WATER AVAILABILITY FOR AGRICULTURE

CHALENGE AND COPING STRATEGY

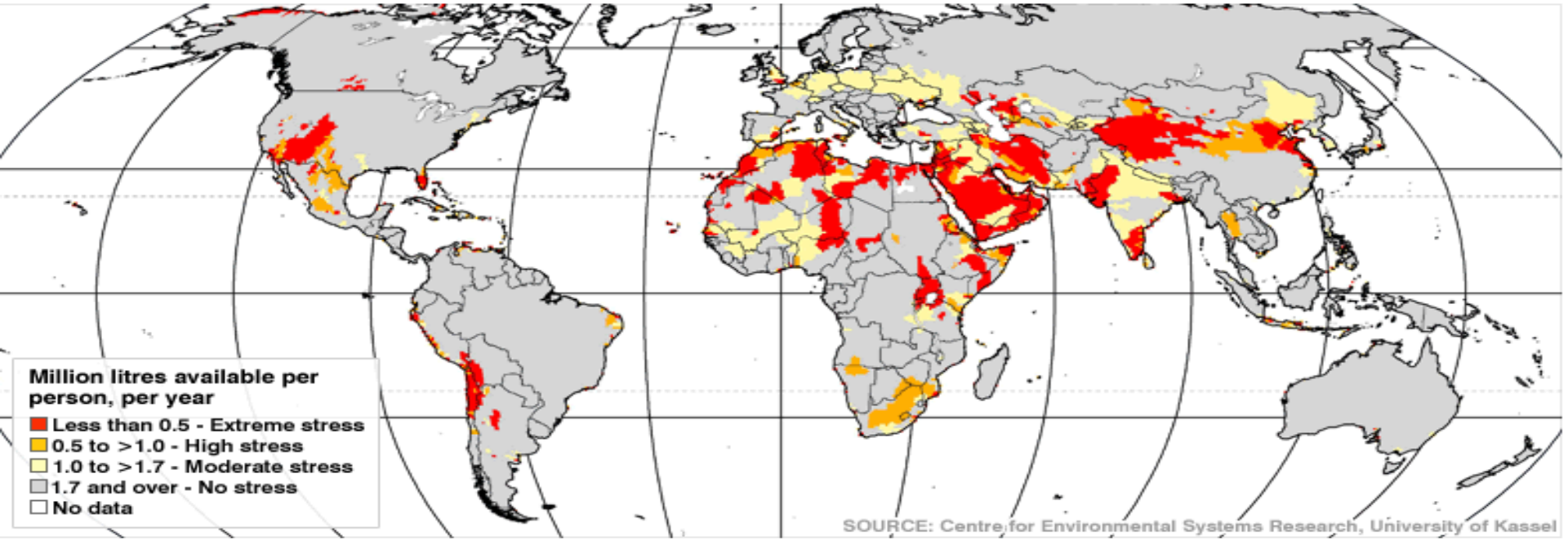
AGENCY FOR AGRICULTURAL RESEARCH & DEVELOPMENT
Agro-climatology and Hydrology Research Institute

Challenges in Water Resource Management

- Amid growing demand with increasing population and developing economy, water supply is decreasing due to watersheds degradation → *458 urgently need rehabilitation*
- The scarcity is aggravated with malfunctioning delivery systems and more frequent flood and drought
- With current water utilization about 80% supply for agriculture will certainly decrease in increasingly tight competition
- Proportional water sharing is hindered by weak user associations

