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Effective Adaptation Policies and Measures in Developing Countries

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One of the Keys to address: Mainstreaming adaptation into development

(Takemoto and Mimura, 2007)

- Climate risks are comprised of direct and indirect impacts.

☆ Direct impacts: air and sea temperature rise, change in precipitation intensity and volume, extreme meteorological events, etc.

☆ Indirect impacts: economic and social impacts such as deterioration of eco-system and sanitation, decrease of agricultural production , increase of infectious disease, increase of poverty

- Resilience against climate impacts in developing countries might be mostly determined by social and economic conditions.
- Stand-alone adaptation measures are not effective in developing countries. It is essential to mainstream adaptation into development policies.

How to address to integrate adaptation into development?

- Bottom up approach could be applicable considering characteristics of adaptation…
  - adapting capacity for present/short range climate variability
  - uncertainty on the impacts of CC
  - sectoral characteristic
  - local characteristic
- Target setting is essential for adaptation policy framework.
  - targets on funding (bilateral, multilateral, mandatory, voluntary)
  - targets on sustainable development (i.e., to double the crop yield, to improve water access, to decrease infant mortality (in line with MDG))
- Impacts and vulnerability assessment is particularly important in order to achieve the targets on sustainable development in cost effective manner.

Preliminary Estimate of the Costs of Additional Impacts of Climate Change and Adaptation (World Bank, 2006) Note: "B" denotes billion.

Item	amount per year	Estimated portion climate sensitive	Estimated costs of adaptation	Total per year (USD 2000)
ODA & Concessional Finance	$100B	40%	10 to 20%	$4B to $8B
Foreign Direct Investment	$160B	10%	10 to 20%	$2B to $3B
Gross Domestic Investment	$1500B	2 to 10%	10 to 20%	$3B to $30B
Total International finance				$6B to $11B
Total adaptation finance				$9B to $41B
Cost of additional impacts				$40B ($10B to $100B)

Estimate of additional costs for adaptation to climate risk (Unit: million US dollars) (Takemoto and Mimura, 2007)

Sectors	Additional adaptation cost	
	Lower estimation (10%)	Higher estimation (20%)
Water supply and sanitation	390	780
Agriculture, forestry and Fishery	400	800
Transport and storage	550	1100
Food aid	170	330
Climate risk sectors (broadly defined)	2,200	4,300

Estimation of future adaptation costs in developing countries (Takemoto and Mimura, 2009)

Takemoto and Mimura	US$ 2.2–4.3 billion/yr	Additional to conventional ODA
World Bank	US$ 4–41 billion/yr	Additional financial investments
UNDP	US$ 86 billion	By 2015
UNFCCC	US$ 28–67billion	By 2030

