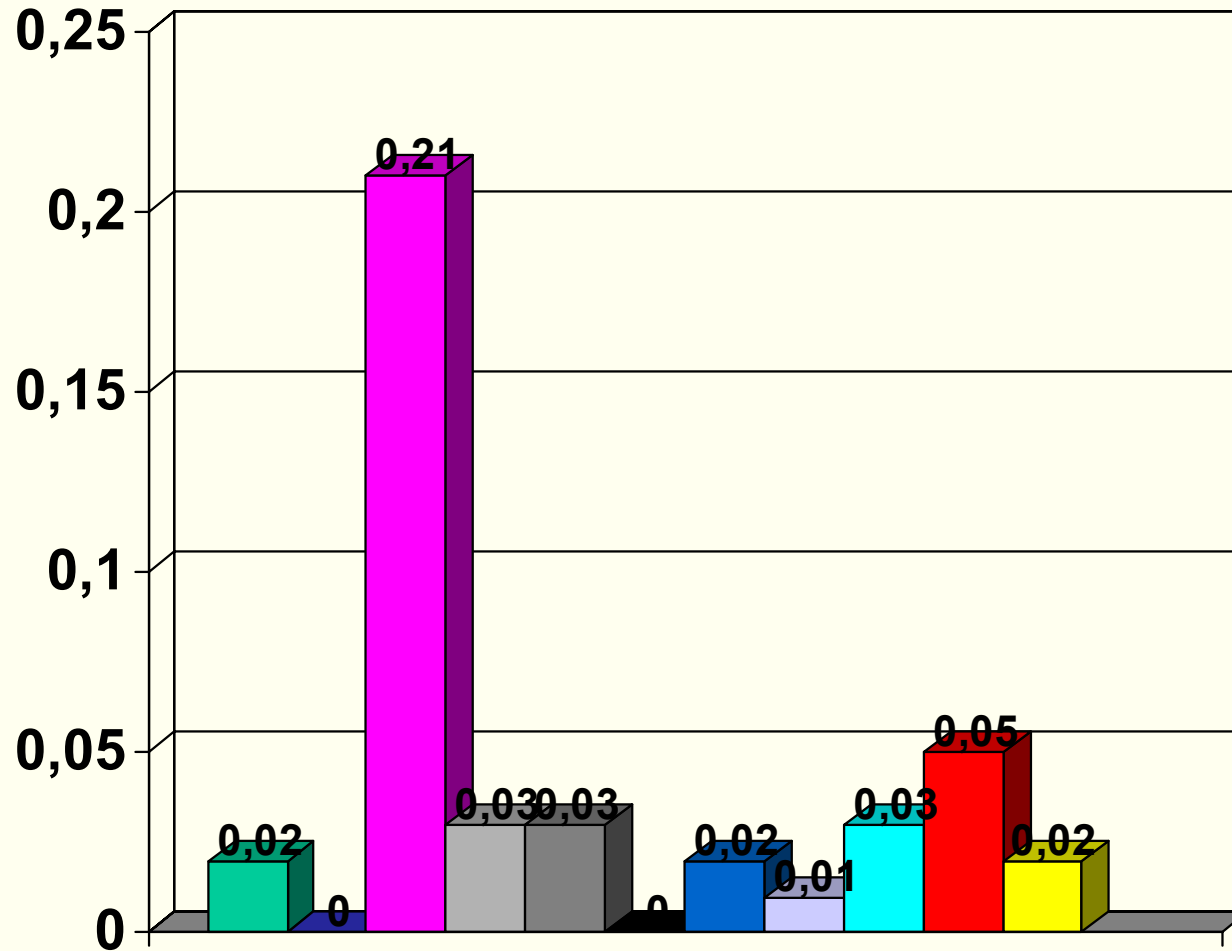
4. Cost recovery

- For the price of water to play the role of enhancing the sustainability of water resources it has to reflect different types of costs:
 - Financial costs : costs of providing and administering water services
 - Operation and maintenance costs
 - Capital costs
 - Environmental costs: costs of damage of water users to the environment and ecosystems (salinization, over-abstractions in ground water aquifers, degradation of soils..)
 - Resource cost (Opportunity cost) :The cost of foregone opportunities when the scarce resource is used (instead for its best next alternative)

Cost recovery

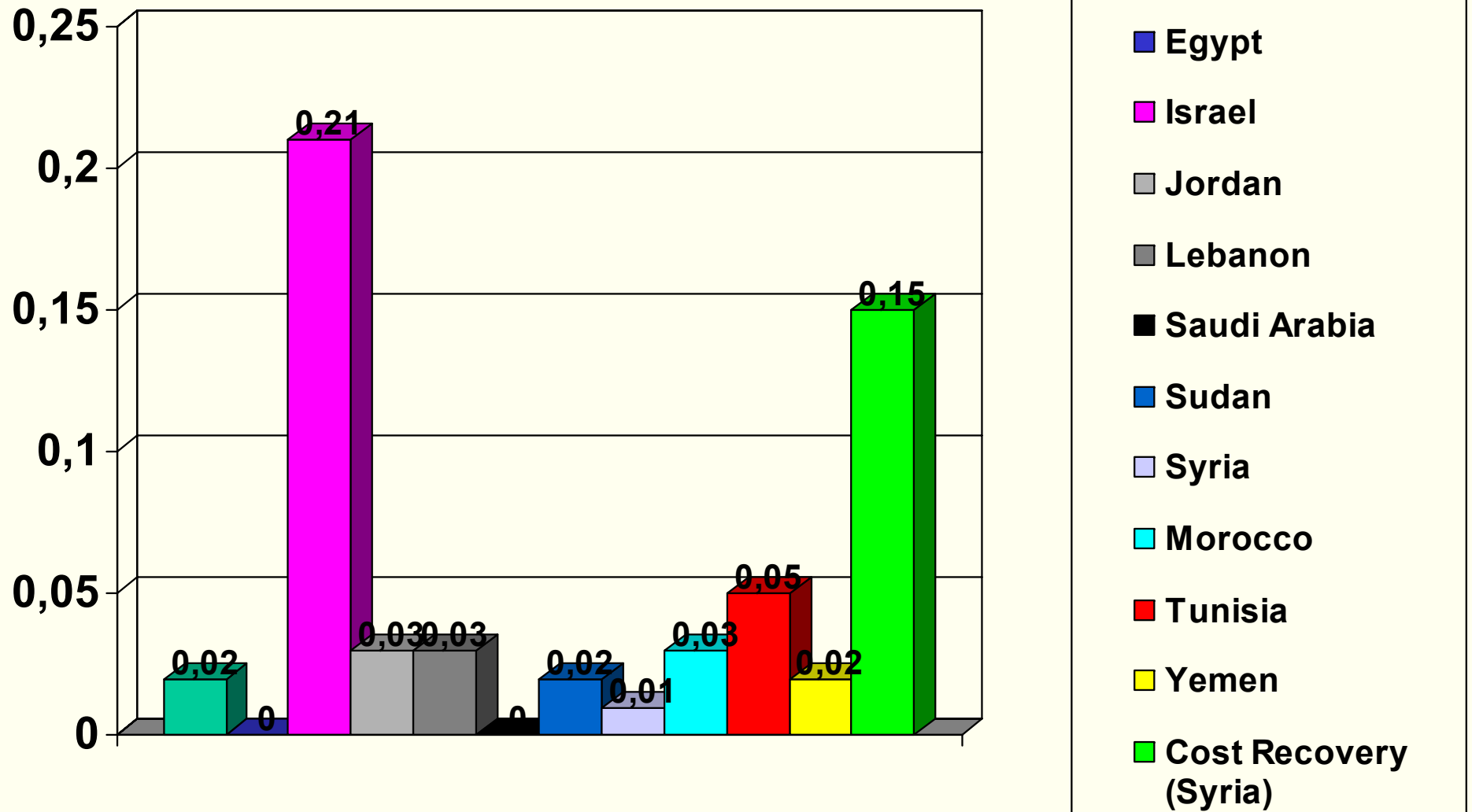
- A common feature in irrigation agriculture is that the price of water provided to the farmers is highly subsidized
- Thus: Financial revenues from irrigation water are often insufficient to recover even O&M costs of irrigation systems, especially in countries and regions that are large irrigation water consumers (scarcity problems, inefficient use of water)
- Pricing policies rarely consider environmental and resource costs (do not reflect scarcity value)
- **OBJECTIVES OF NEW WATER PRICING POLICIES:** include the full recovery of financial costs and the integration of environmental issues. The implementation of this policy is difficult (enforcement, ...)

Water charges and cost recovery estimates US \$/m³



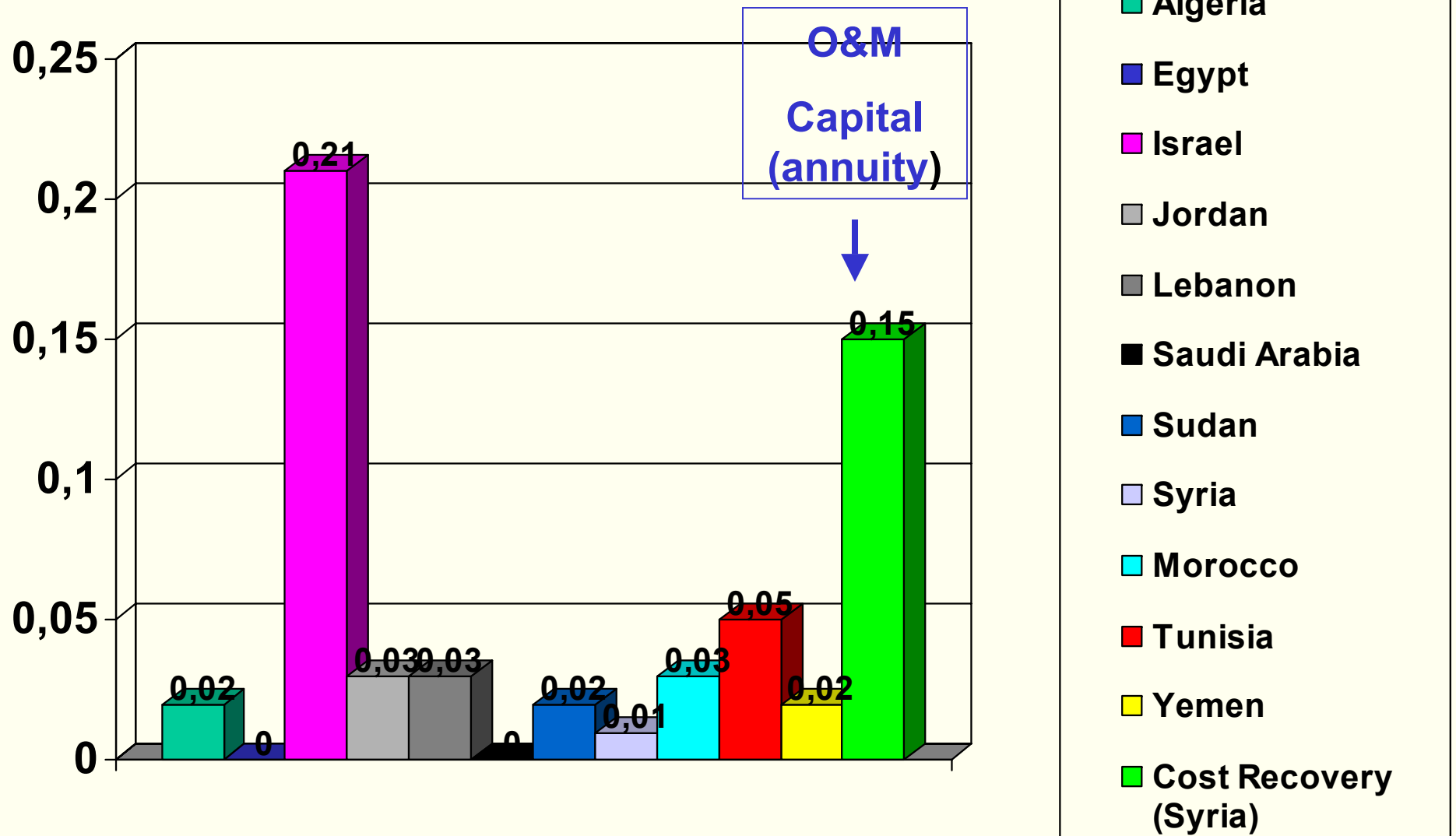
Source: Dinar (1997), ESCWA(2000), Varela(2002)