HOW WATER AVAILABILITY MAY CHANGE, AS TEMPERATURES, POPULATION AND INDUSTRIALISATION INCREASE

1961-90



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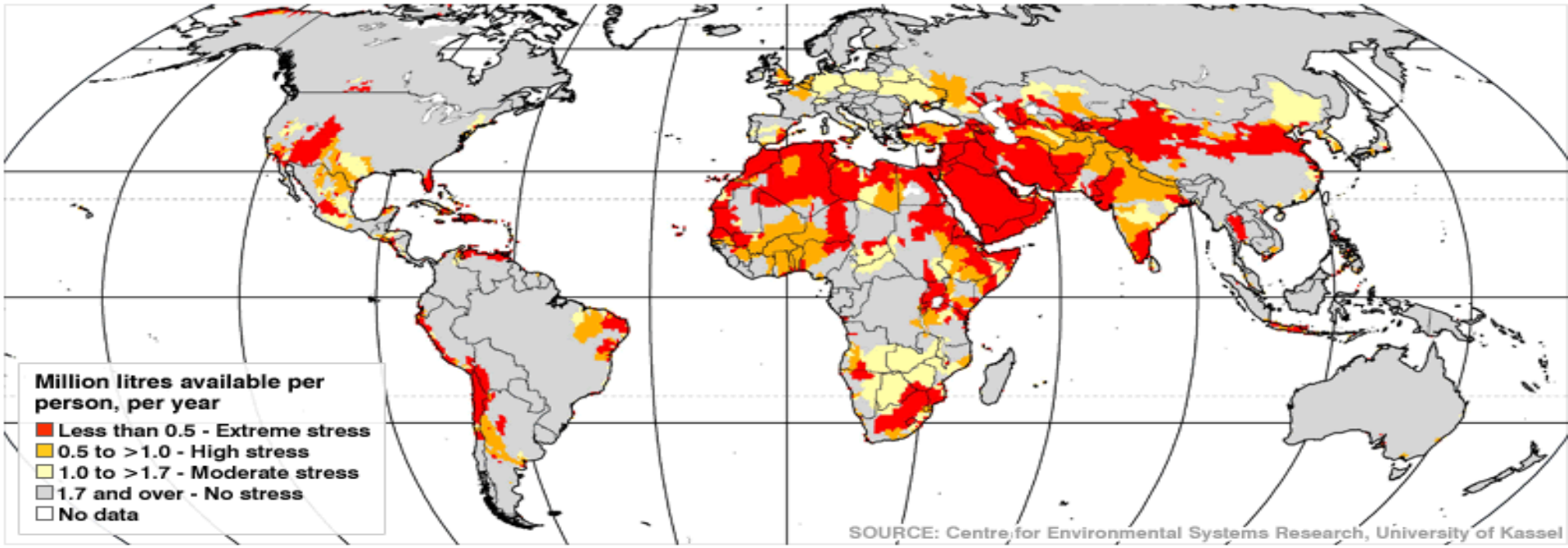
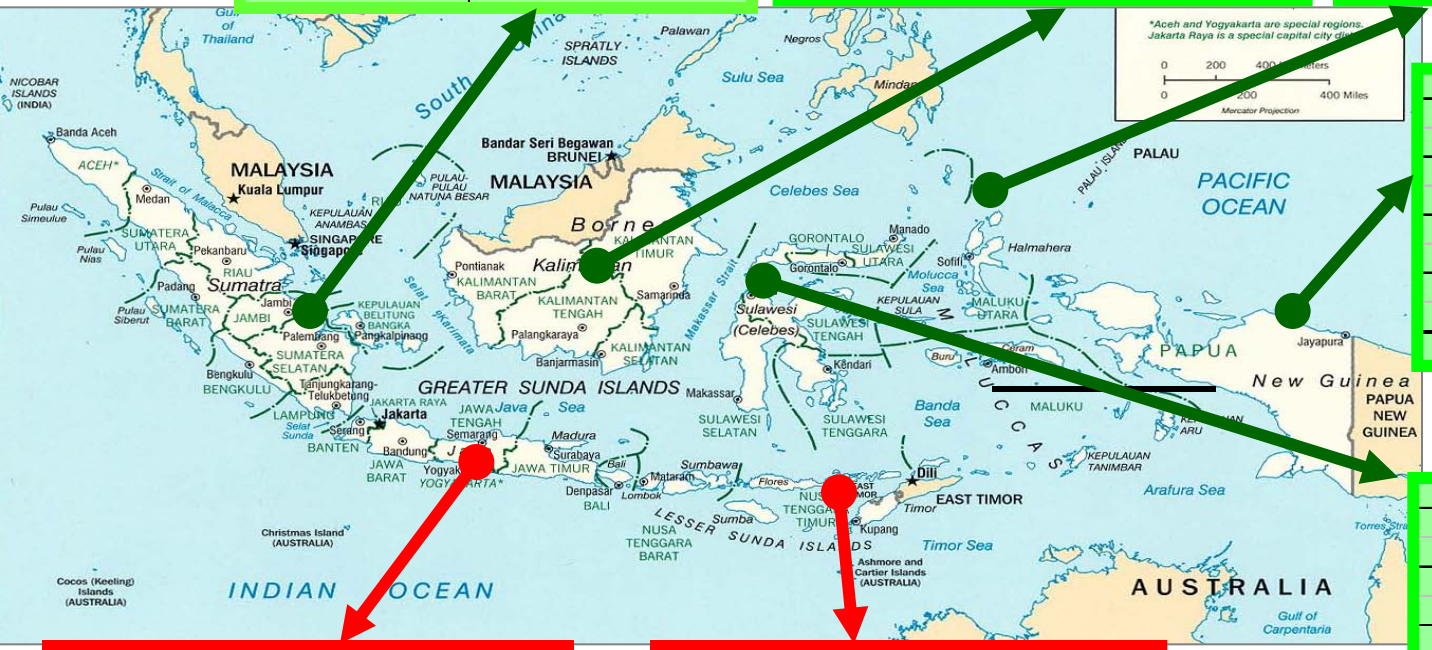