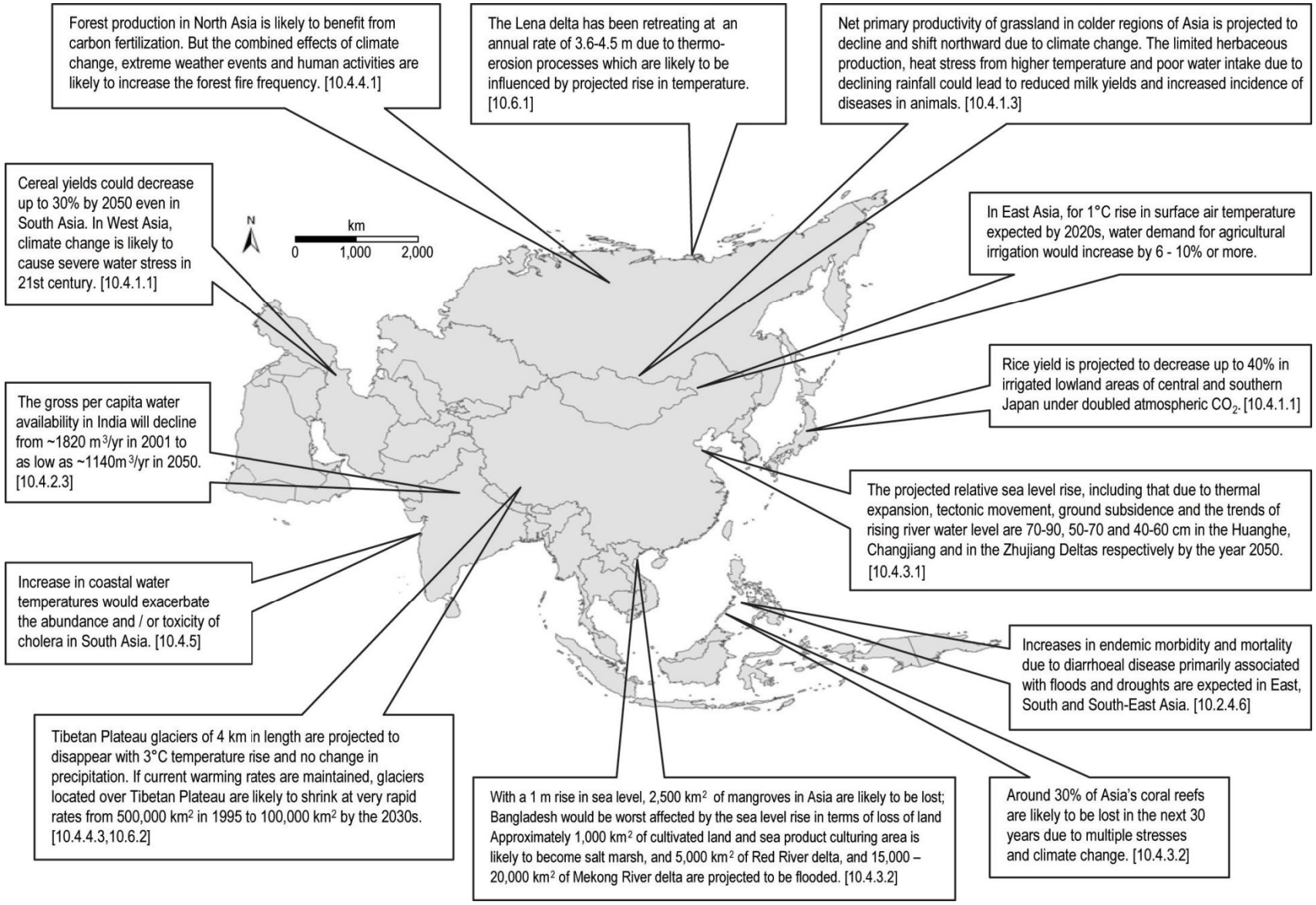
Climate risks : what is Asian vulnerability?

Will vulnerability gradually decrease thanks to economic development?

- More than 60% of the world's population concentrates in Asia.
- Coastal areas such as Mekong delta and Bangladesh are particularly vulnerable.
- Shortage of food supply due to decrease in crop yields and increase in population.
- Increase of population density, rise in sea level, increase in risk of flooding, and tidal wave due to rise in sea level, etc.
- Shortage of water supply due to melting of glaciers in the Himalayan Mountains, etc.

(IPCC AR4, 2007)

Climate impacts appear / will appear in whole Asia



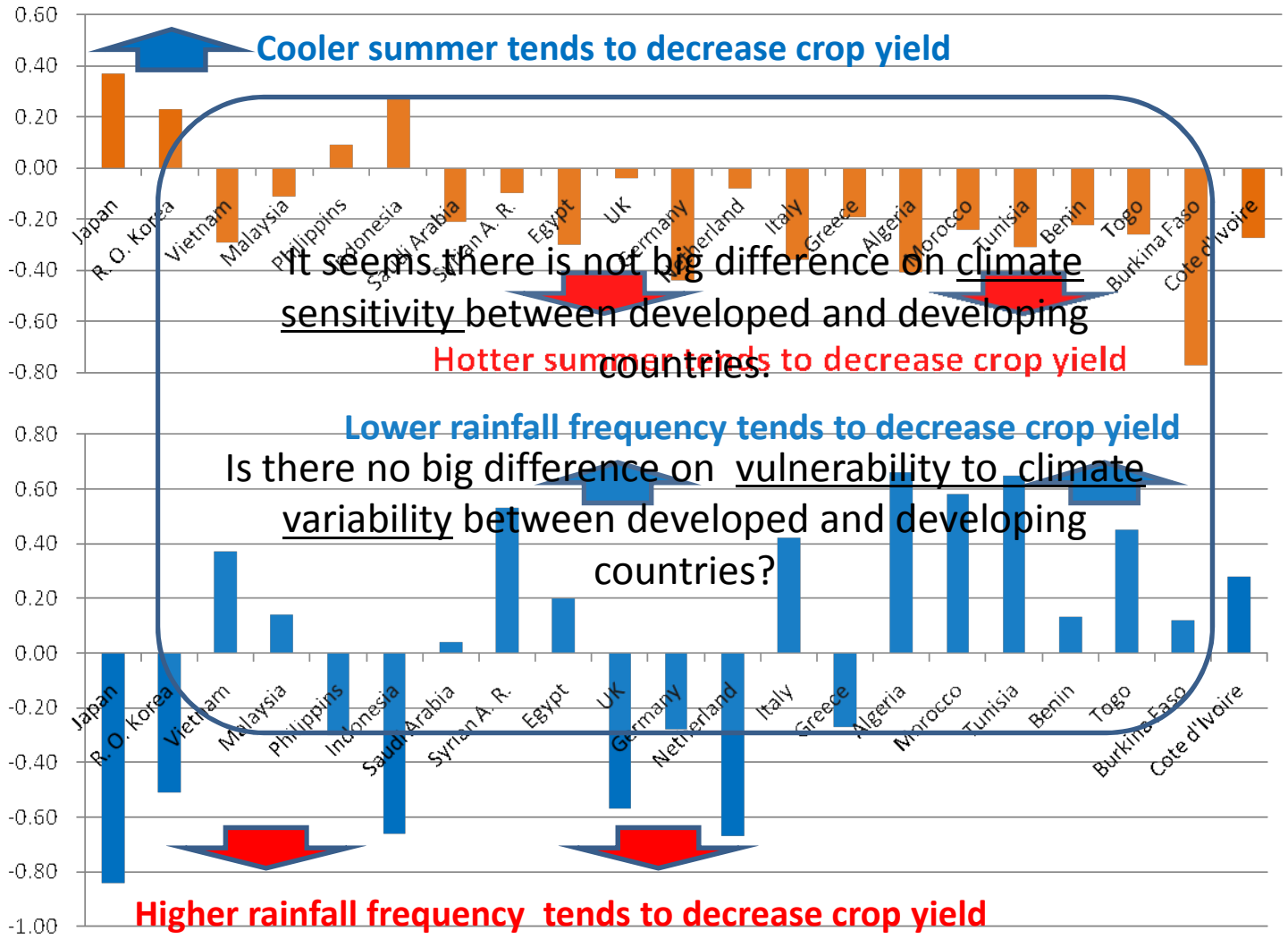
Hotspots of key future climate impacts and vulnerabilities in Asia.(IPCC AR4, 2007)