Water charges and cost recovery estimates US \$/m³



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Water charges and cost recovery estimates US \$/m³



Source: Dinar (1997), ESCWA(2000), Varela(2002)

WATER MANAGEMENT IN MEDITERRANEAN COUNTRIES

PRESSURE ON WATER RESOURCES	VERY HIGH	Malta	Libya				
	HIGH	Jordan Israel Cyprus	Tunisia			Egypt	
	MODERATE				Morocco Lebanon Spain	Turkey	
	LOW	Italy	Albania	Croatia	Greece France Slovenia		
		LOW	STABLE		LIGHT INCREASE	MODERATE INCREASE	HIGH INCREASE
EVOLUTION OF TOTAL WATER DEMAND							

 INDISPENSABLE	 CONTINUE FOR STABILIZING WATER DEMAND
 NECESSARY FOR NOT INCREASING RESOURCE PRESSURE	 SEASONAL OR LOCAL

Source: based on Plan Bleu 2000, Rieu 2002

5. Water policies

- Public authorities are increasingly concerned with the enacting and implementation of water and irrigation policies targeted to:
 - attain socio-economic objectives of agricultural and rural development
 - secure the conservation of the water resource base
 - develop incentives for a more efficient use of water among competing users (more efficient water management)
- The challenge of these water policies is to provide new instruments to respond to the new water management requirements:
 - Reduce the gap between the scarcity value of water and water charges
 - Attain cost recovery → water pricing
 - Increase water allocation efficiency → volumetric pricing (Mg cost pricing)
 - Develop market-based allocation

5. Water policies in an integrated perspective

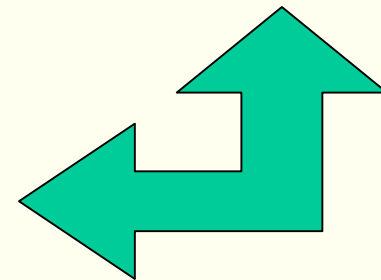
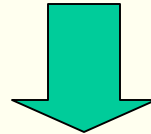
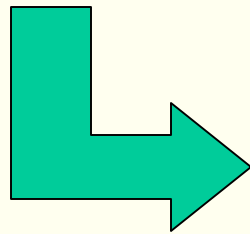
- Water policies are not isolated and must be analyzed in the context of agricultural, trade and environmental policies
- Price support policies (and input subsidies) lead to overuse of water resources and depletion of water courses, causing mounting water scarcity, aquifers' depletion, loss of wetlands and overall environmental damage
- more severe in countries relying on underground water for irrigation (Mediterranean, Middle East, ..)

The policy context for irrigation agriculture

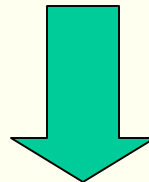
**AGRICULTURAL
POLICIES**

**WATER
POLICIES**

**ENVIRONMENTAL
POLICIES**



**IRRIGATION
POLICIES**



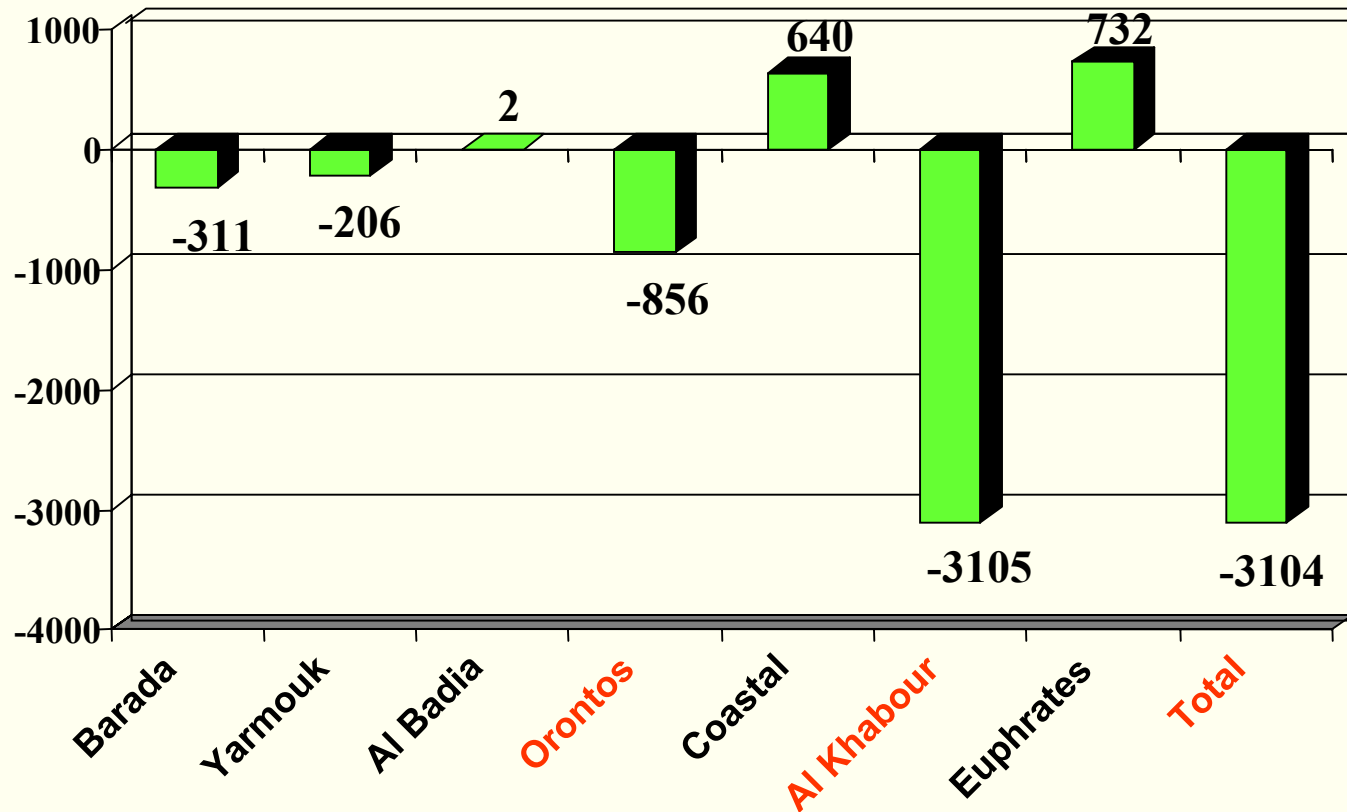
**IRRIGATION
AGRICULTURE**

Two Case studies of policy contradictions and inefficient water management

- **Syria**
 - severe water scarcity problems
 - Increased expansion of irrigation to meet food self-sufficiency
 - Strict agriculture production plan with heavily subsidized crop prices and inputs (wheat, cotton, sugar beet). Irrigation agriculture benefits of 70% of all expenses
 - average water consumption is 12,400 m³ / ha, 16,700 m³/ha in the Euphrates basin
 - A case of **exports of virtual water** producing heavy resource depletion
- **Spain**
 - EU CAP programs have resulted in an increase in irrigated surface and mounting water abstractions in some areas causing depletion of aquifers and loss of wetlands
 - A case of **policy contradiction and equity**

Water balance in Syria (2002)

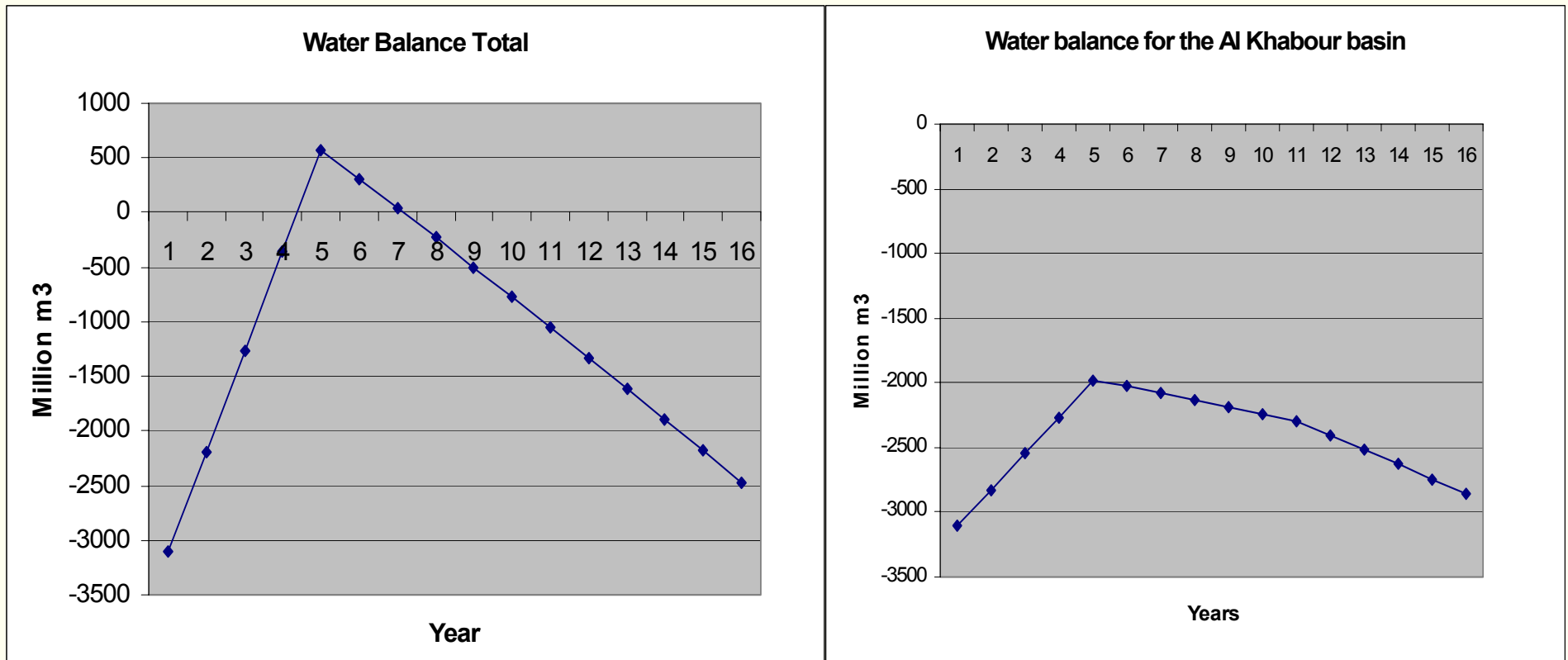
- Total water resources → 16,058 million m³/year
- Total uses → 19,162 million m³/year
- National water balance deficit → 3,104 M m³/year
- Future population growth will increase the deficit unless demand is proportionally reduced



Syria's unsustainable water policy

Combination of irrigation modernization (4 years) and irrigation expansion (15 years).