SUMATERA ISLAND	
TOTAL WATER AVAILABILITY	
480.968,0 (MCM)	25 % Tot. Nas
RAINY SEASON	DRY SEASON
384.774,4 (MCM)	96.193,6 (MCM)
TOTAL WATER REQUIREMENT	
19.965,7 (MCM)	18 % Tot. Nas
RAINY SEASON	DRY SEASON
8.319,0 (MCM)	11.646,7 (MCM)
SURPLUS	SURPLUS

KALIMANTAN ISLAND	
TOTAL WATER AVAILABILITY	
556.699,0 (MCM)	28 % Tot. Nas
RAINY SEASON	DRY SEASON
389.689,3 (Juta m^3)	167.009,7 (Juta m^3)
TOTAL WATER REQUIREMENT	
4.898,0 (MCM)	4 % Tot. Nas
RAINY SEASON	DRY SEASON
2.040,8 (MCM)	2.857,2 (MCM)
SURPLUS	SURPLUS

MALUKU ISLAND	
TOTAL WATER AVAILABILITY	
61.776,0 (MCM)	4 % Tot. Nas
RAINY SEASON	DRY SEASON
49.420,8 (MCM)	12.355,2 (MCM)
TOTAL WATER REQUIREMENT	
235,7 (MCM)	0.2 Tot. Nas
RAINY SEASON	DRY SEASON
98,2 (MCM)	137,5 (MCM)
SURPLUS	SURPLUS



PAPUA ISLAND	
TOTAL WATER AVAILABILITY	
545.377,0 (MCM)	28 % Tot. Nas
RAINY SEASON	DRY SEASON
381.763,9 (MCM)	163.613,1 (MCM)
TOTAL WATER REQUIREMENT	
137,2 (MCM)	0.1 % Tot. Nas
RAINY SEASON	DRY SEASON
57,2 (MCM)	80,0 (MCM)
SURPLUS	SURPLUS

SULAWESI ISLAND	
TOTAL WATER AVAILABILITY	
143.778,0 (MCM)	7 % Tot. Nas
RAINY SEASON	DRY SEASON
129.400,2 (MCM)	14.377,8 (MCM)
TOTAL WATER REQUIREMENT	
15.440,0 (MCM)	14 % Tot. Nas
RAINY SEASON	DRY SEASON
6.433,3 (MCM)	9.006,7 (MCM)
SURPLUS	SURPLUS