How to secure sustainable development path in agricultural sector in developing countries with minimizing impacts of climate change ?

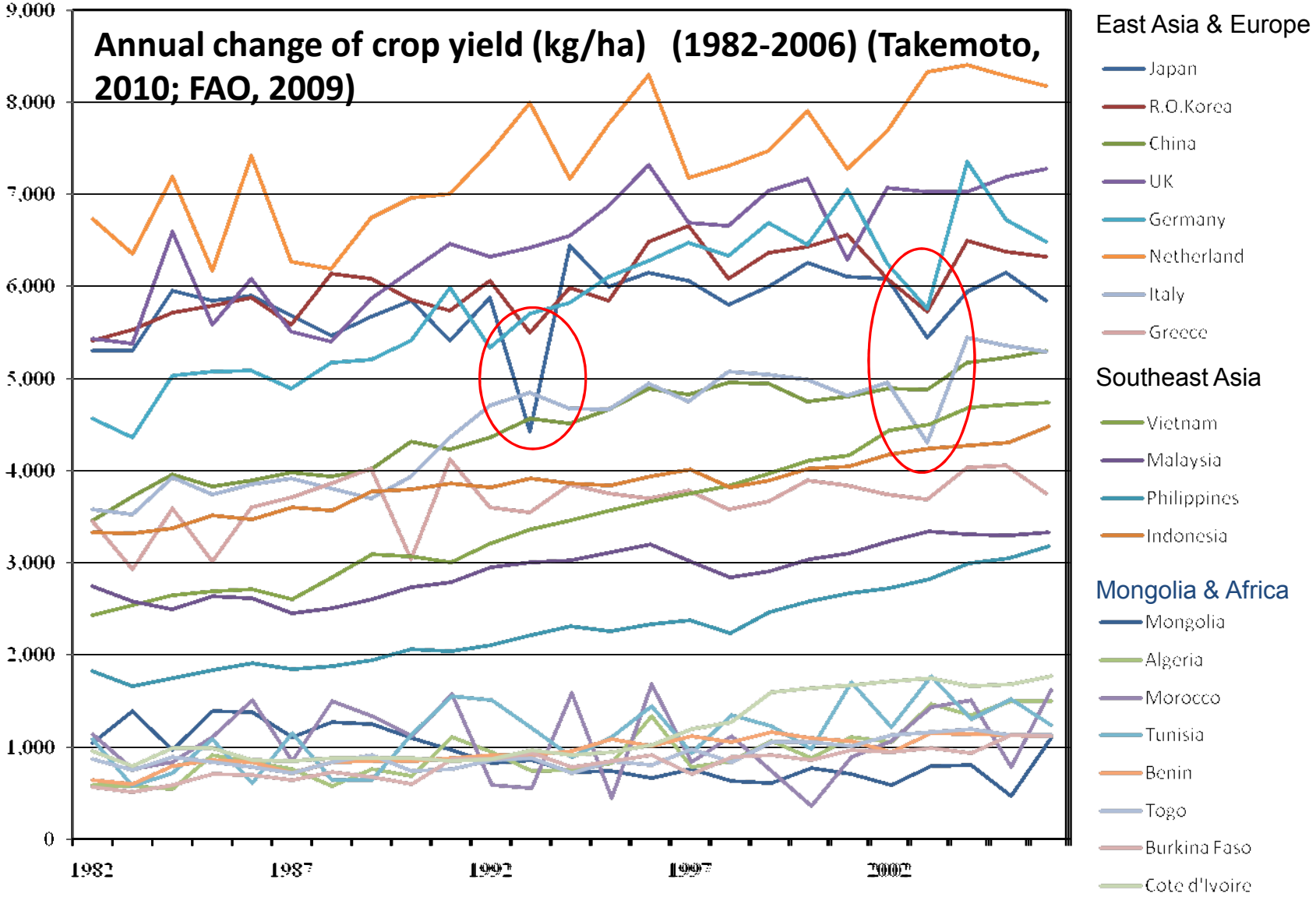
How much is crop yield sensitive to climate variability?
-comparison by countries- (Takemoto, 2010)

