National Capacity Development Training of Trainers (TOTs)
Workshop on
Developing and Implementing Mitigation and Preparedness Water Scarcity and Drought (WS&D) Management Plans
Zaragoza - Madrid, Spain, May 6-9, 2014

Socio-economic impacts of droughts and economic instruments

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Policy challenge

Table 1: Ten Global Risks of Highest Concern in 2014

No.	Global Risk
1	Fiscal crises in key economies
2	Structurally high unemployment/underemployment
3	Water crises
4	Severe income disparity
5	Failure of climate change mitigation and adaptation
6	Greater incidence of extreme weather events (e.g. floods, storms, fires)
7	Global governance failure
8	Food crises
9	Failure of a major financial mechanism/institution
10	Profound political and social instability

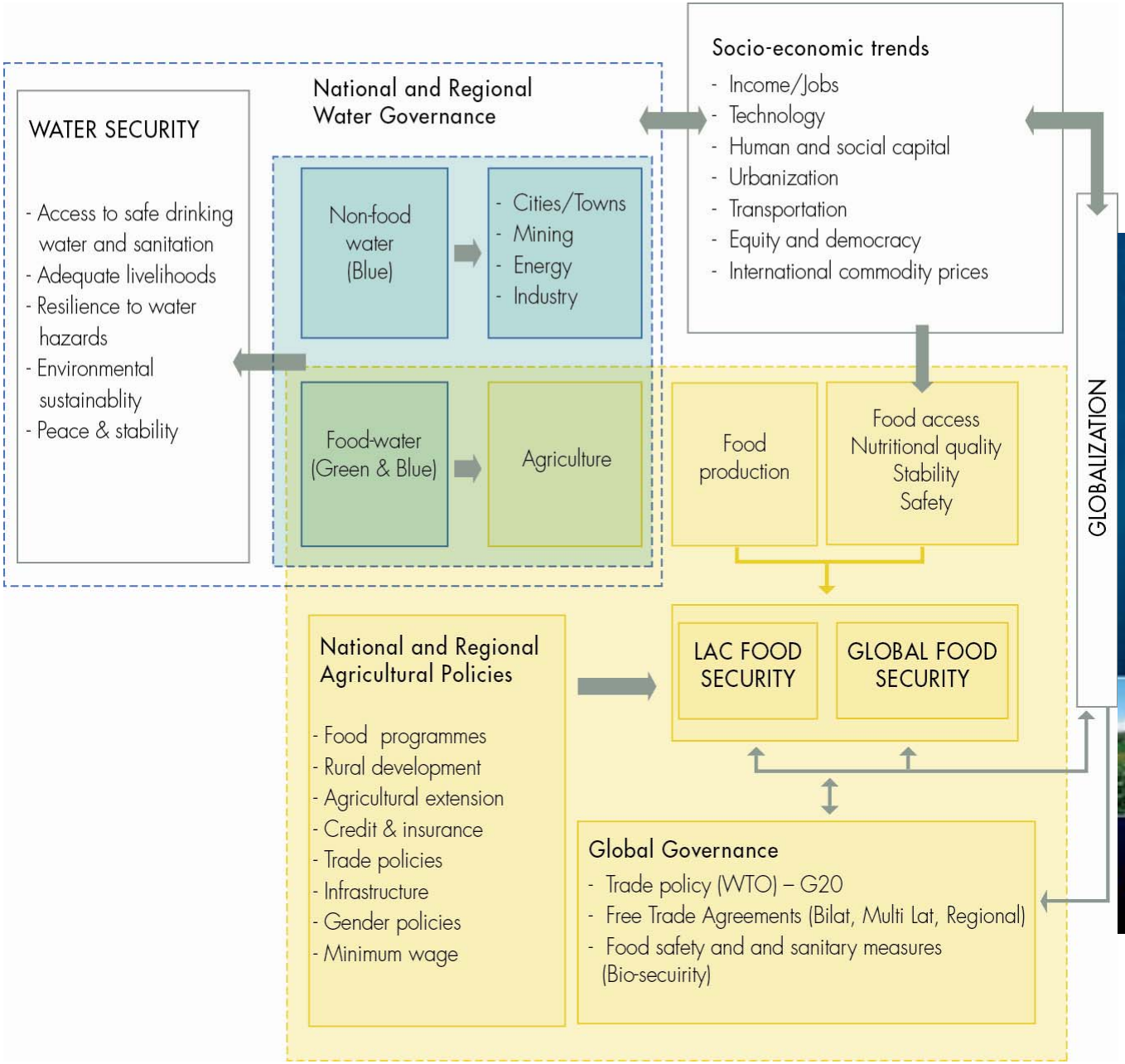
Source: Global Risks Perception Survey 2013-2014.
Note: From a list of 31 risks, survey respondents were asked to identify the five they are most concerned about.