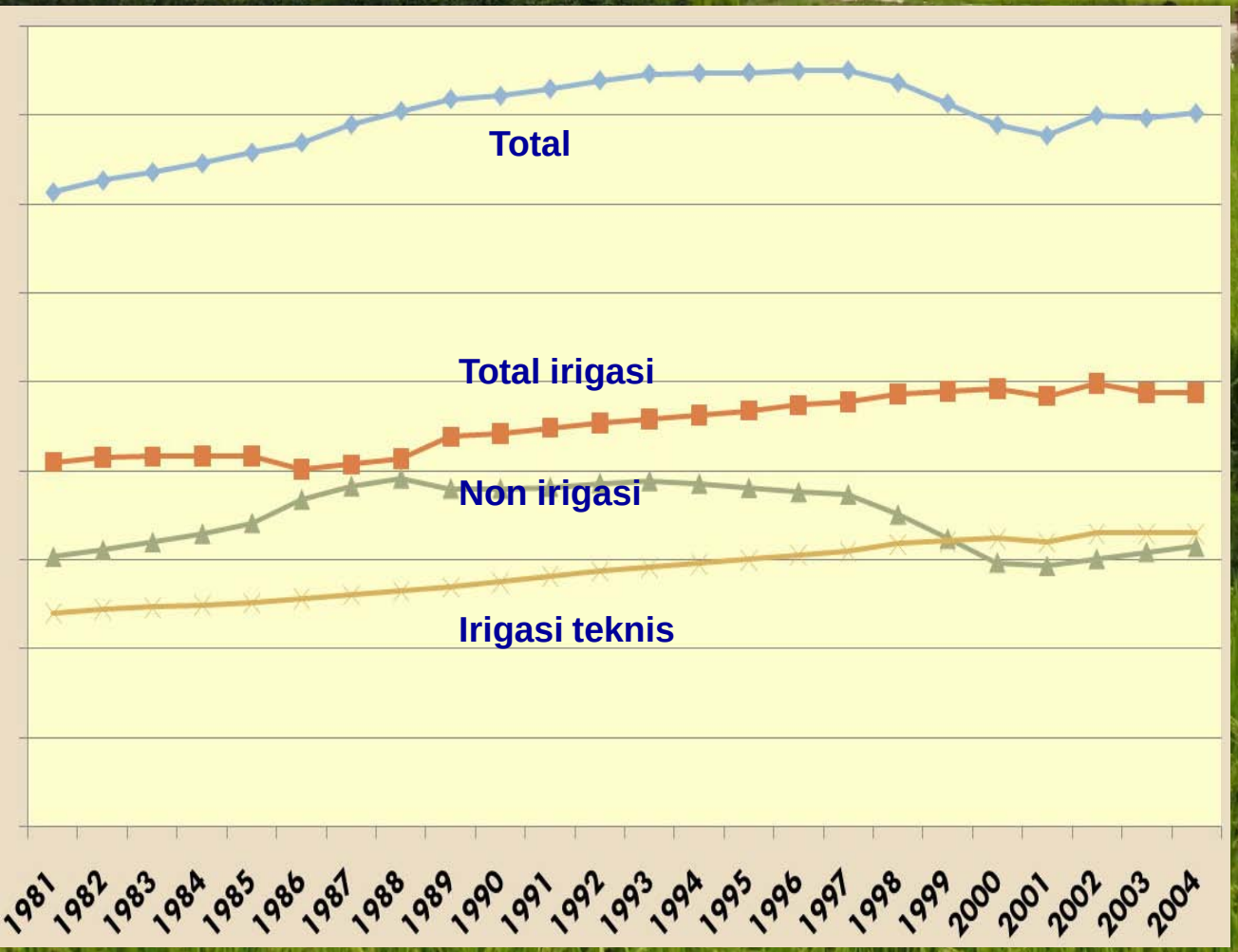
JAVA AND BALI ISLAND	
TOTAL WATER AVAILABILITY	
126.451,0 (MCM)	7 % Tot. Nas
RAINY SEASON	DRY SEASON
101.160,8 (MCM)	25.290,2 (MCM)
TOTAL WATER REQUIREMENT	
65.839,1 (MCM)	59 % Tot. Nas
RAINY SEASON	DRY SEASON
27.432,9 (MCM)	38.406,1 (MCM)
SURPLUS	DEFICIT

NUSA TENGGARA ISLAND	
TOTAL WATER AVAILABILITY	
42.156,0 (MCM)	2 % Tot. Nas
RAINY SEASON	DRY SEASON
37.940,4 (MCM)	4.215,6 (MCM)
TOTAL WATER REQUIREMENT	
5.760,0 (MCM)	5 % Tot. Nas
RAINY SEASON	DRY SEASON
1.440,0 (MCM)	4.320,0 (MCM)
SURPLUS	DEFICIT

WATER BALANCE PER ISLAND

Source : Sub Directorate of Hydrology, Public work, 2003

Development of Paddy Fields (M ha) 1981--2004



Not All of the Irrigated Lands are Fuctioning

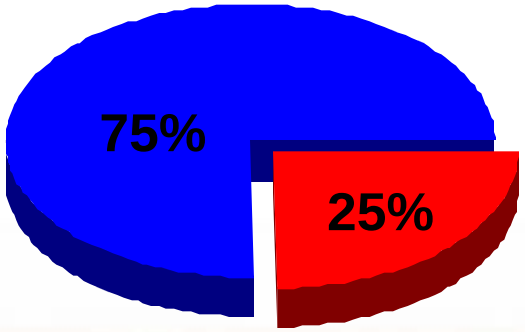
NON SWAMPY LAND → **IRRIGATED LAND : 8.59 million ha** ← **SWAMPY LAND**