Up
Coefficient of first order correlation between annual variability of crop yield and that of average temperature

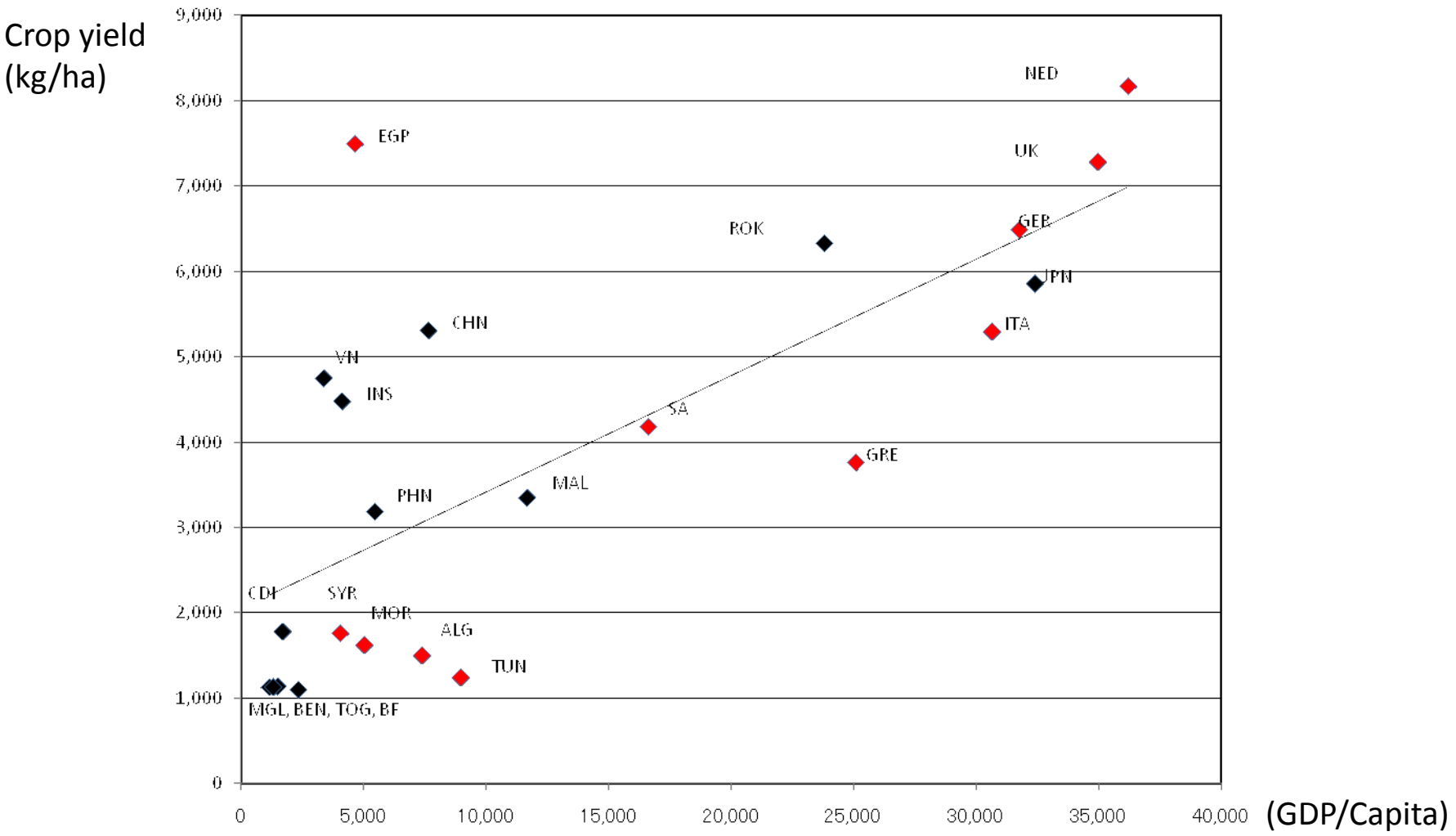
Bottom
Coefficient of First order Correlation between annual variability of crop yield and that of number of rainfalls