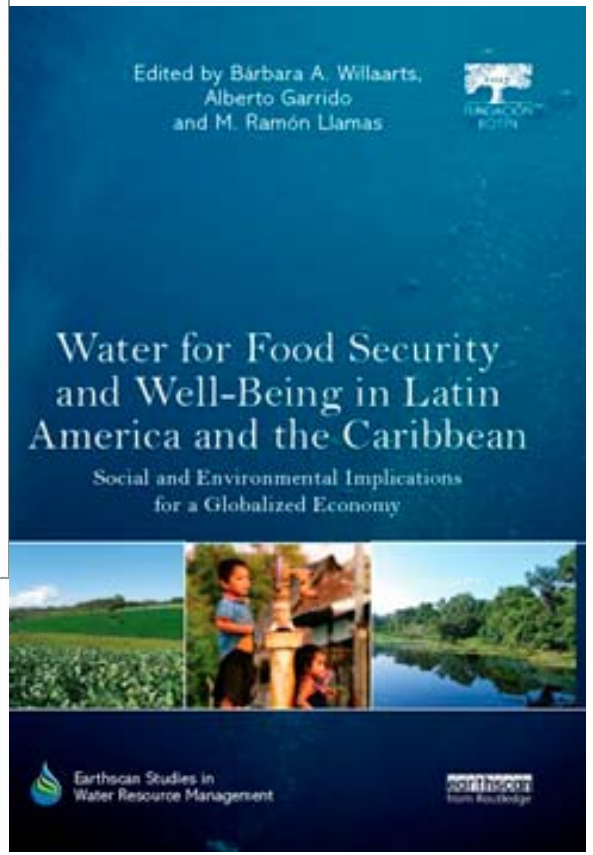
Source: World Economic Forum, 2014

Policy challenge

Source: World Economic Forum, 2014

Policy challenge





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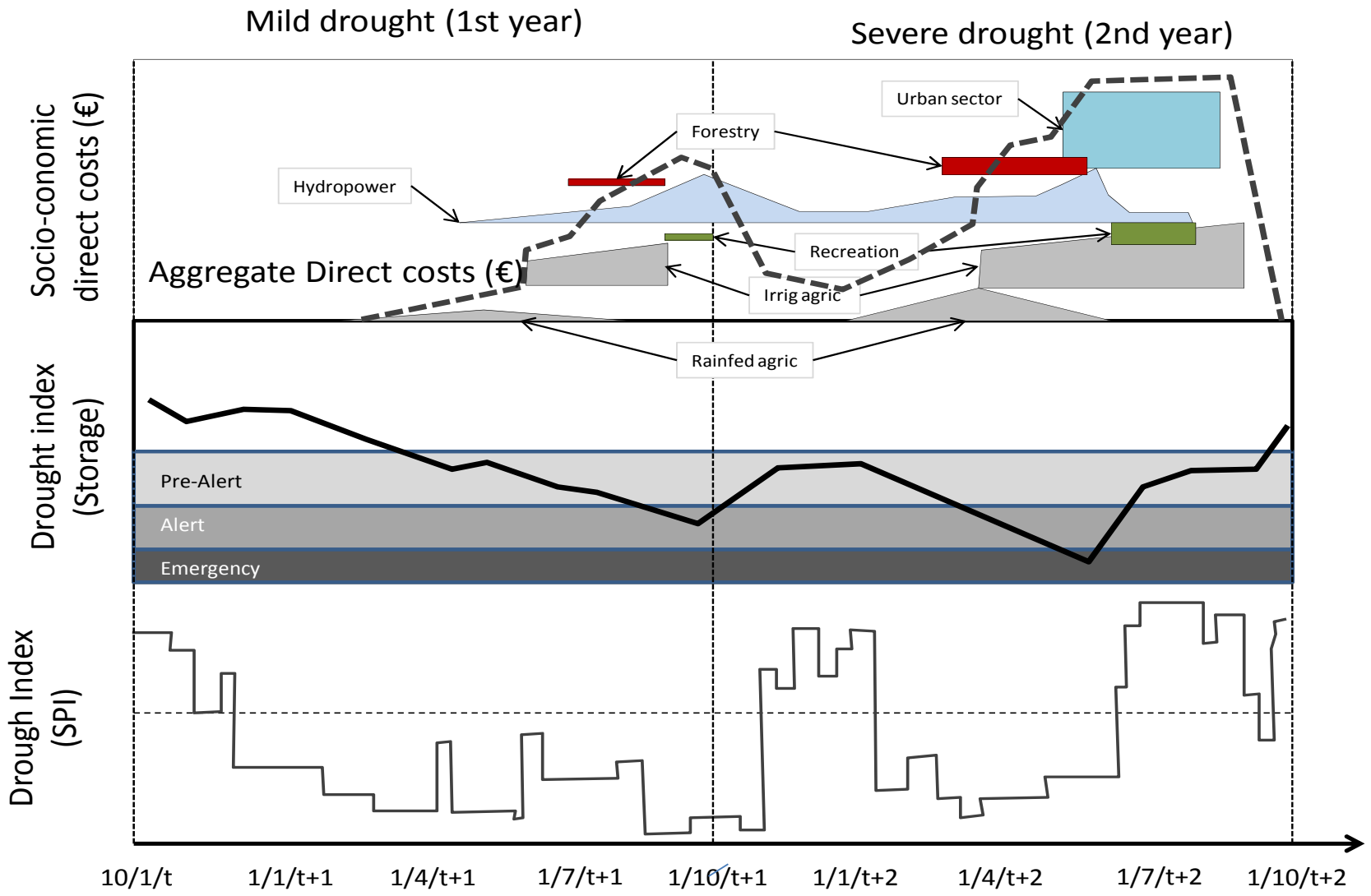
1. Framework for thinking about drought socio-economic impacts



1. Framework for thinking about drought socio-economic impacts

Categorisation of drought impacts
Note: Notation for Domains Residential Sector (RS); Economic sector (ES) and Environment (EV)

	Type of impacts	
	Tangible (Market impacts)	Intangible (Non-market impacts)
Direct	Urban Water Supply (RS) Agricultural and Livestock Sector (ES) Hydroelectricity (ES) Fishfarm (ES) Recreational Uses (ES)	Welfare impacts (RS) Environmental impacts (EV) - Aquatic ecosystems -Forest ecosystems
Indirect	Impacts on the Agro-industrial sector (ES) Agricultural Employment (ES) Tourism and service sector (ES)	Humans health and disease exposure

Source Hernández-Mora, N. Marina Gil, Alberto Garrido, Roberto Rodríguez-Casado. (2012). *La sequía 2005-2008 en la cuenca del Ebro: vulnerabilidad, impactos y medidas de gestión*. UPM-CEIGRAM-Madrid. ISBN 978-84-695-7228-3.