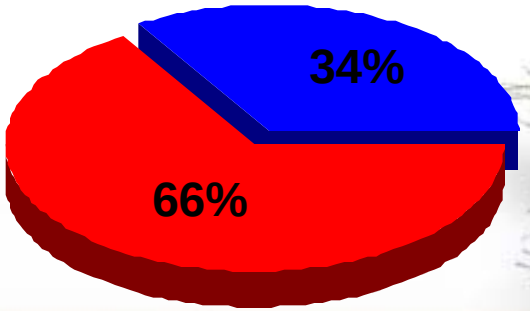
Installed : 6.77 M ha

- Functioning : 5.10 M ha (30% damaged)
- Not Functioning : 1.67 M ha

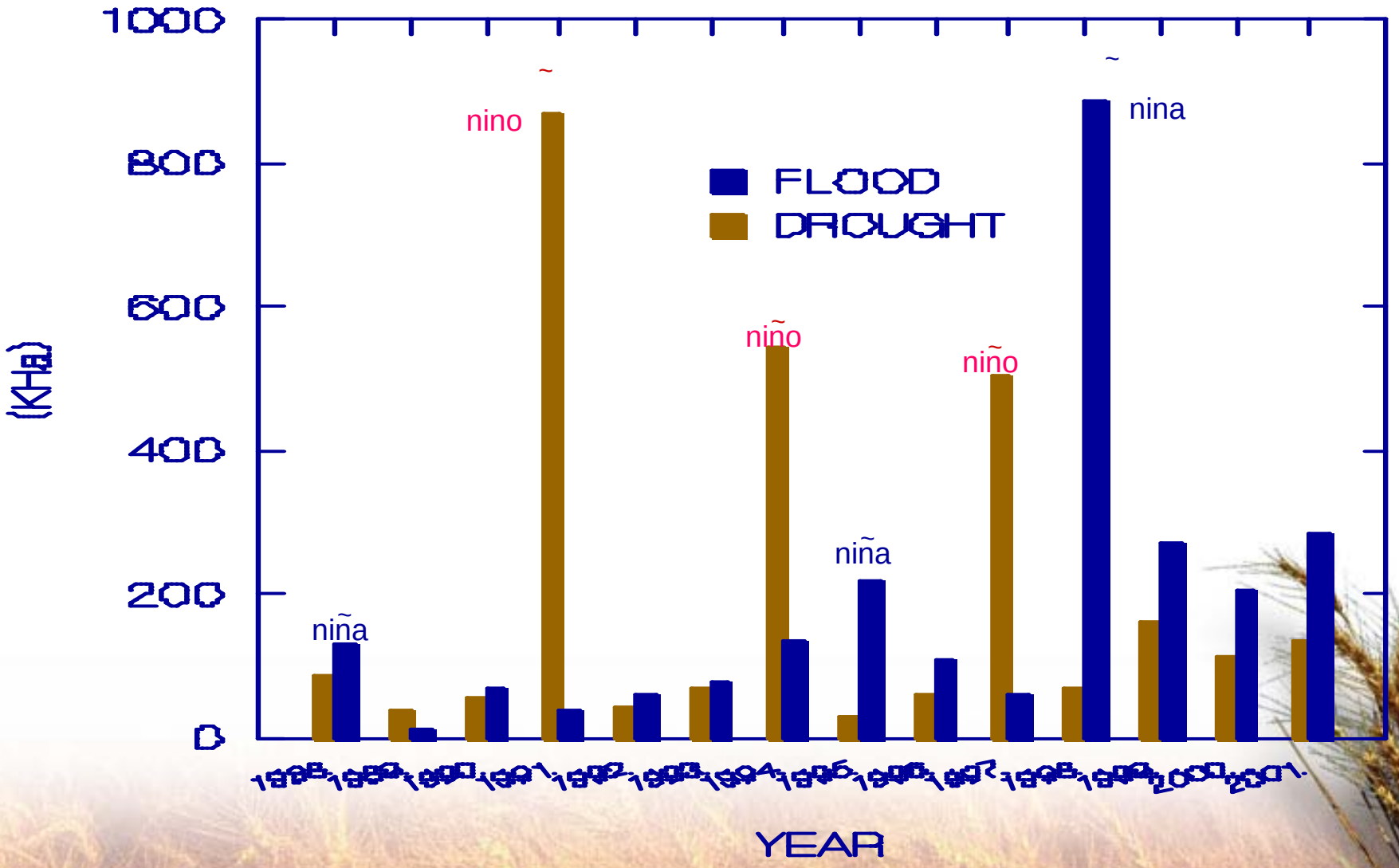
Installed : 1.82 M ha

- Functioning : 0.61 M ha
- Not Functioning : 1.21 M ha

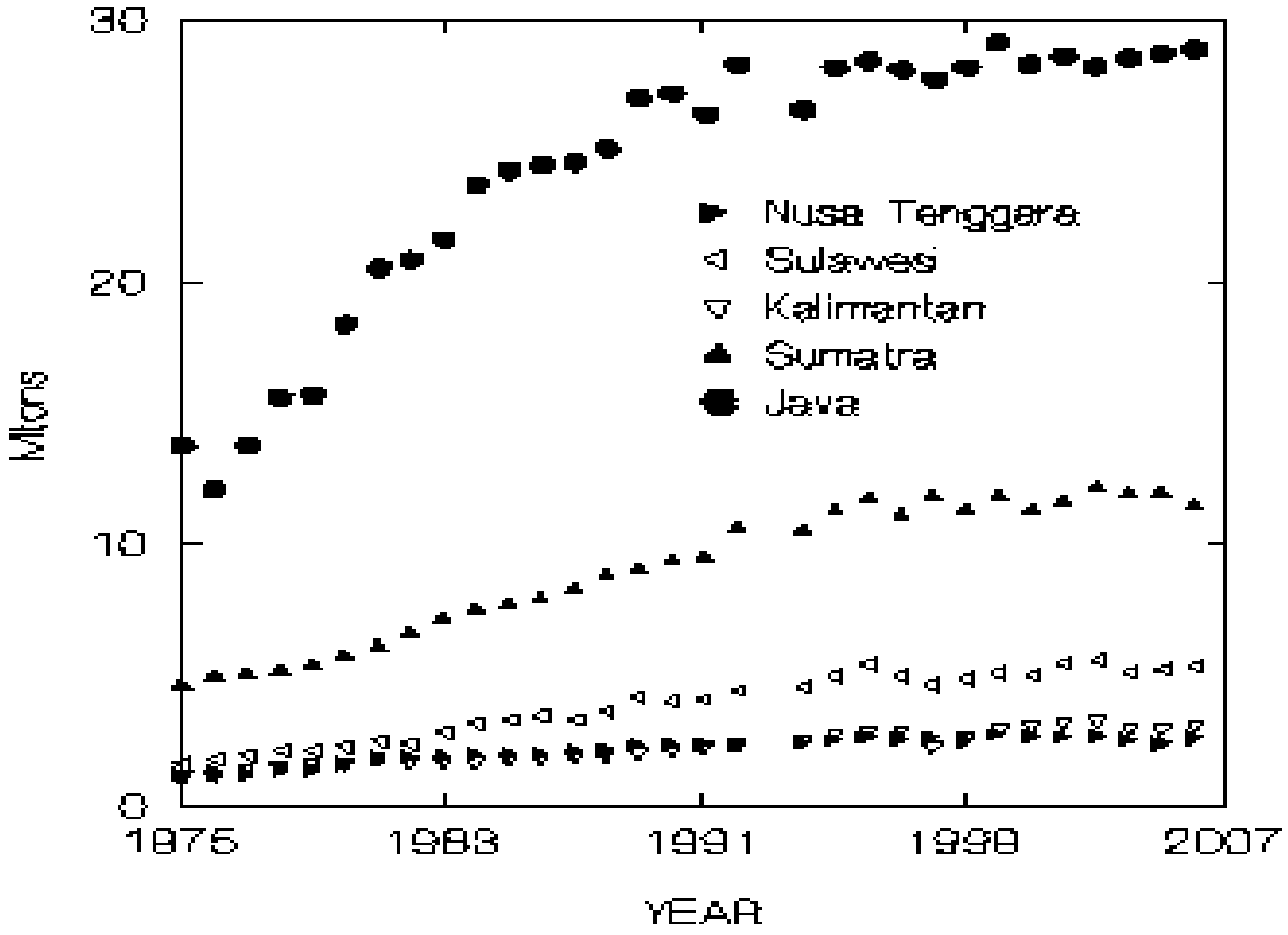




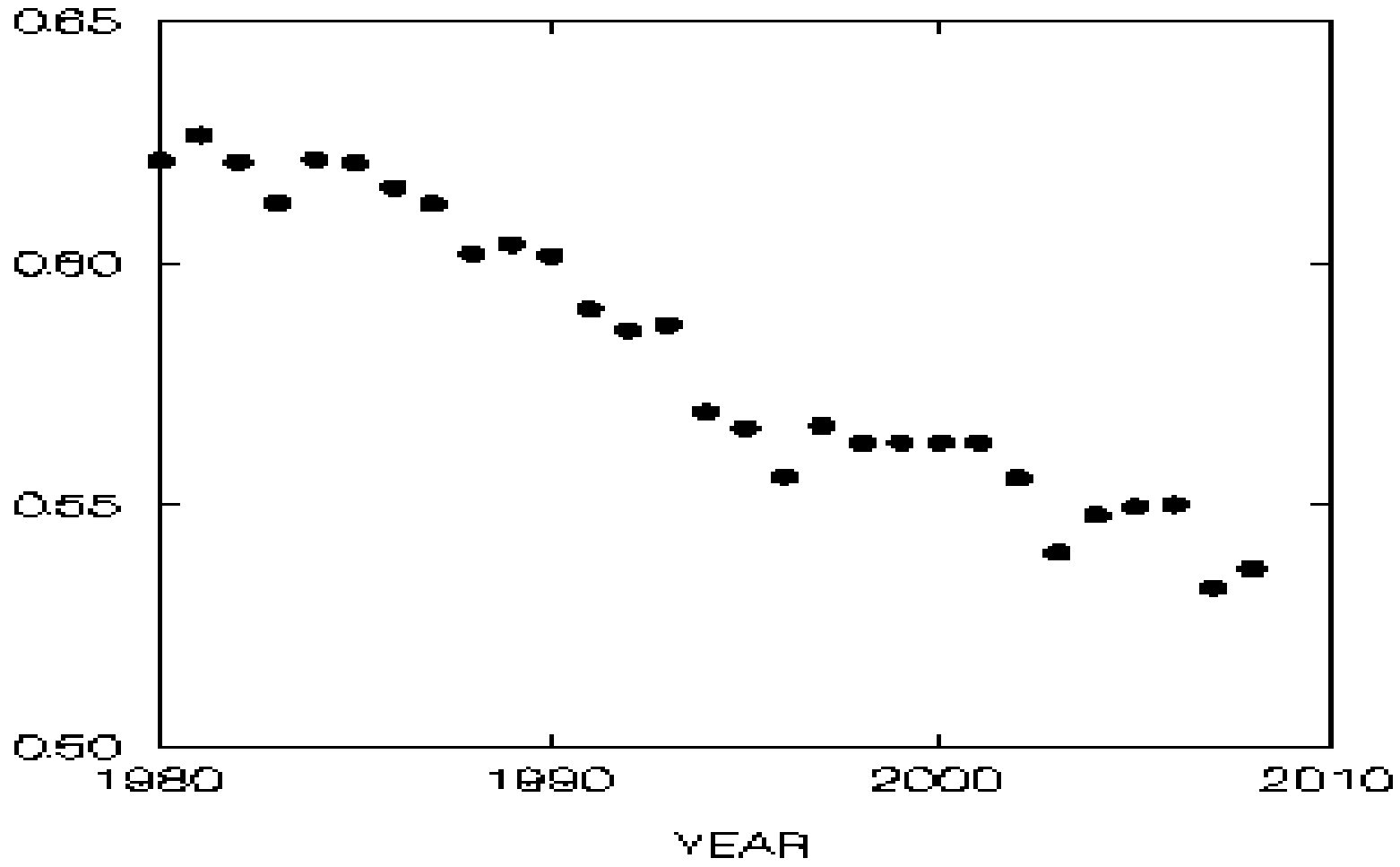
Flood and Drought Affected Rice Fields