Countries having lower crop yield baselines have more social vulnerability (i.e.; indirect vulnerability to climate risk).
Increasing baseline of Agricultural productivity will reduce vulnerability to climate risk in Agriculture.



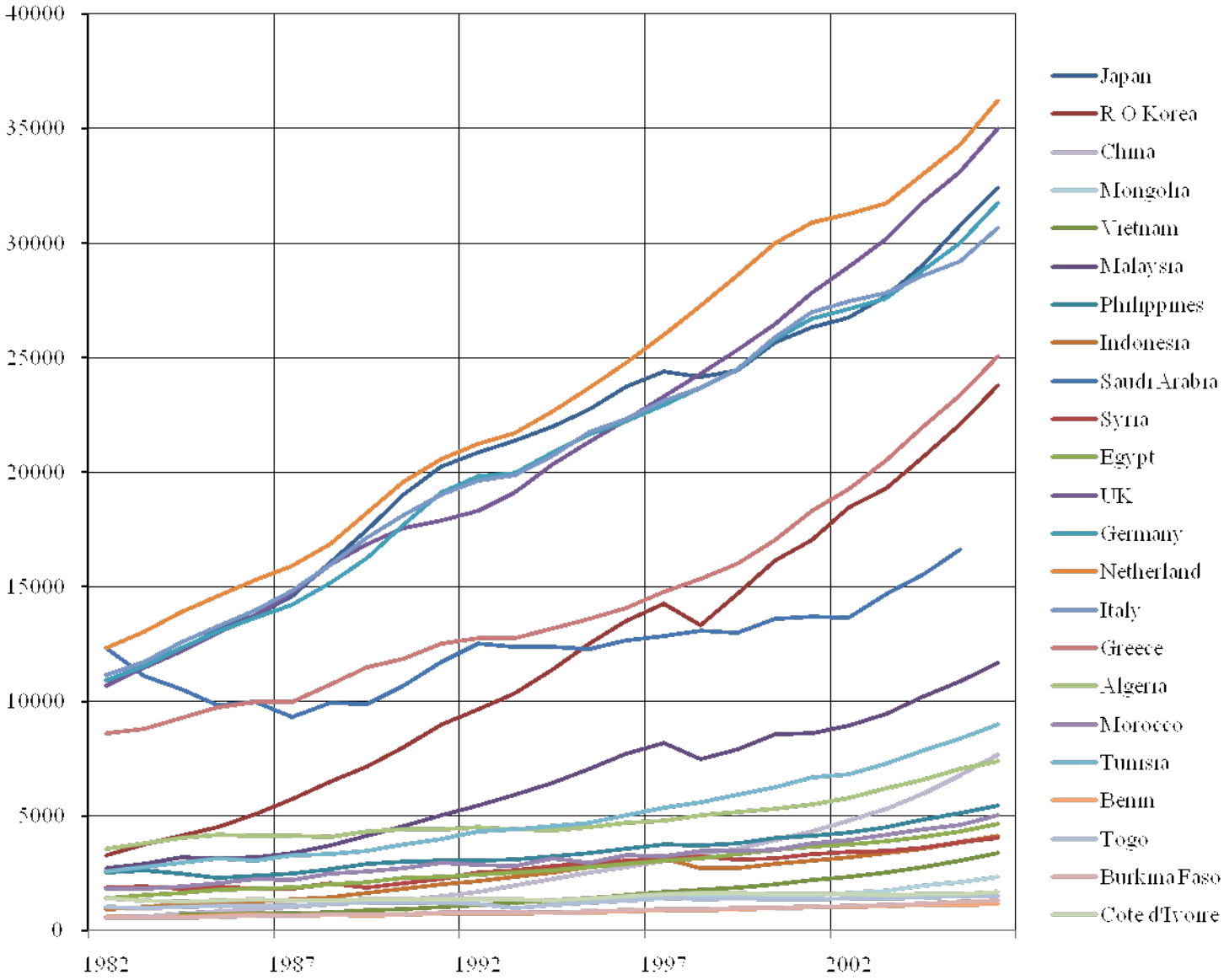
It is likely that economic growth will reduce vulnerability in agricultural sector.