2. Economic impacts

Sector	Type of Impact	Methodology	Reliability	Value (Million €)	% of importance
Urban water supply	Alleviation and mitigation measures	Gathered from government sources	High	136.34	13.63
	Water supply companies	-	High	0	
	Additional private costs	Estimated	Low	15.89	1.59
Agriculture and livestock	Alleviation and mitigation measures	Gathered from government sources	High	29.03	2.90
	Insurance claims and indemnity losses	Estimated with data from ENESA	Reasonable/Indicative	22.81	2.28
	Reinsurance impacts	Estimated from data of the CCS	Reasonable/Indicative	23.80	2.38
	Value of agricultural production	UPM modeling approach	High	384.84	38.48
	Livestock production and health	Estimated from various sources	High	0	
Hydropower	Cost of extra energy	UPM approach 0	High	385.00	38.50
Industry	Aquaculture	UPM with industry data	High	0	
	Cut flowers and greenhouses		High	0	
	Forest products	Government estimates	High	2.34	0.23
	Navigation		Reasonable/Indicative	Unknown	
Recreational uses	Recreational and sports fishing	Estimates from sectoral studies and official data	Reasonable/Indicative	0	
	Skiing		Reasonable/Indicative	Significant but unknown	
TOTAL DIRECT TANGIBLE COSTS				**1000.05**	100
Agro-industry		UPM modeling approach	High	589.04	98.93
Employment			High	Not significant	
Tourism		Estimates from sectoral studies and official data	Low	6.36	1.07
TOTAL INDIRECT TANGIBLE COSTS				**595.4**	**100**
Social water uses		Benefit transfer	Reasonable/Indicative	0.23	0.01
			Reasonable/Indicative	0.55	0.02
			Reasonable/Indicative	1.16	0.04
Risk perception			Low/Doubtful	2861.19	99.62
Environment			Reasonable/Indicative	8.86	0.31
TOTAL DIRECT INTANGIBLE COSTS				**2,871.99**	100

2. Economic impacts

Direct Impacts

Agriculture:

- Rainfed agriculture
- Irrigated agriculture
- Livestock

- Urban sector:
  - Households' welfare
  - Institutional customers
  - Industries/services
  - Parks and street cleaning
- Tourist sector
- Energy
- Environment

Indirect Impacts

Agrifood sector

- Food processing industries
- Ag. Input industries

- Urban sector business:
  - Hotels, restaurants, bars

- Tourist industry
  - Golf courses, resources

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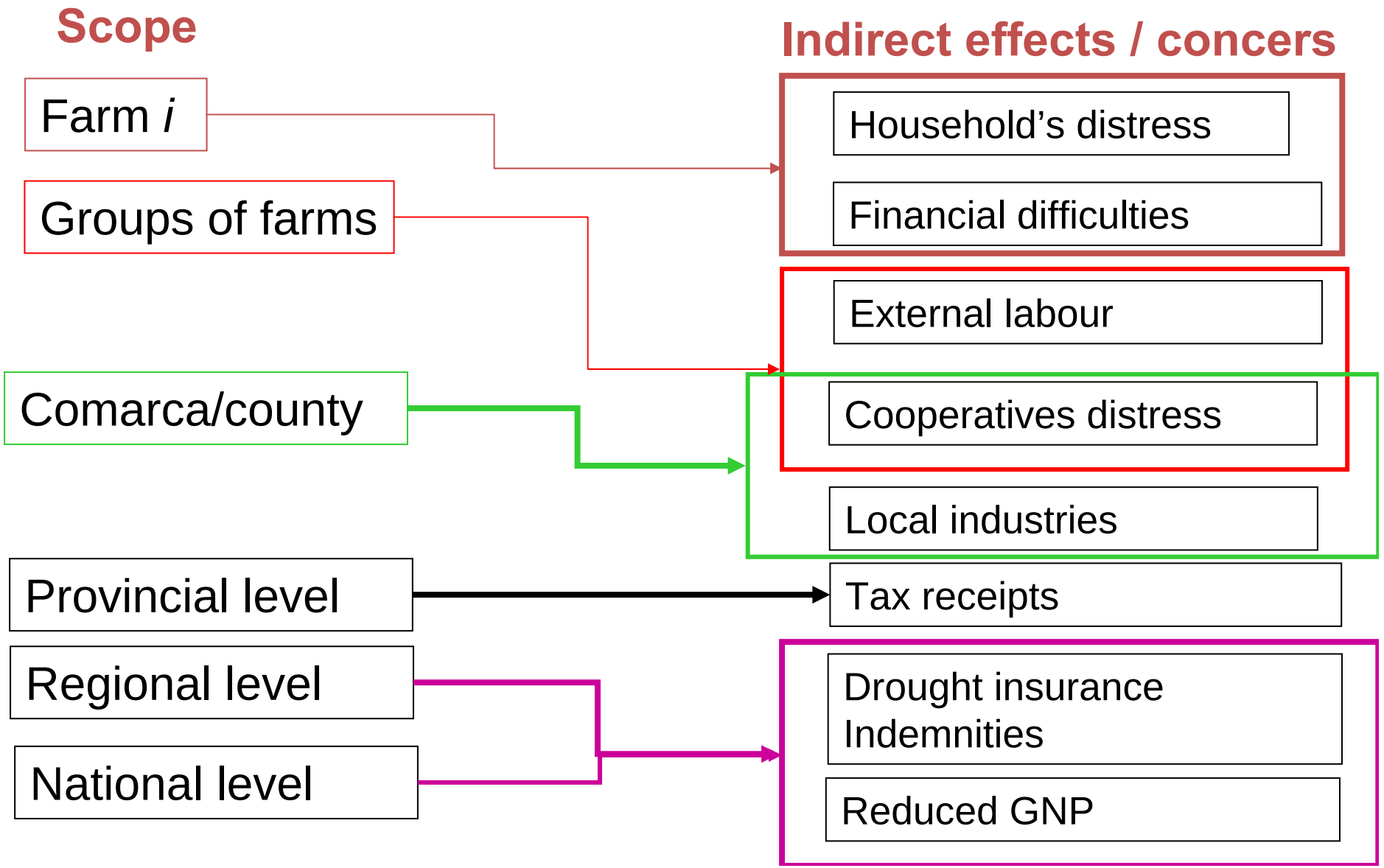
2. Economic impacts