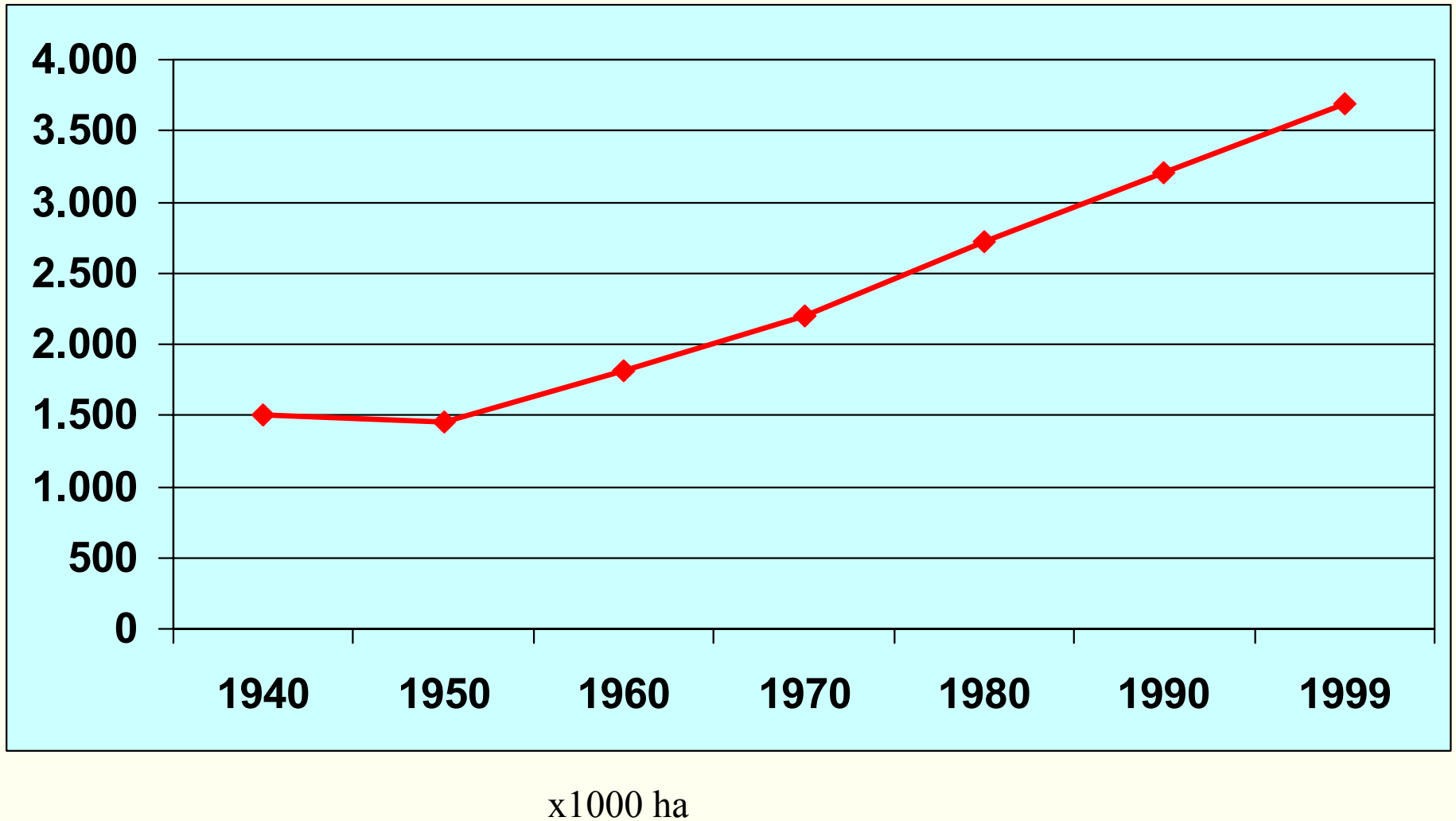
Technical solutions will not meet water conservation objectives



**Example of
Water management
policies for Wetland
Conservation in Spain**

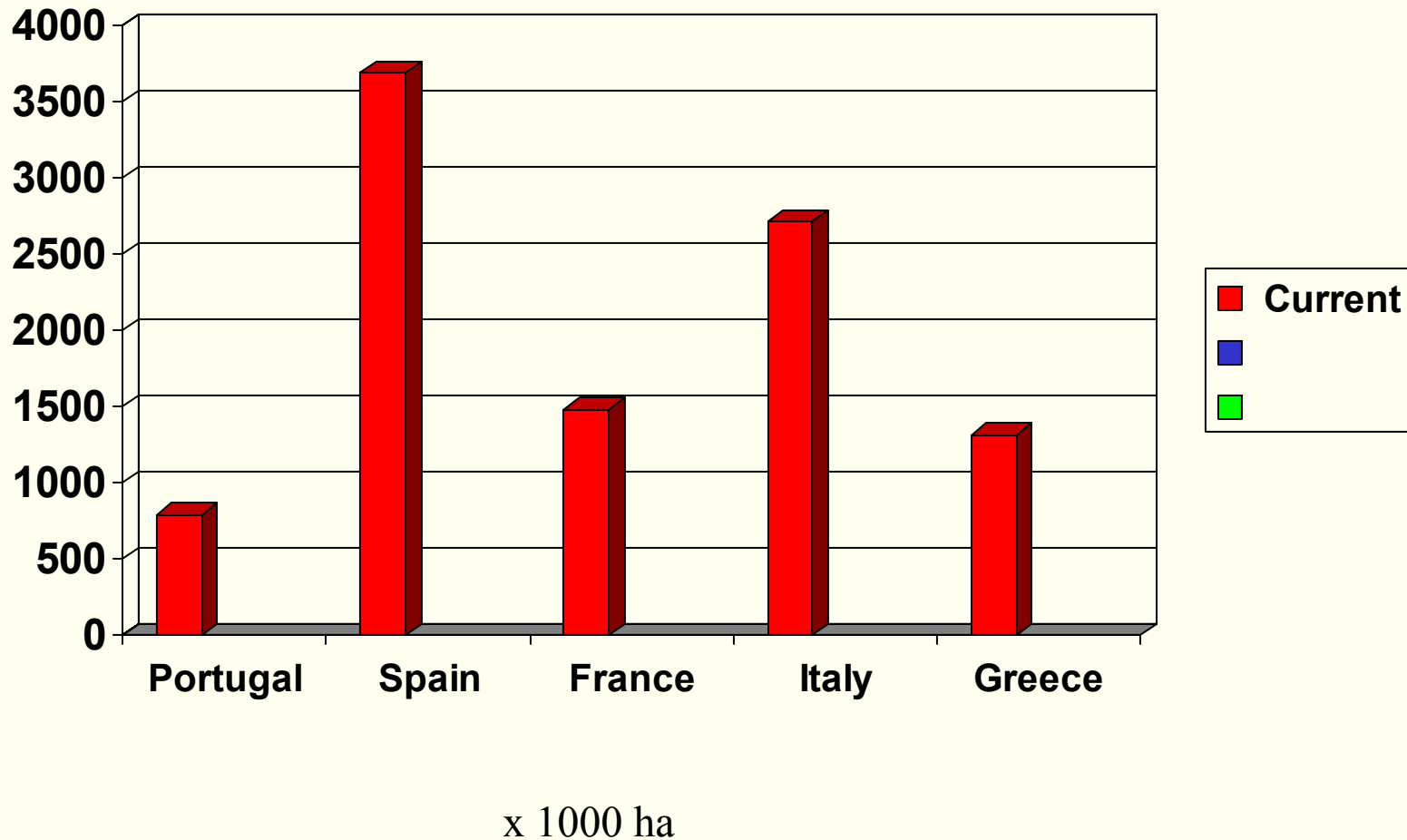


Evolution of irrigated surface in Spain





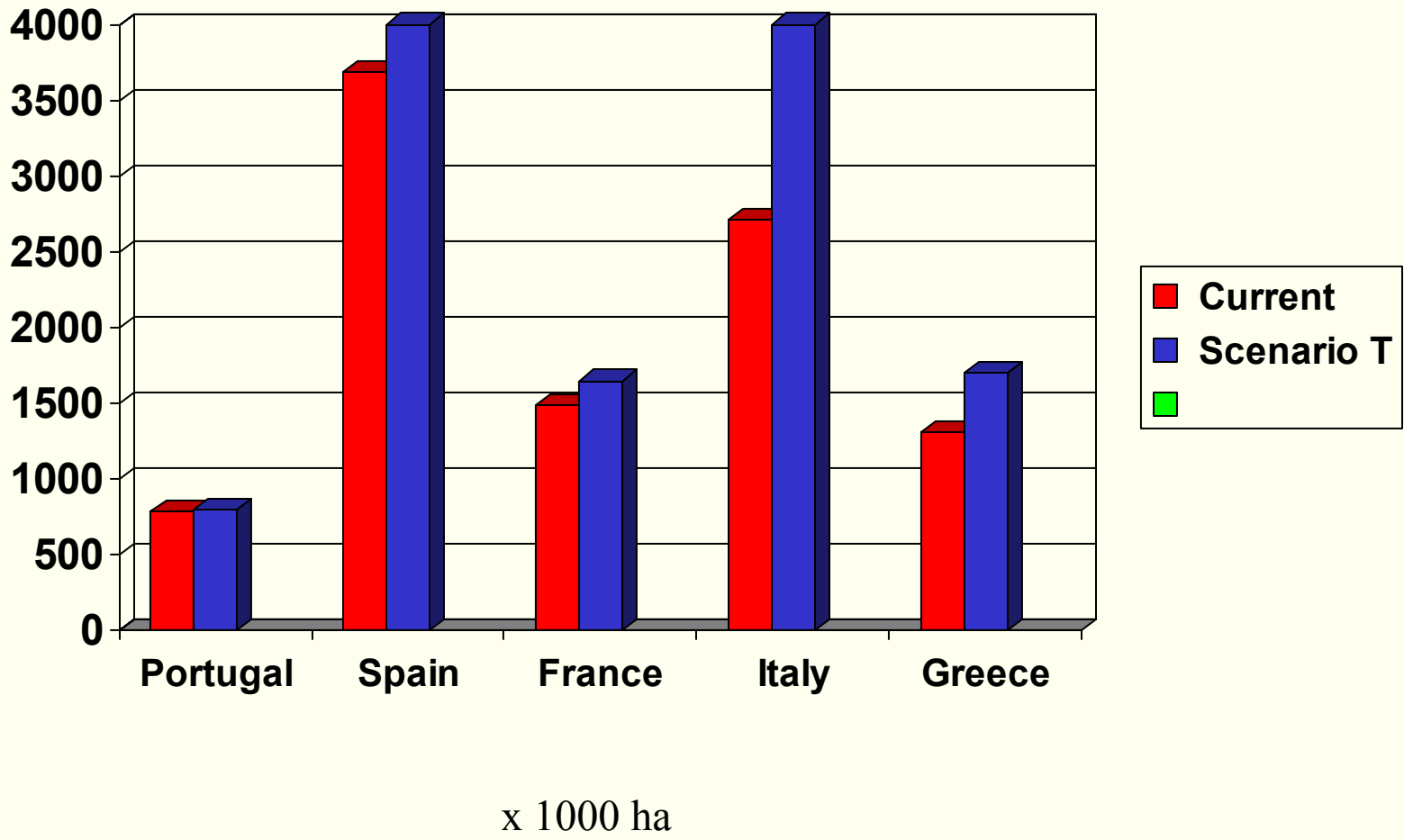
EU countries: Irrigation area and projections for 2025 by type of scenario