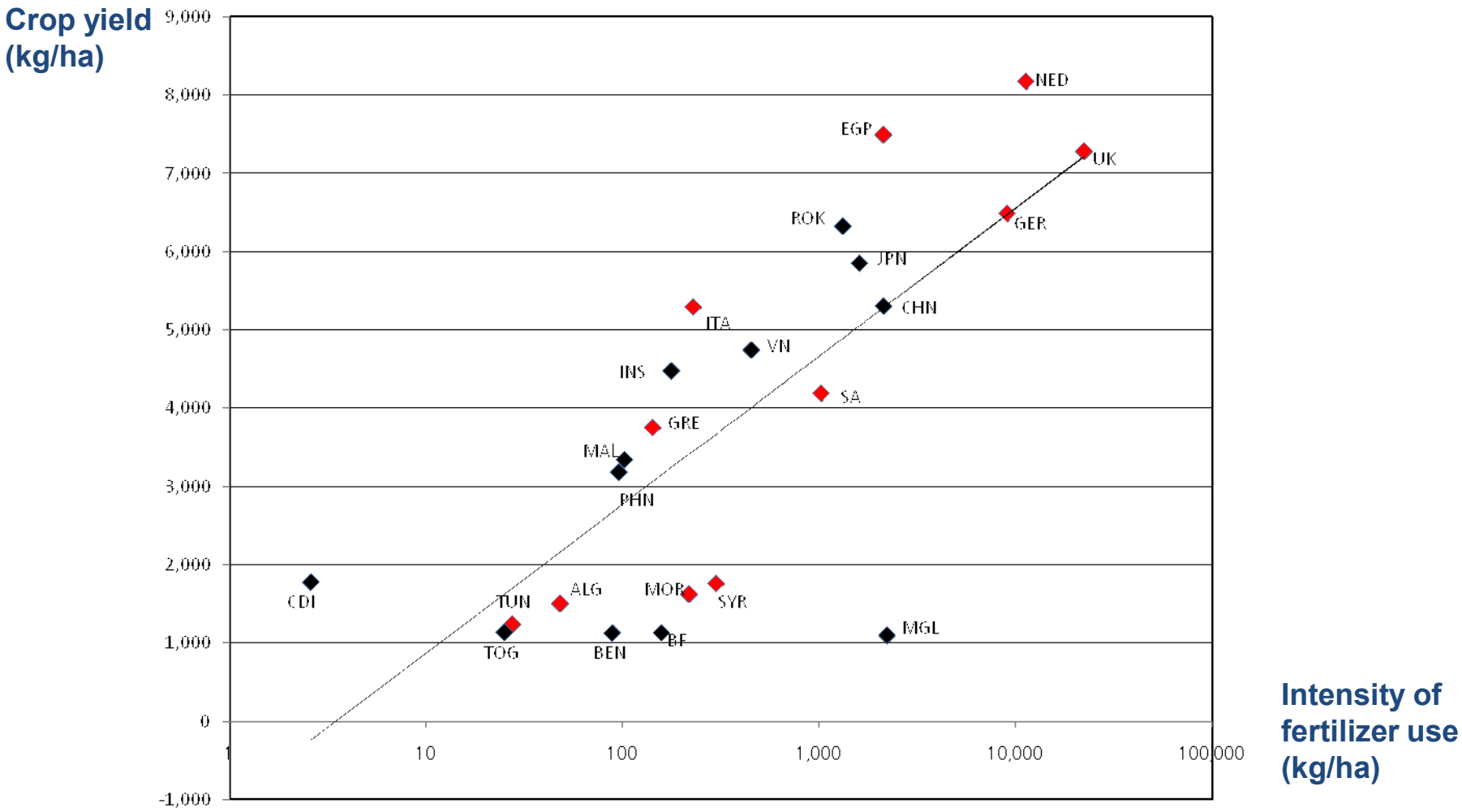
Correlation between GDP/capita (PPP) and crop yield (kg/ha)（data as of year 2006, except for Saudi Arabia(year 2005） linear correlation coefficient = 0.73（Takemoto, 2010; FAO, 2009; UNSD, 2009）

Annual change in GDP/capita (PPP, US$)(1982-2006)

(Takemoto, 2010; United Nations Statictics Divisions, 2009)