- Droughts **have direct impact on domestic** water supply and **on water-dependant economic sectors,** such as irrigation and hydroelectricity production, Agro-industry, on water and **precipitation-dependan**t, and on other economic activities.
- **Non-market impacts** include social welfare reductions and impaired environment.
- The cost of the measures implemented to mitigate, prevent or alleviate the impacts of drought can also be **attributable** to the economic cost of the drought.
- **Existing information on economic impacts of droughts** is scarce, incomplete, unreliable and scattered
- Drought impacts **on natural ecosystems** are difficult to value in economic terms.

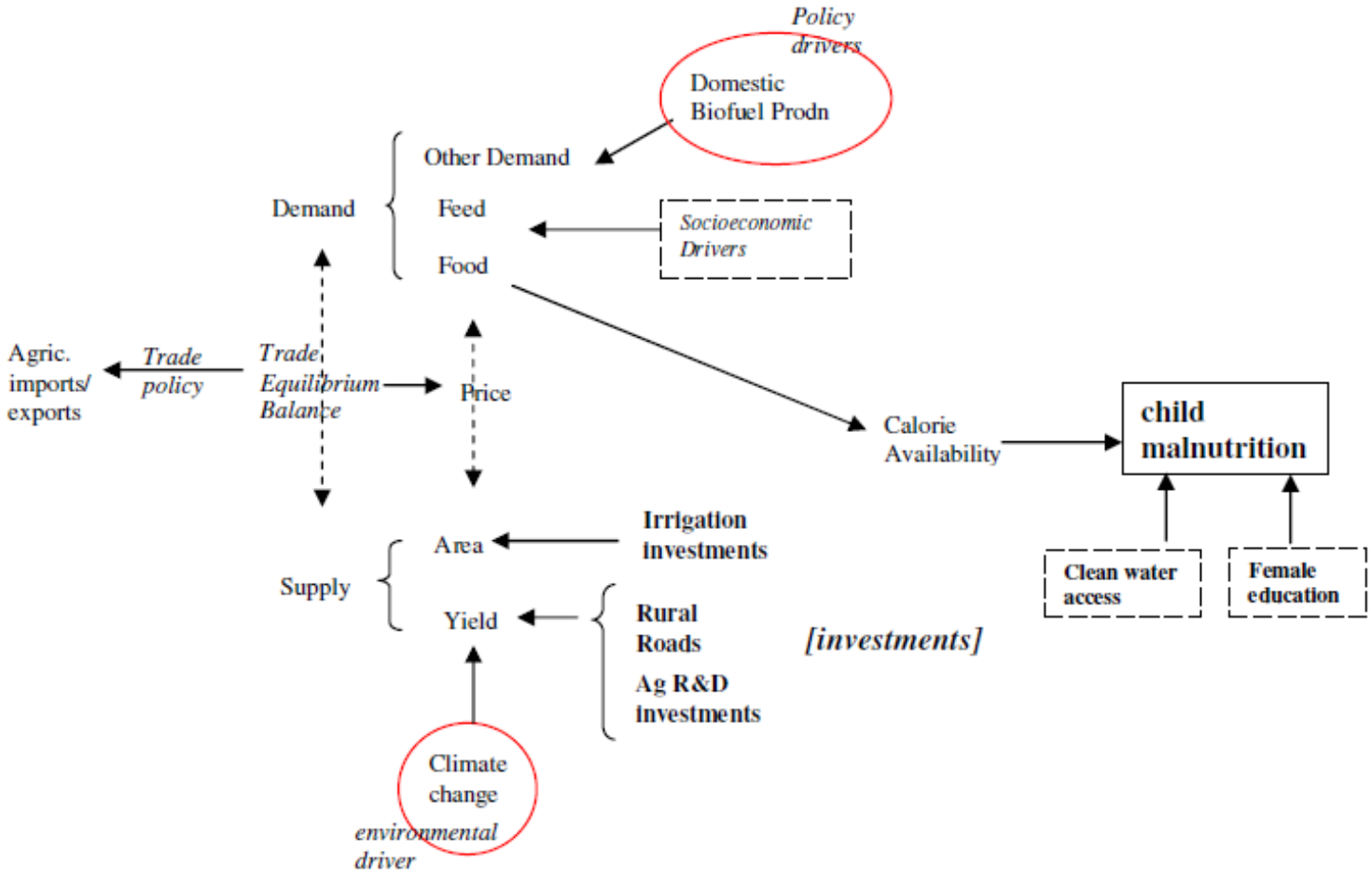
2. Economic impacts

Agricultural Impacts

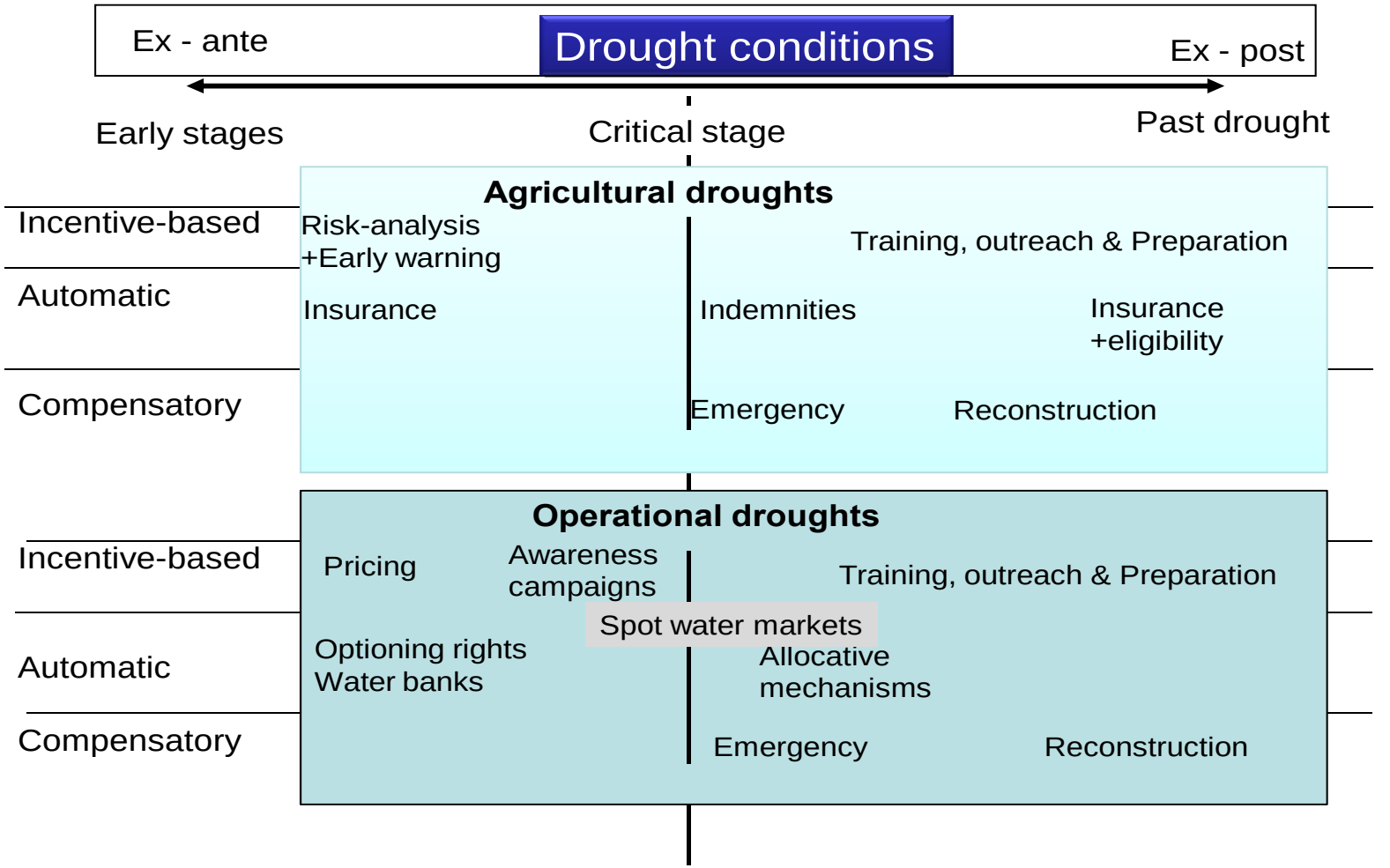


2. Economic impacts

Figure 3: Key entry points for policy and investment used in modeling



3. Economic instruments



Source: Garrido, A. and A. Gómez-Ramos. "Risk Sharing Mechanisms supporting planning and policy" En Iglesias, A., A. Cancelliere, F. Cubillo, L.Garrote y D.Wilhite. (Eds.). *Coping with Drought Risk in Agriculture and Water Supply Systems. Springer.* EEUU. 133-151. 2009.