Blue Plan for the Mediterranean



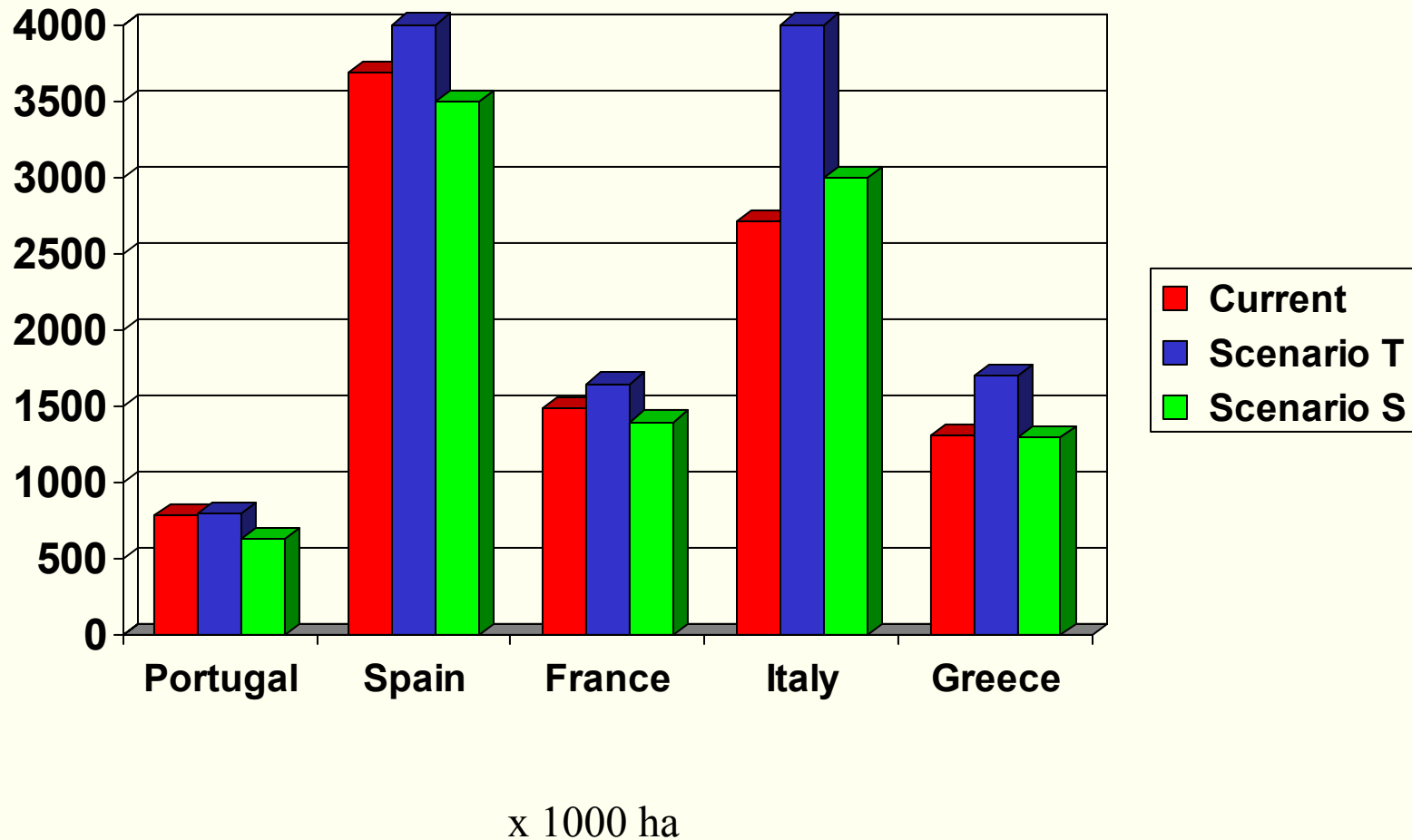
EU countries: Irrigation area and projections for 2025 by type of scenario



Blue Plan for the Mediterranean



EU countries: Irrigation area and projections for 2025 by type of scenario



Blue Plan for the Mediterranean

Wetlands in the National Park 'Tablas de Daimiel' (La Mancha, Spain)