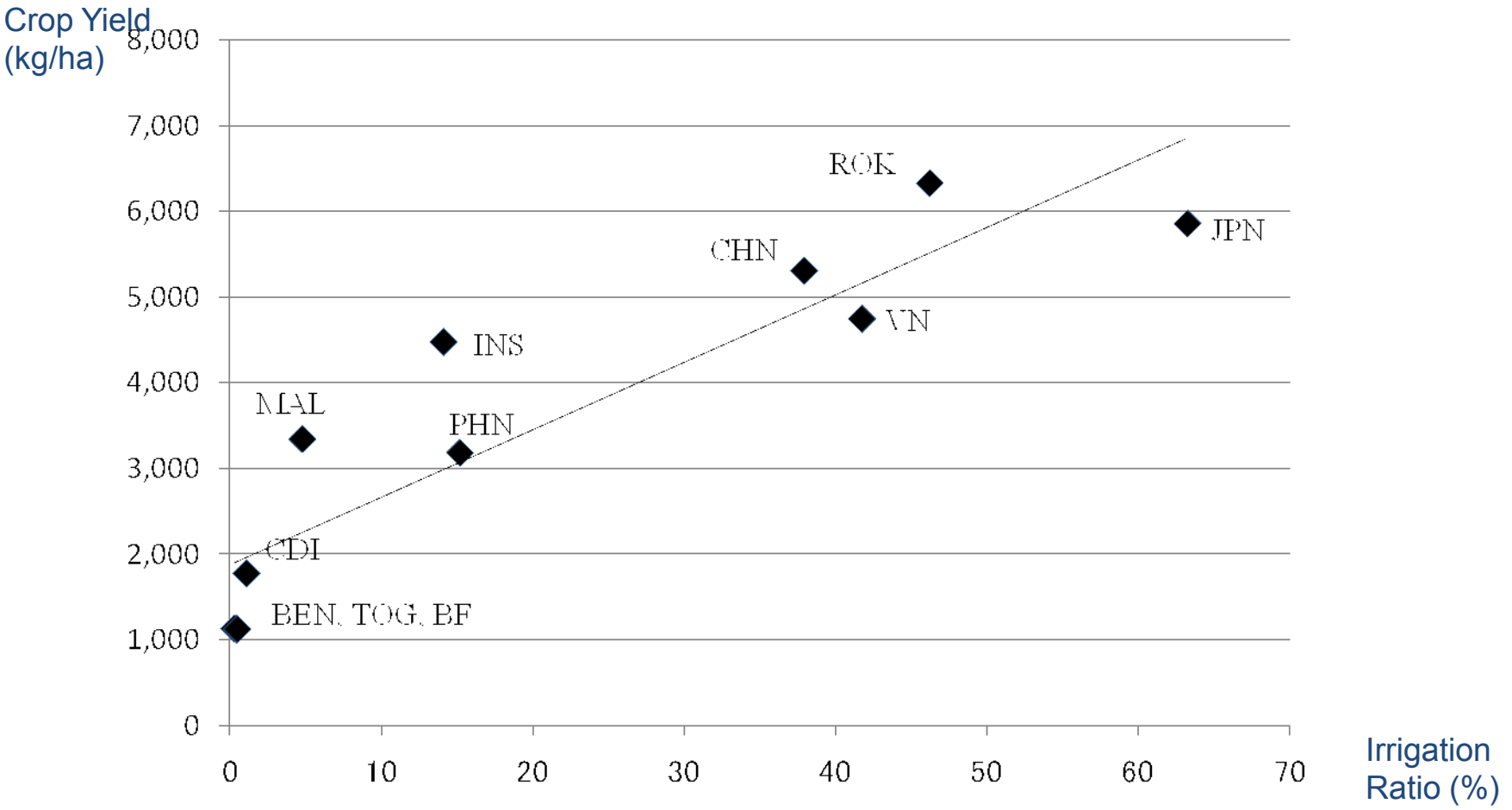


Usage of fertilizer will also enhance agricultural productivity (although water and soil pollution should be taken care of)