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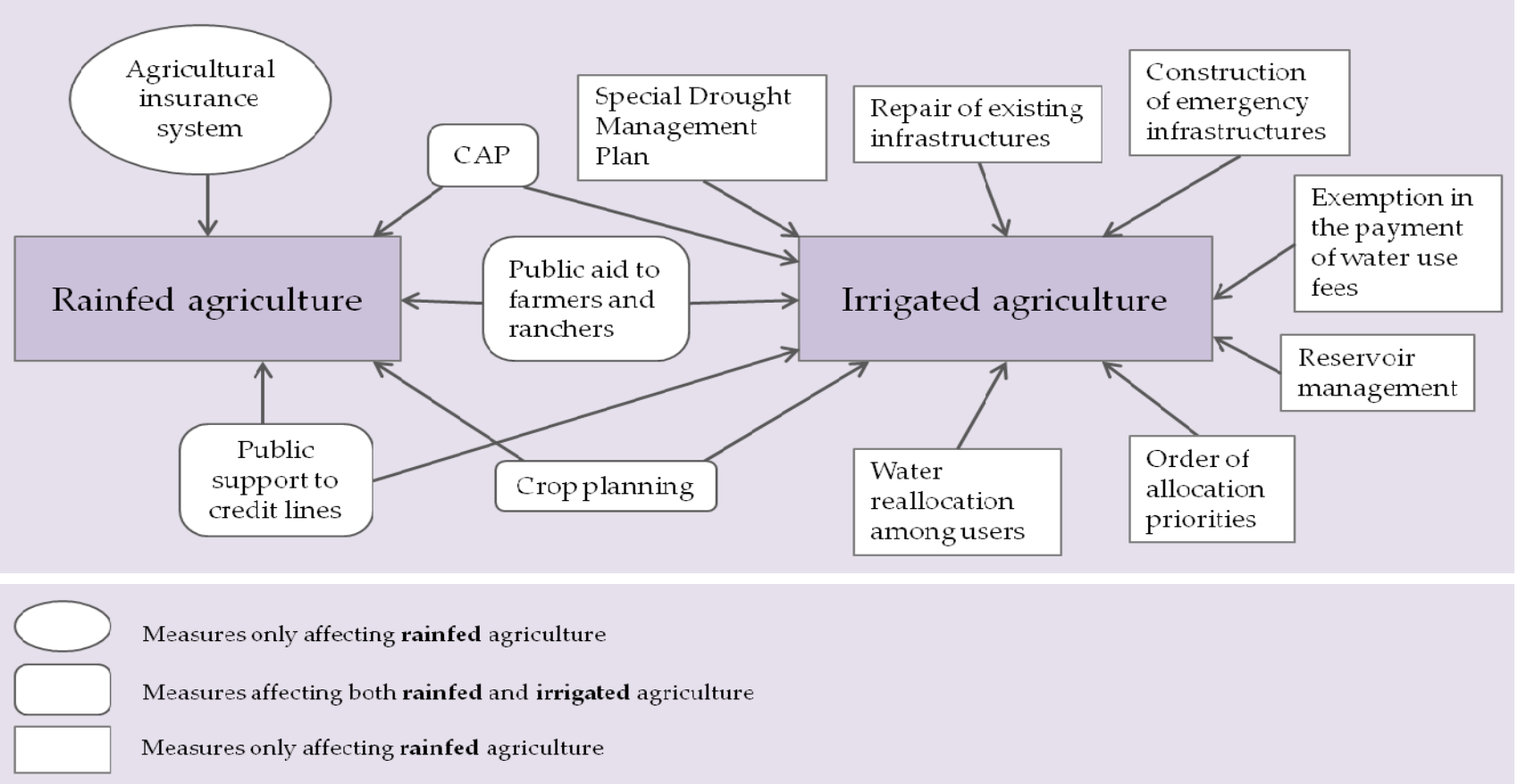
3. Economic instruments

Conceptual map of the measures applied on agriculture (in Spain)



Source: **Nuria Hernández-Mora, Marina Gil and Alberto Garrido**
Assessment Report Ebro Case Study – Droughts
Prempt Project http://www.feem-project.net/preempt/

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4. Virtual water trade

Some water shortage combinations foreseen by 2050

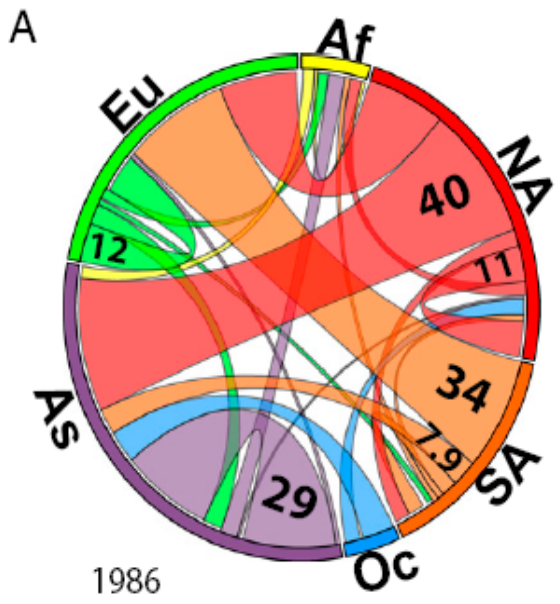
GREEN / BLUE	Green shortage <1300m^3/p/yr	Green freedom >1300m^3/p/yr
Blue shortage <1000m^3/p/yr	**a** Iran, Pak, Jordan Eg, Eth, India, China	**b** Kyrg, Czeckosl, Les, S Afr
Blue freedom >1000m^3/p/yr	**c** Jap, Bangl, N+SKor, Nga. To,	**d** Zimb, Ghana, Ang, Botsw, Chad, Ke, Mali, Namib, Sud, Ta, Za, Zimb