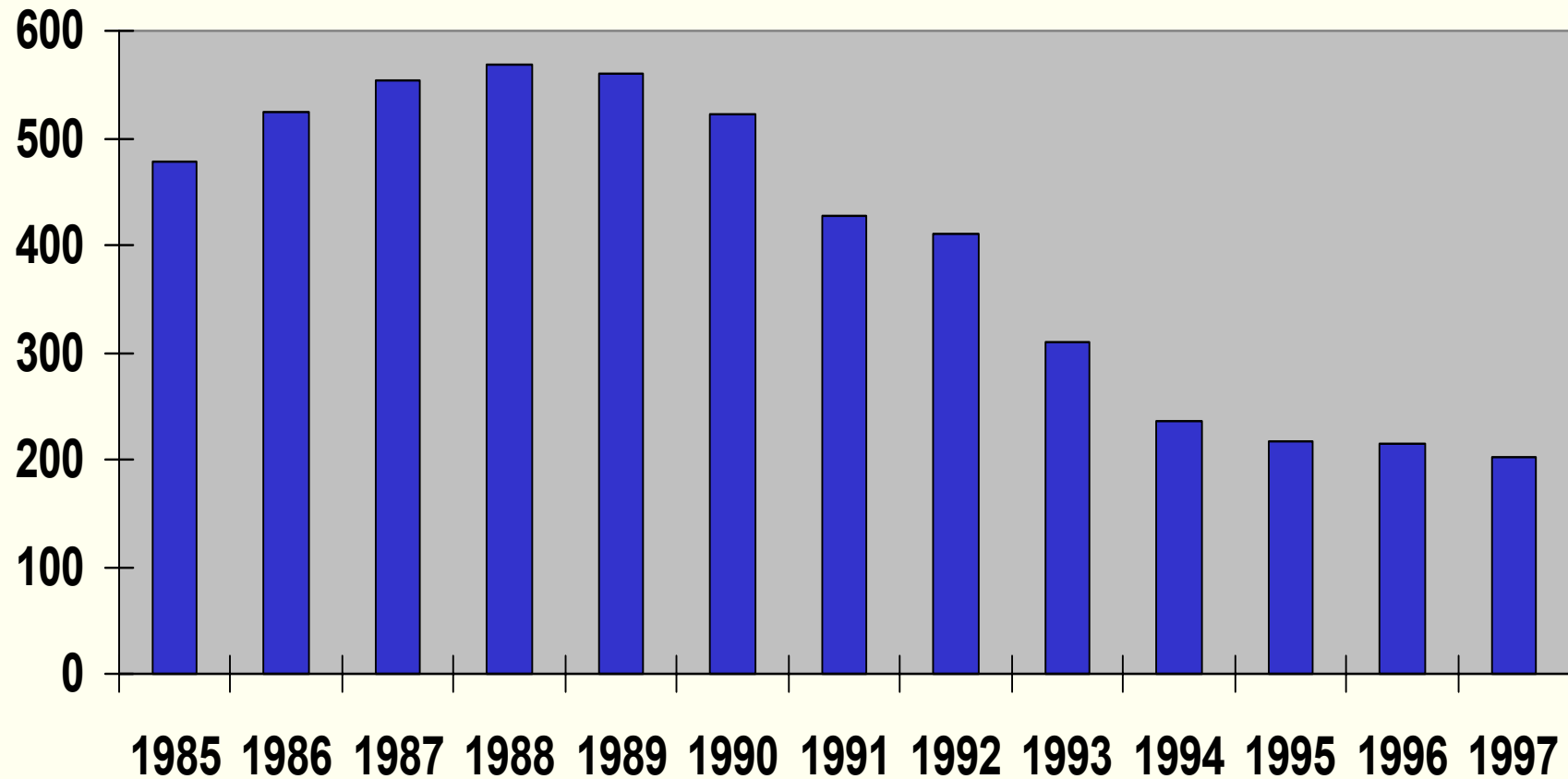


Relevance of the case study

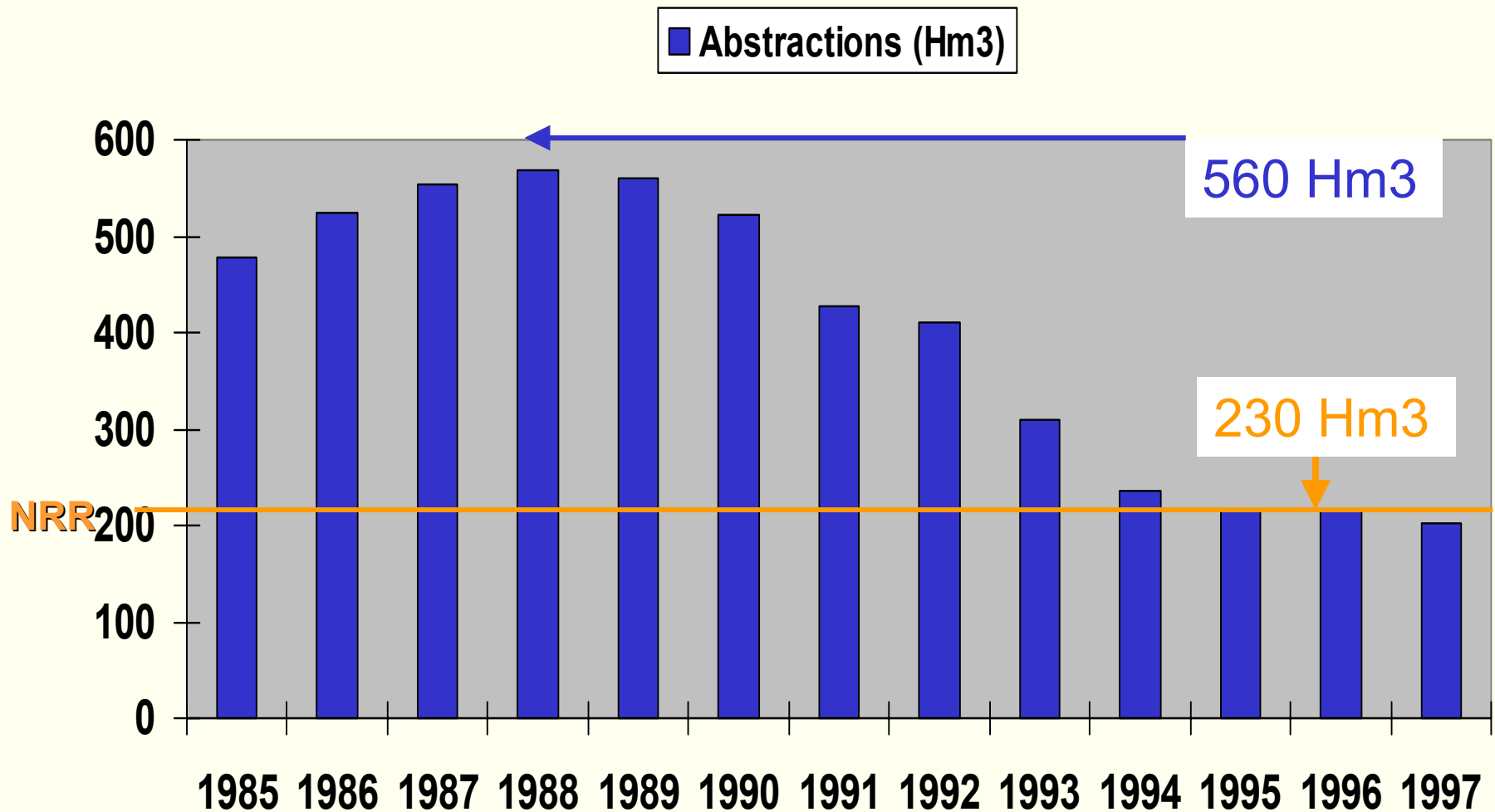
- **Issue:**
 - Expansion of irrigation (CAP yield-based payments) has produced over-exploitation of aquifers , degradation of the associated wetlands, in the National Park ‘Tablas de Daimiel’ a highly valued ecosystem (ESA, Ramsar ...)
- **Policy context → Same objectives, different instruments**
 - Declaration of aquifer’s over-exploitation (1987)
 - **National Policy:** Water Management Regime (Water use restrictions → water quotas (1991))
 - **EU policy:** Income Compensation Program under CAP environmental policy (1993)
- **Methodology:**
 - Water management model → Analytical tool for the assessment of cost-effectiveness of alternative policy options (equity component)

Evolution of water abstractions and irrigated surface

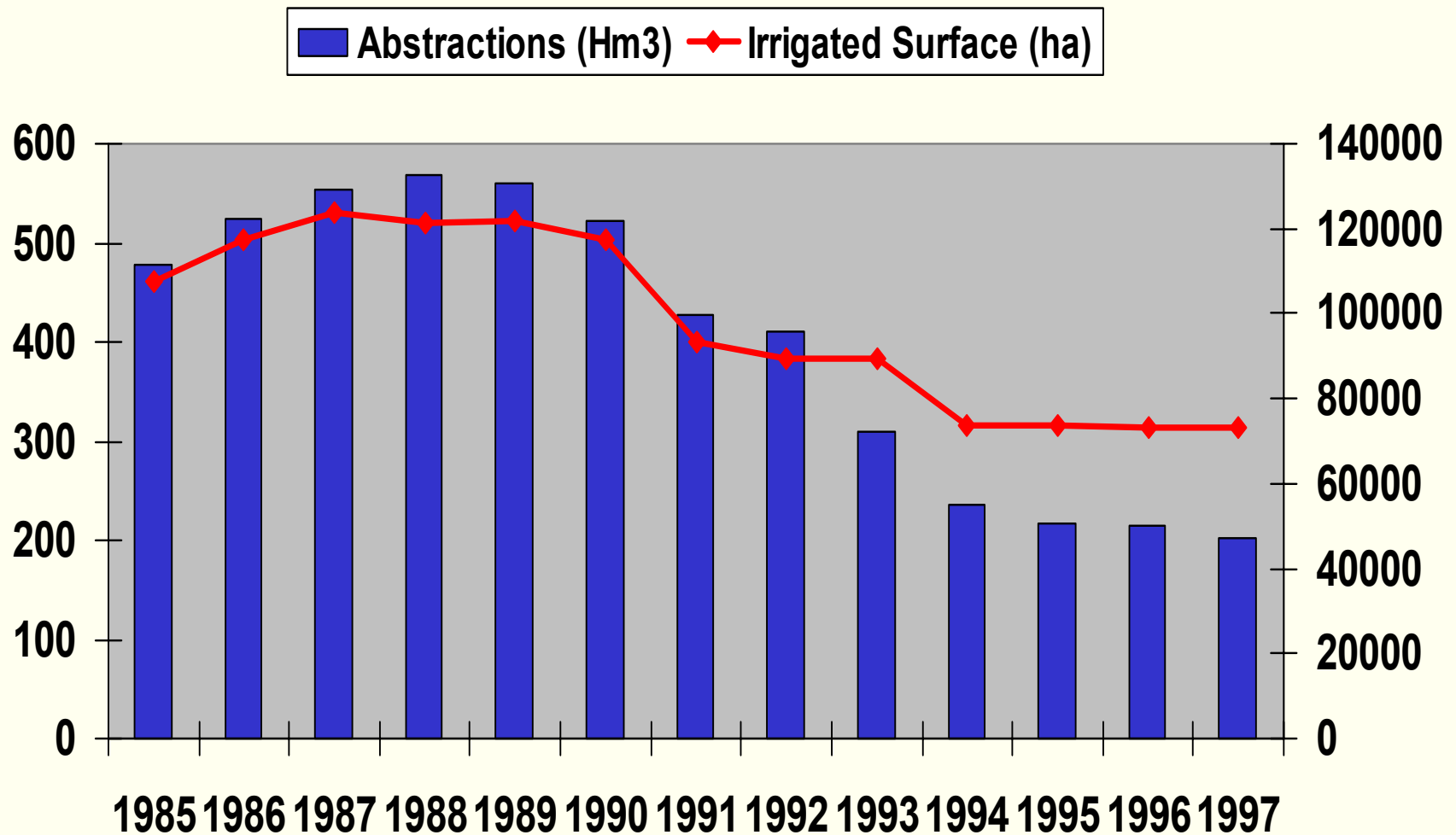
■ Abstractions (Hm3)