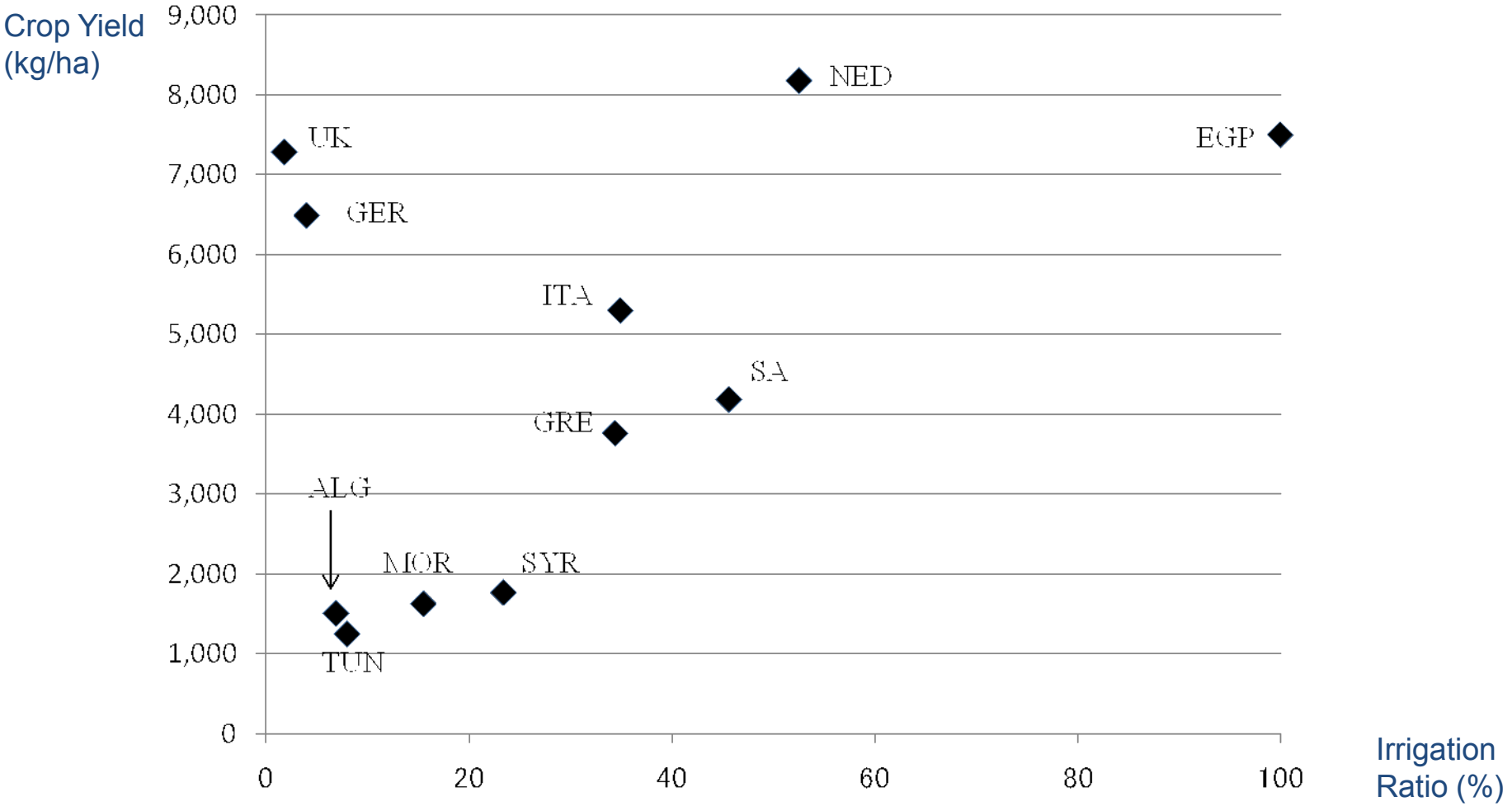
Correlation between Amount of Nitrogen fertilize (kg) per ha and crop yield (kg/ha)（as of year 2006, except for Benin (as of year 2002). Correlation coefficient is 0.84. (Takemoto, 2010; FAO, 2009).

Even in water-rich countries, irrigation is effective to raise rice productivity



Correlation between crop yield (2006) (kg/ha) and irrigation ratio(1998-2002) (%) in rice-producing countries (1982-2006) Correlation coefficient is 0.90。(Takemoto, 2010; AQUASTAT, 2009, FAO,2009)

In wheat production, relatively few rainfall is enough, however, in dry areas, irrigation is necessary.



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Strategy for mainstreaming adaptation into sustainable development (Takemoto and Mimura, 2009)

(1) Implementation of climate risk assessment

- present, sort-term time scale and local scale are particularly important
- Capacity enhancement on assessment technology is essential

(2) Analyses on past development projects in the target countries and their relation to climate risk to learn from past experiences

- Key sectors peculiar to the target countries
- Type of development funds implemented in the countries

(3) Prioritizing projects by taking into consideration both the extent of climate change risks and the needs of the target countries

- **WIN-WIN policy should be implemented (beneficial to community first, capable to adapt to climate risk as well)**
- Mal-adaptation should be avoided (Infrastructure projects in areas that would be vulnerable to climate risks)

Thank you for your attention!