Some policy implications

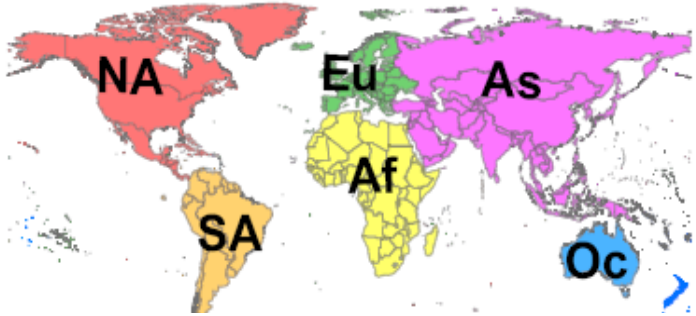
GREEN / BLUE	Green shortage <1300m^3/p/yr	Green freedom >1300m^3/p/yr
Blue shortage <1000m^3/p/yr	**a** **46 % of world pop** • horizontal expansion • food import • radical water productivity increase	**b** **14% of world pop** • upgrading rainfed agric/ rainwater harvesting
Blue freedom >1000m^3/p/yr	**c** **21% of world pop** • irrigation expansion	**d** **19% of world pop** • upgrading rainfed agric • irrigation expansion

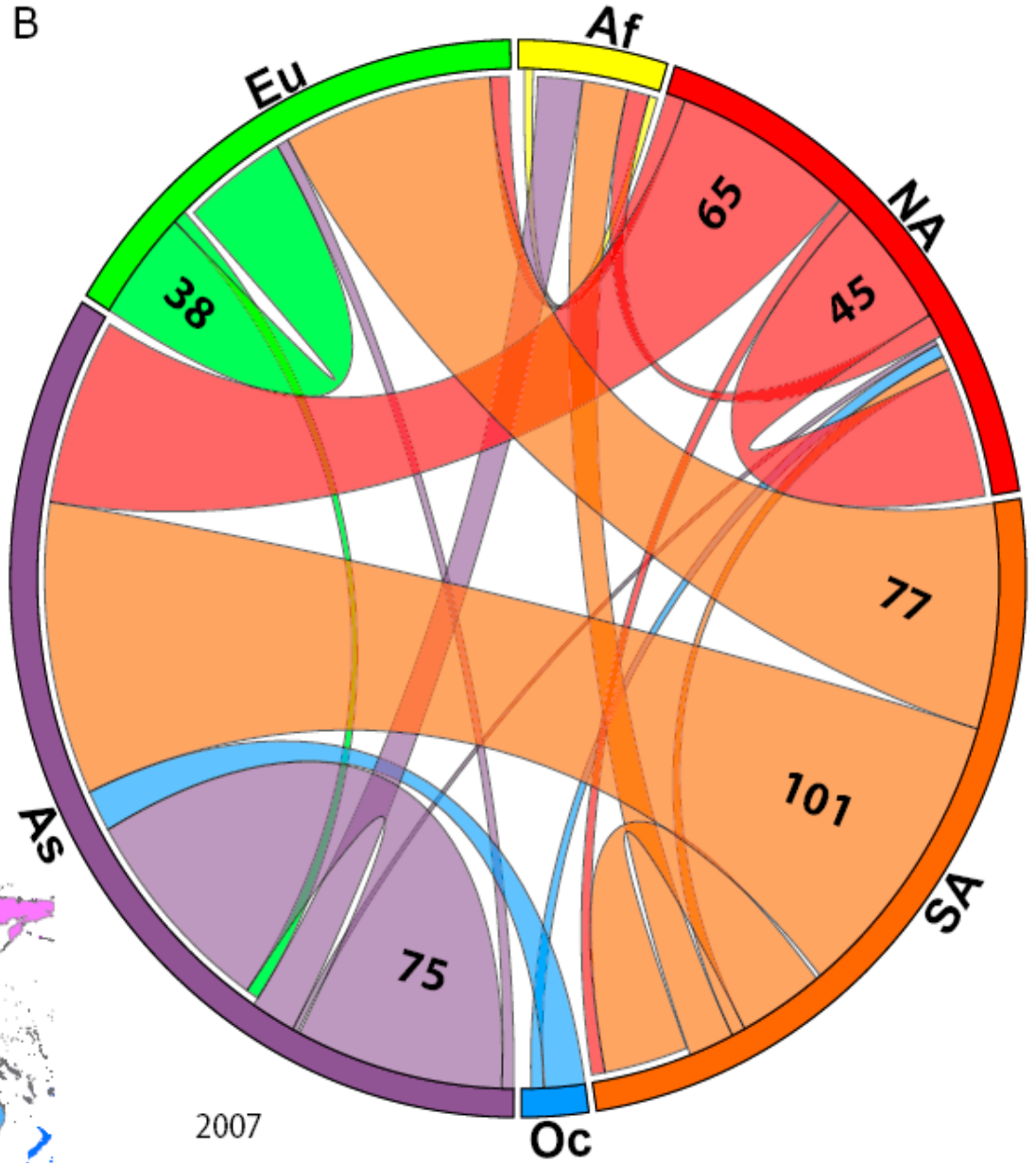
Flankenmark and Rockstrom in (2011) in Garrido, A. y H. Ingram (Eds). *Water for Food in a Changing World*. 2nd Rosenberg Volume Series. Routledge Publishers. 2011. Londres.