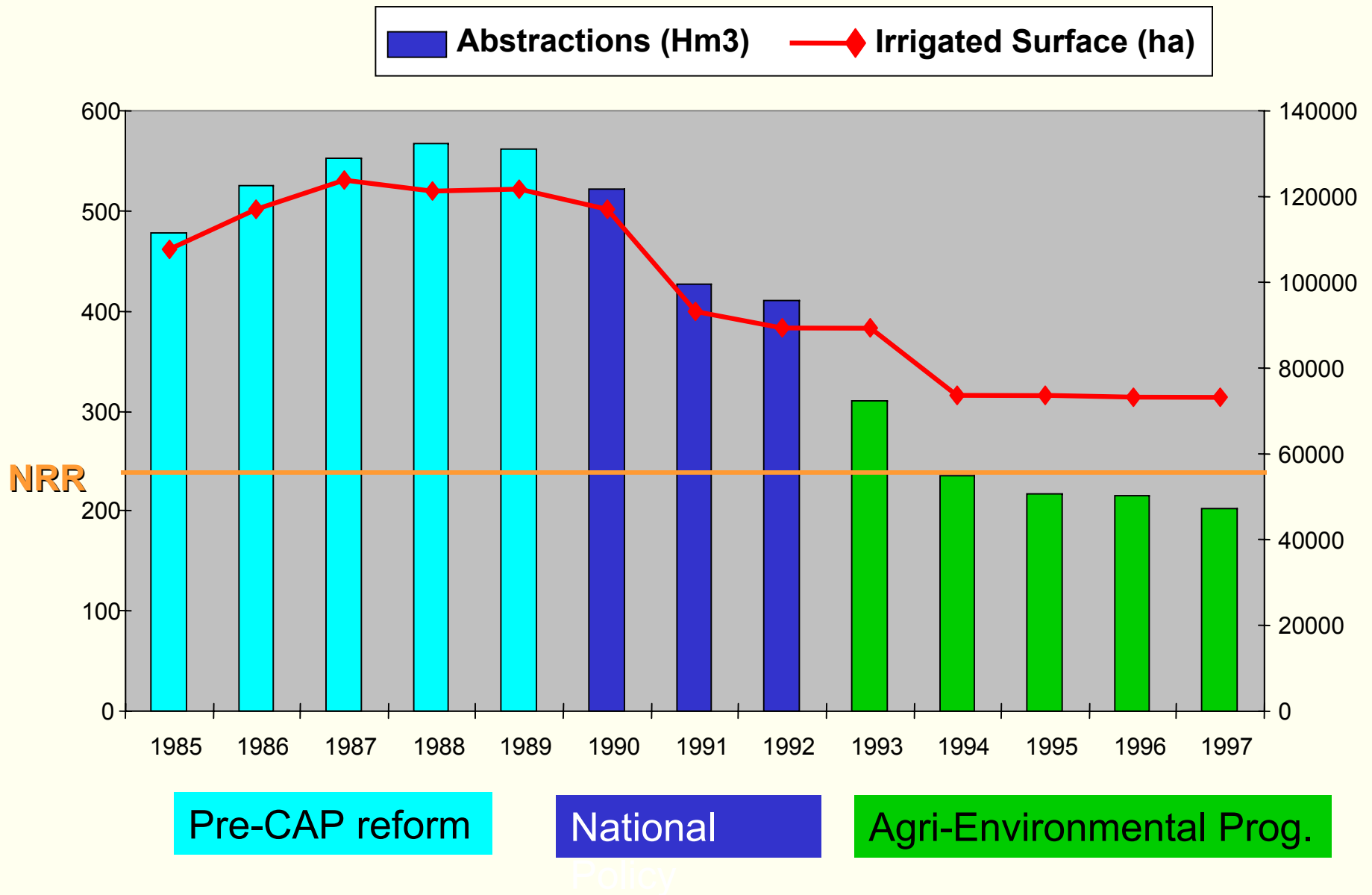
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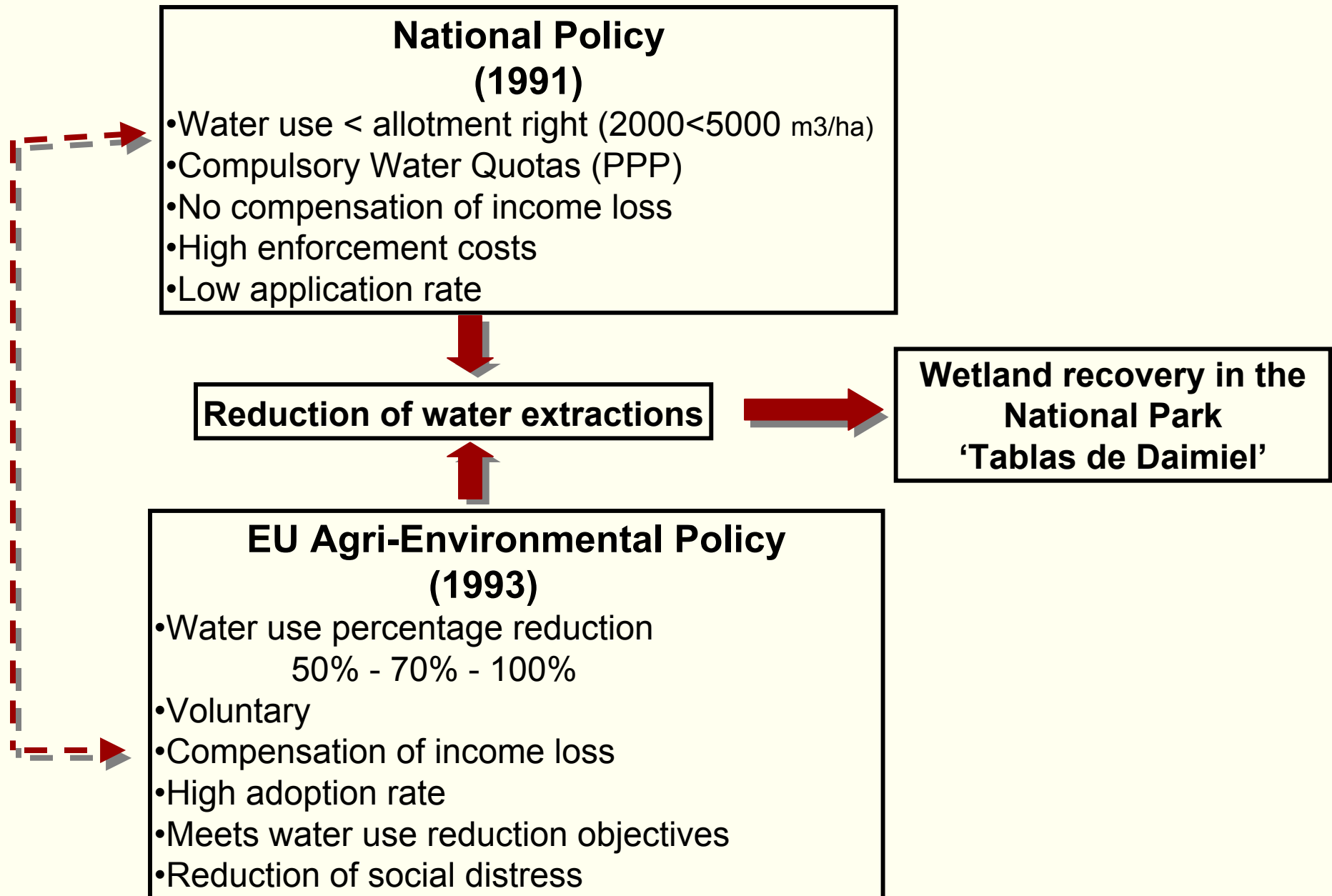
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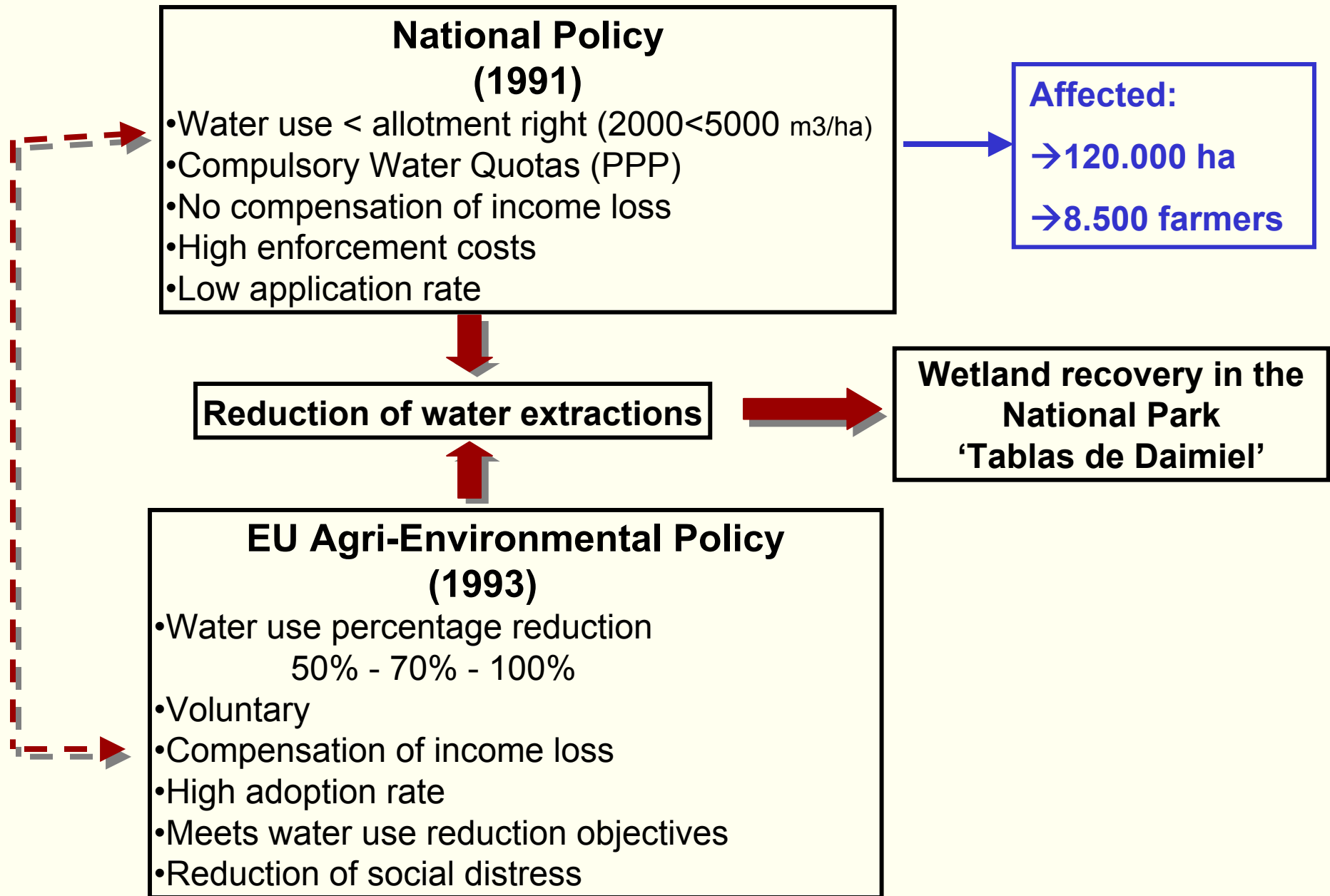
Evolution of water abstractions and irrigated surface



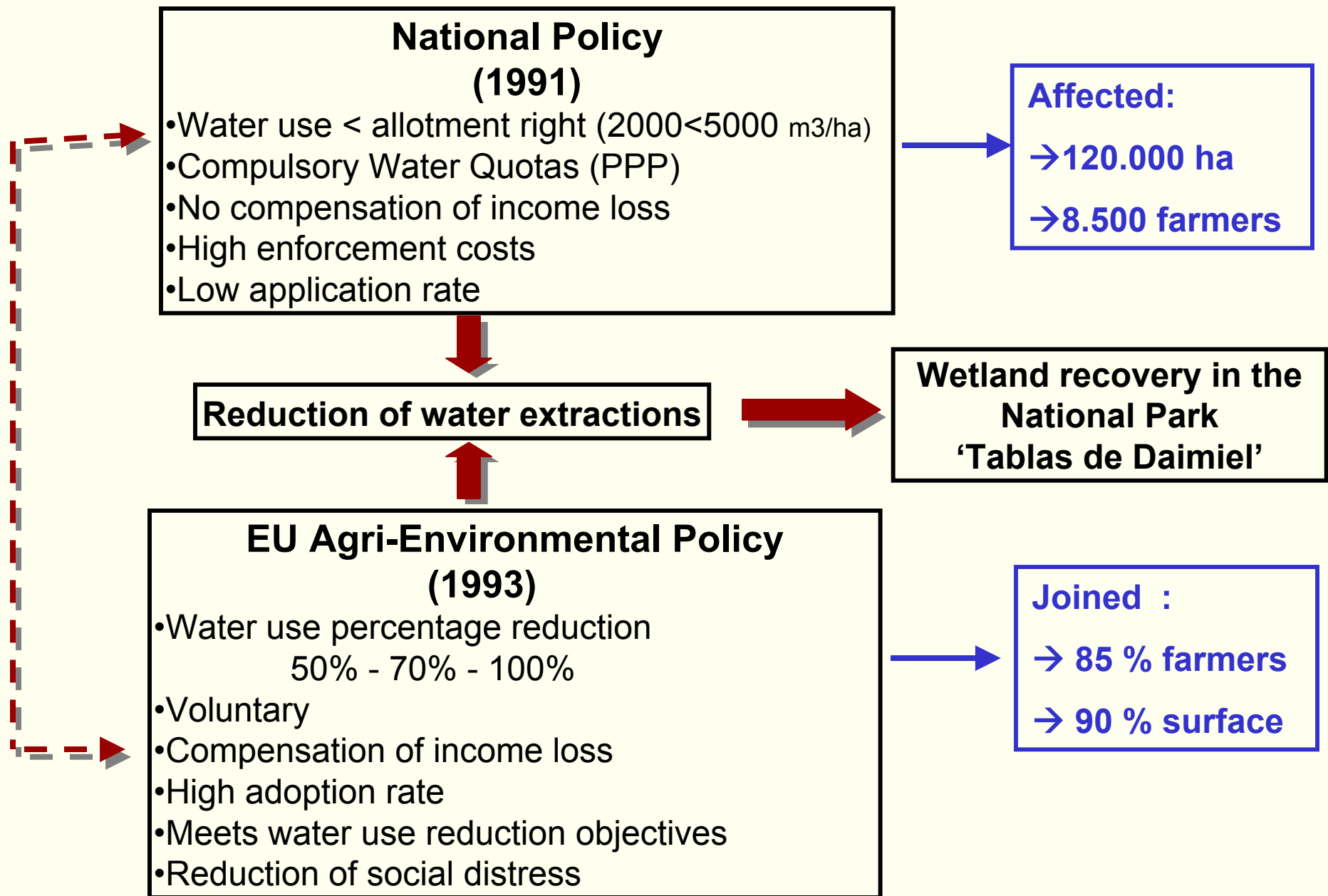
The Policy Context: Two policies for one objective



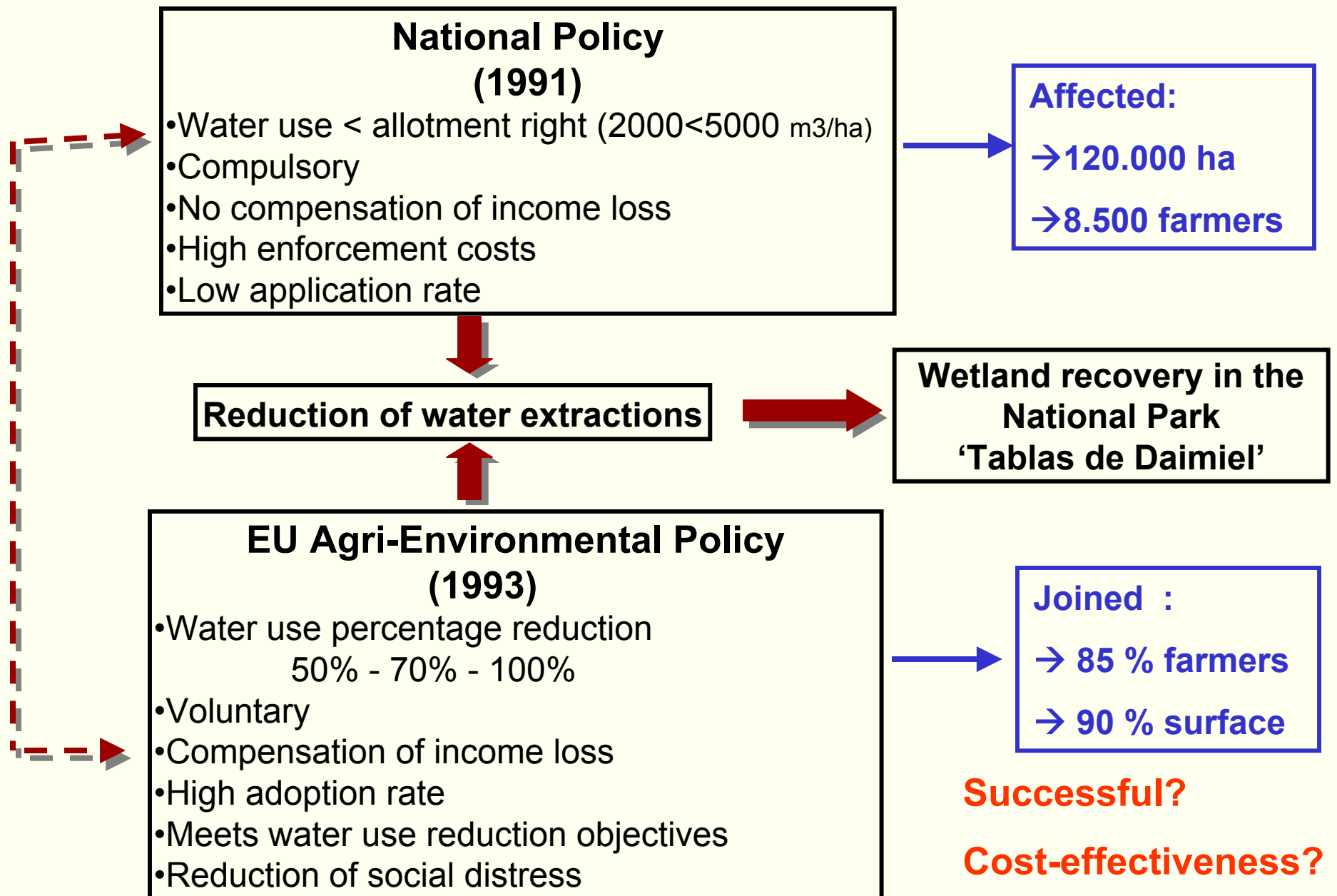
The Policy Context: Two policies for one objective



The Policy Context: Two policies for one objective



The Policy Context: Two policies for one objective





Comparative Assessment of Policy options

Currently applied policy:

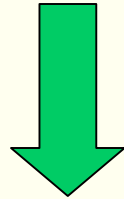
CAP direct payments + Agri-environmental Payments



Comparative Assessment of Policy options

Currently applied policy:

CAP direct payments + Agri-environmental Payments



Water Pricing Policy

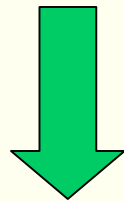
- volumetric water tariffs
- Volumetric + bonus system



Comparative Assessment of Policy options

Currently applied policy:

CAP direct payments + Agri-environmental Payments



Water Pricing Policy

- volumetric water tariffs
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New EU Policy

Cross-Compliance

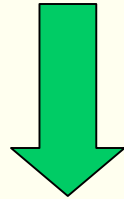
- conditioning CAP direct payments to reducing water consumption



Comparative Assessment of Policy options

Currently applied policy:

CAP direct payments + Agri-environmental Payments



Water Pricing Policy

- volumetric water tariffs
- Volumetric + bonus system

New EU Policy

Cross-Compliance

- conditioning CAP direct payments to reducing water consumption

SIMULATION MODEL

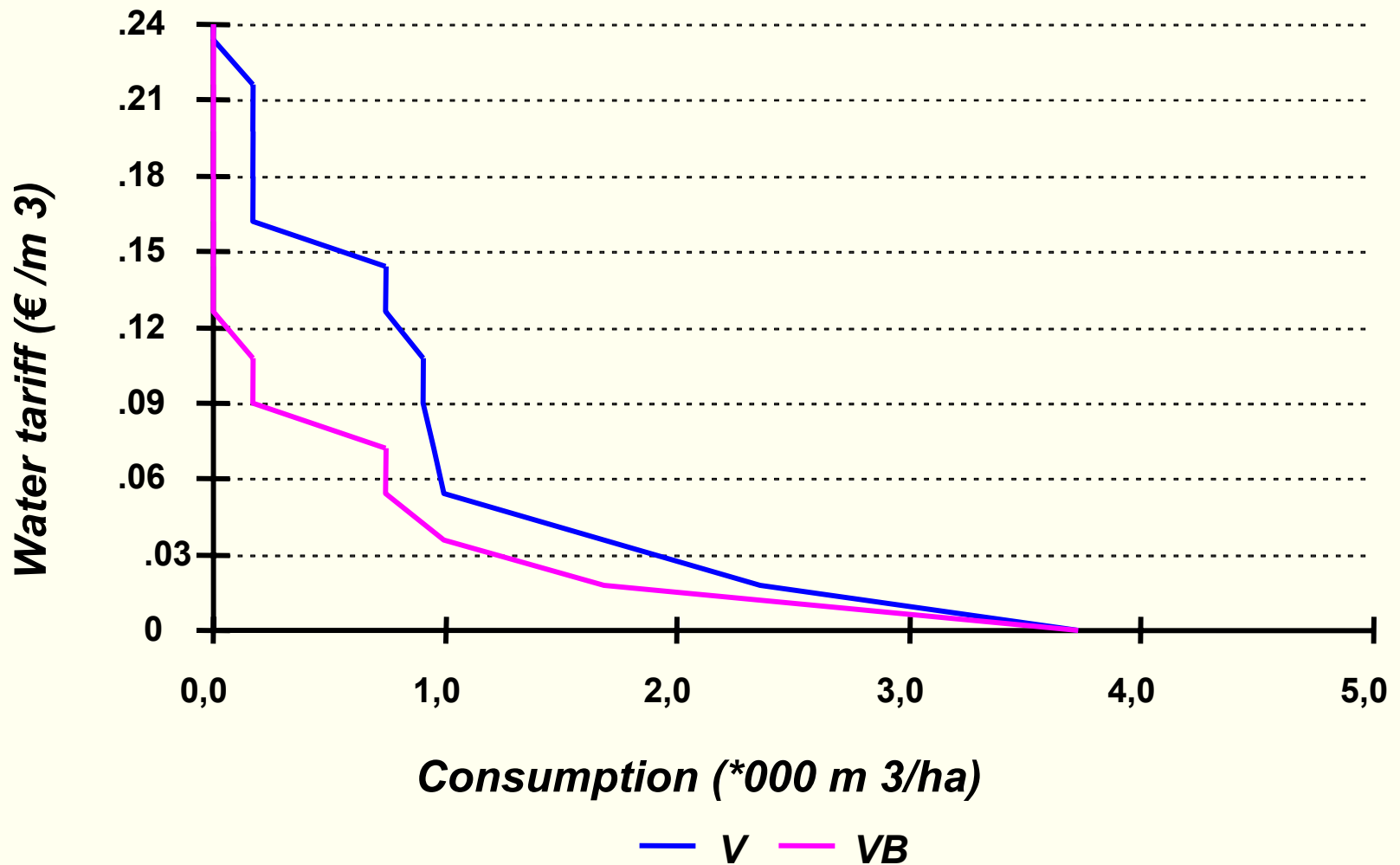


Assessment of Policy options

- **Evaluate the currently applied policy**
 - For attaining a sustainable use of the aquifer and wetland recovery
- **To obtain comparative results on:**
 - Effects on the environment (water conservation)
 - Effects on the private sector (farmers income)
 - Effects on the public sector (public expenditure) → **cost-effectiveness of the policy**
- We use MPM on a set of representative farms of the irrigation zone of Daimiel in the Spanish region of La Mancha

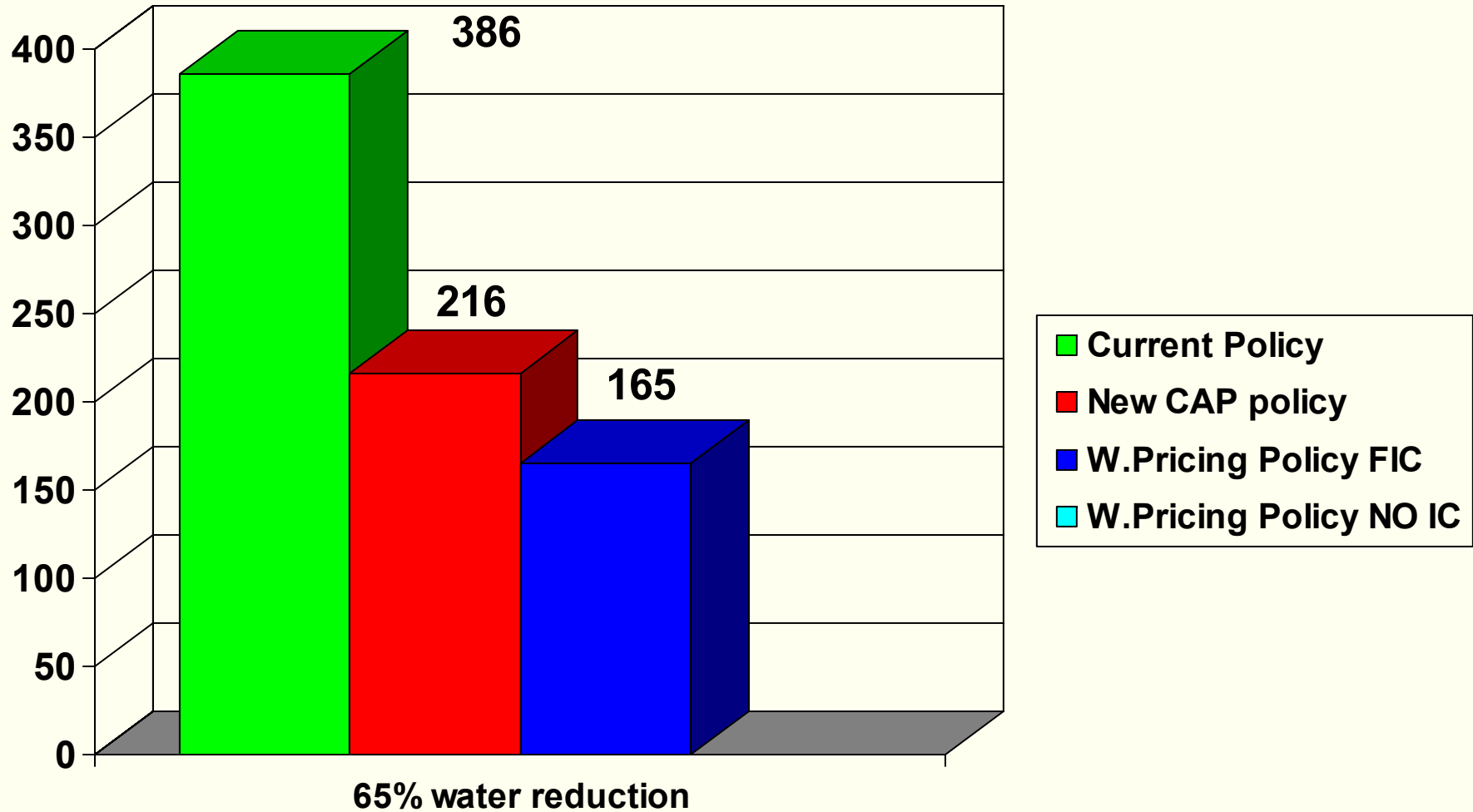
Water Demand (aggregate)