4.New irrigation concepts for the 21st century



Source: Dalin et al. (PNAS, 109:16, 2012)





5. The Role of insurance

Agricultural drought risks can be insured against:

- Considered a systemic risk (expensive reinsurance)
- Needs subsidies (private sector, reluctant)
- Technically, more difficult than single-peril insurance (Hailstorm

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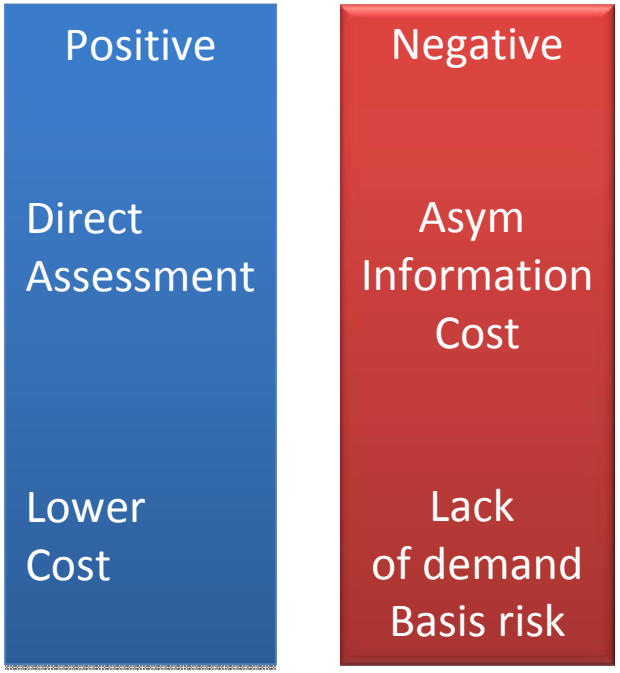
5. The Role of insurance

Agricultural drought risks can be insured against:

- Single peril insurance
- Yield insurance (multiperil insurance)

- Index insurance
  - -Rainfall insurance
  - -Satelite insurance



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5. The Role of insurance

- Problems related to asymmetric information:
  - Due to the differing ability of agents and principal to discern the agents' risks because of costly monitoring
    - AGENTS: FARMERS/BORROWERS
    - PRINCIPAL:
      - INSURANCE COMPANIES
      - THE GOVERNMENT
      - Banks
  - Two classical problems

5. The Role of insurance

No clear evidence of moral hazard problems in agricultural insurance, especially when:

– With records of individual farmers
– Index insurance (weather derivatives)
– With deductibles
– With bonus-malus
– With low coverages

But, abundant evidence of moral hazard exists in the area of ‘rural banking’ (especially in cases of public agencies)

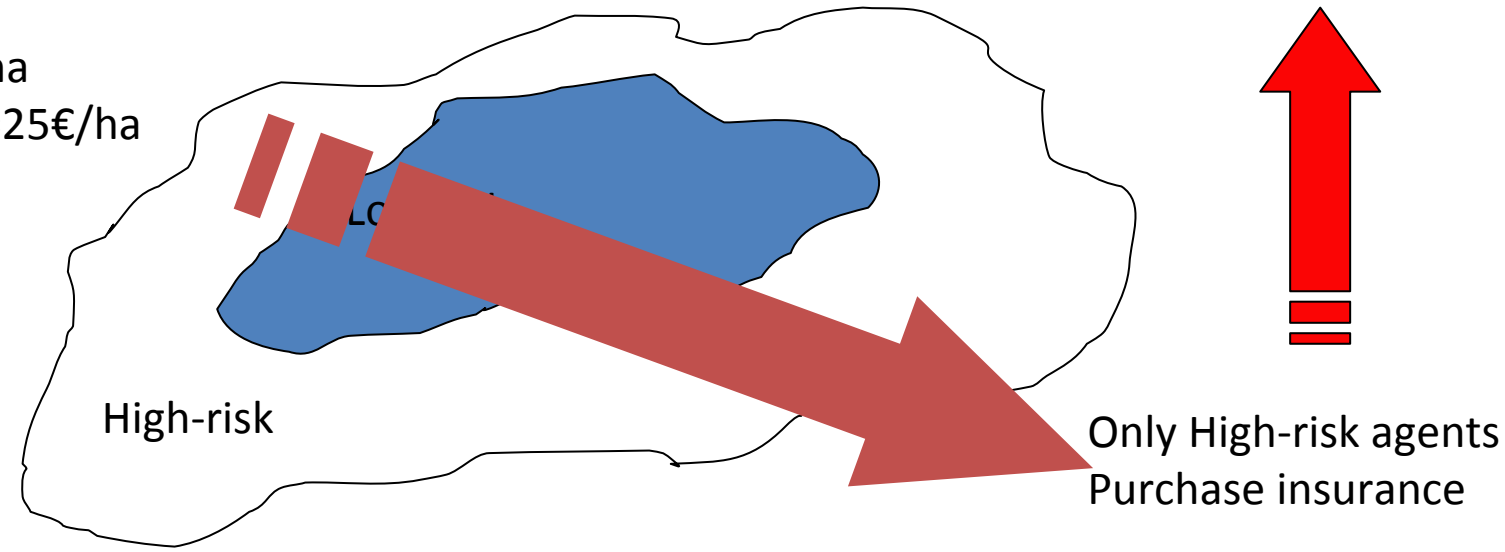
5. The Role of insurance

– Two classical problems:

- Adverse selection: Inability of the insurer to separate low-risk from high-risk agents.

Actuarially Fair premia:
Low-risk=15€/ha
High-risk= 35 €/ha
The whole Area=25€/ha

Loss ratios > 1



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5. The Role of insurance

Problems related to incomplete markets:

- Market-based Agricultural insurance is extremely limited
- Lack of collateral makes borrowing expensive or impossible (problems of rural banking)
- Forward contracting is very scarce
- Poor quality-graded and standardisation imposes in situ inspection of harvests

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Thank you شكرا

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