Two different pricing systems



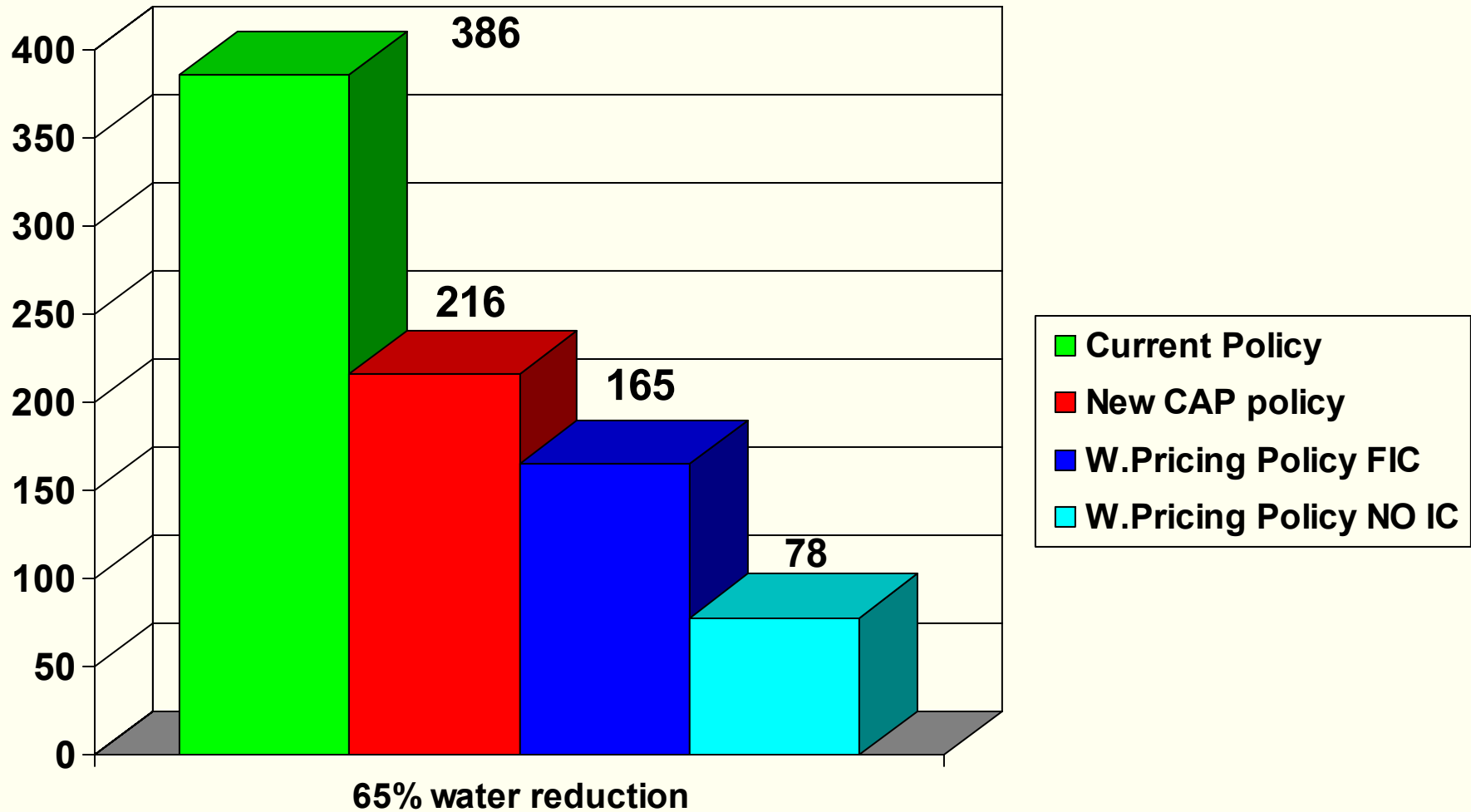


Public Expenditure (€/ha)



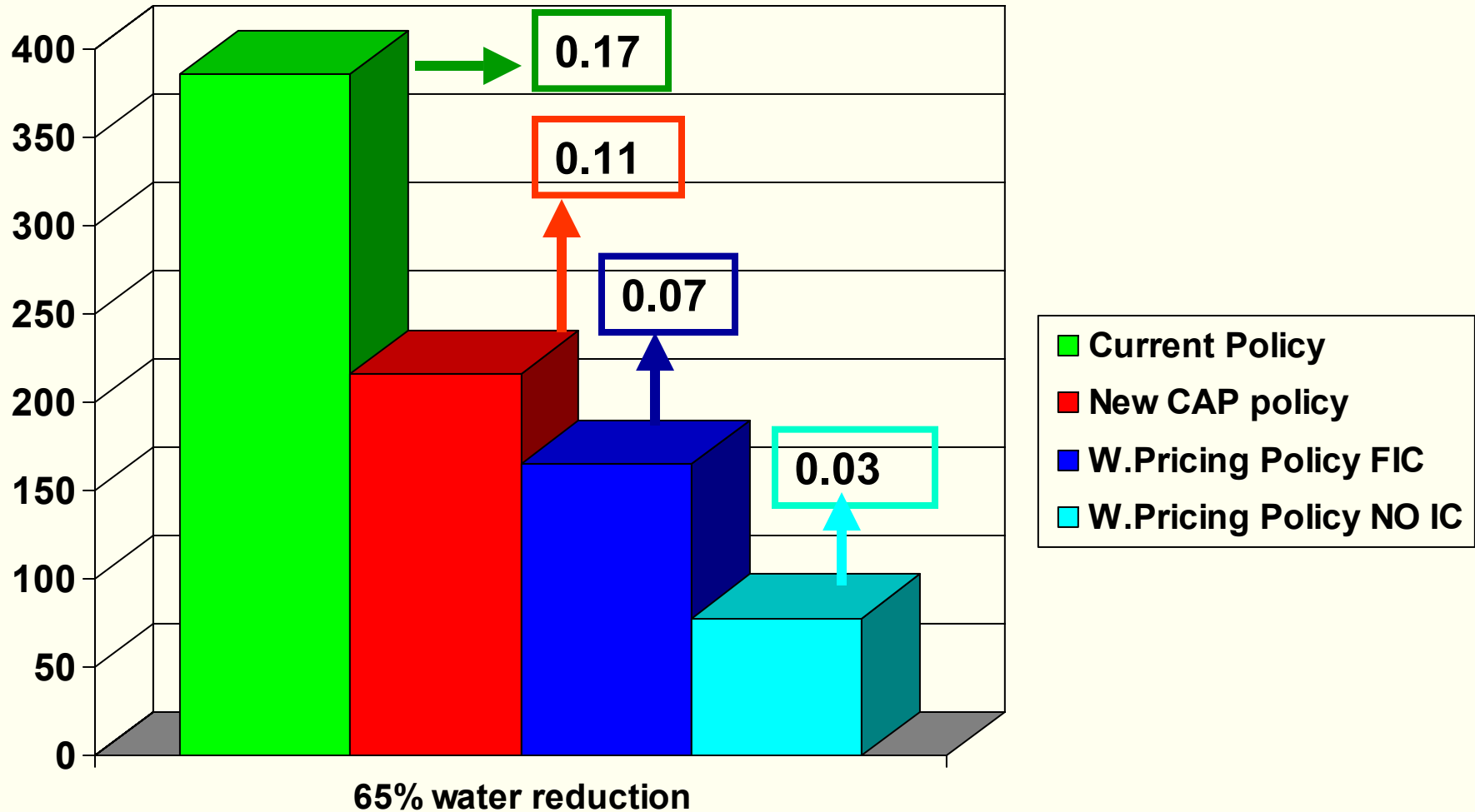


Public Expenditure (€/ha)





Public Expenditure (€/m³)



Assessment of alternative water management policies

- Results indicated that a **water tariff policy is more cost-effective** than the other two policies
- **Balanced integration** of water conservation objectives is more effectively achieved by Water pricing policies
 - High reduction in water consumption
 - Moderate decrease in farm income
 - Moderate public cost
- Equity problem: Have the owners of water entitlements the right to be compensated when they engage in environmentally damaging practices?
- Selection of policy instrument (acceptability, transaction costs...)

6. Concluding remarks

- We cannot conclude that a **unique pricing system** will be the best solution for all contexts (efficiency and equity)
- It will depend on case-specific parameters:
 - level of water scarcity
 - agronomic potential
 - Technical development
 - Economic and social conditions
 - Institutional setting
- **Pure technical solutions** (modernization, rehabilitation of existing systems) **will not result in water conservation** outcomes or more efficient water management. These have to be **combined with economic instruments**
- Irrigators will need to receive the proper market signals (crop prices, input prices and water prices) to engage in water conservation practices

6. Concluding remarks

- **Need for Policy integration:**
- Water policies and agricultural policies will have to be designed and implemented in an integrated manner to avoid distortion effects and contradictory outcomes
- The **institutional arrangements** that support water pricing are crucial to attain efficiency in water management
- The **political economy** and governance structure is determinant in attaining the required institutional development for supporting water management efficiency

7. Research Agenda for Water Management

- Mutual learning from different countries' experiences
- Similarities in water management problems in diverse country and regional settings
- Potential application of methodologies to different geographical contexts, levels of socio-economic development, institutional arrangements, diverse policy options.
- Provide an assessment tool for policy analysis (agricultural policies, water policies, trade policies)
- Potential competitive advantage of different countries and regions in food production and trade

**GRACIAS POR SU
ATENCIÓN**



New perspectives in water management