Regional Rice Production in Indonesia



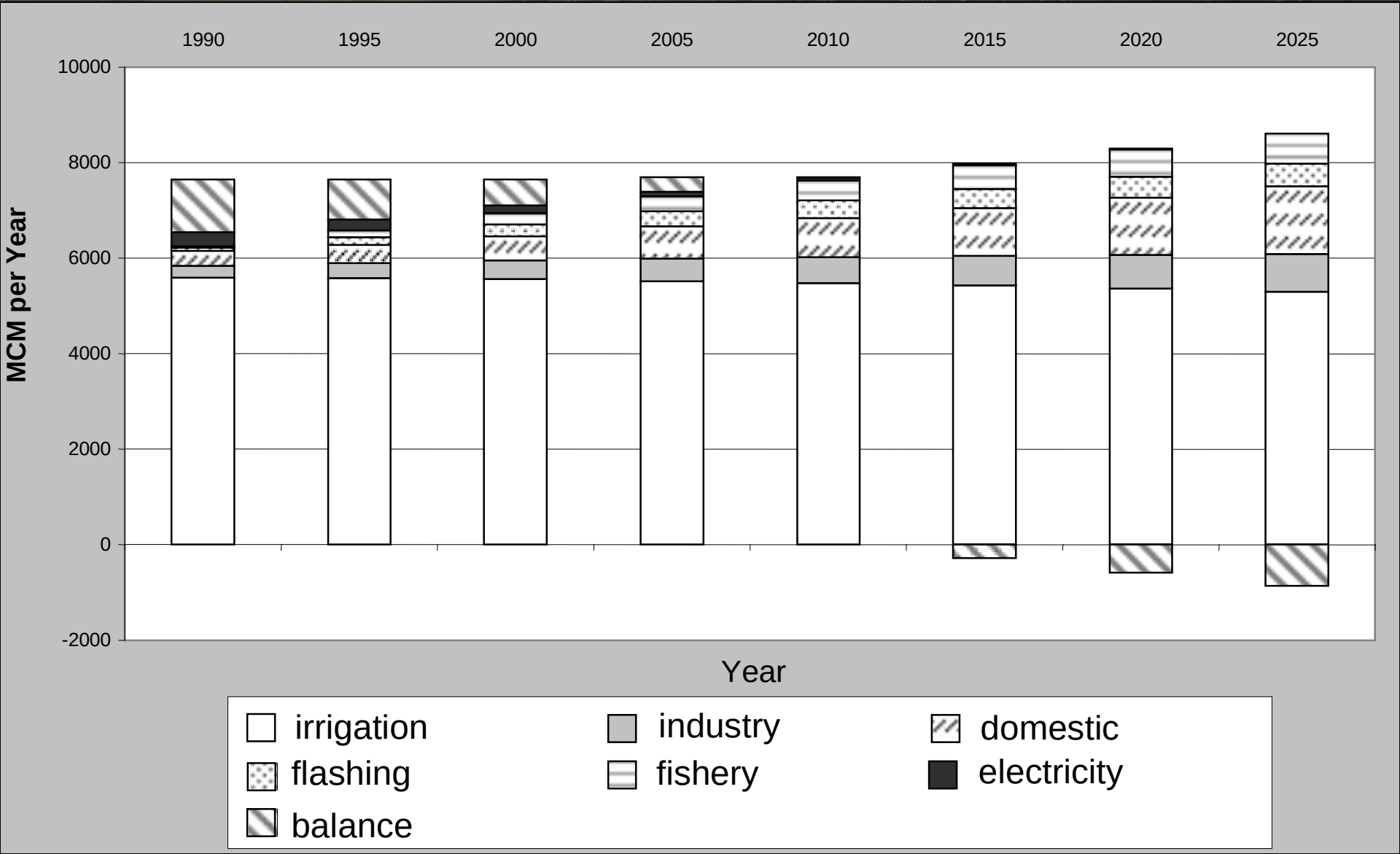
Declining Contribution of Java to the National Rice Production



URBANISATION

- Not only is the world's population predicted to grow (until the middle of the century, at least) but more people are moving to live in cities
- The growth of cities will accelerate the depletion of water resources, which in turn may drive more country dwellers to leave the land.

WATER UTILIZATION TREND IN JAVA



Laissez Faire Approach in Water Governance

- Rice, a water thirsty crop as staple food
  - It requires ~ 3000 liters of water to produce one kg of rice
  - The more affluent a rice consuming country, the less it consumes rice
  - In the past an all out approach to attain rice self sufficiency
- Minor departments in water governance
  - Met Service formerly part of Transportation Ministry for water in the atmosphere
  - Forestry for water in the catchment areas
  - Public Works for water in the rivers and managed lakes
  - Energy and Mineral Resource for groundwater

Adaptation Options for Water Shortage

SUPPLY SIDE

- Prospecting and extracting
- Increasing storage capacity
- Expansion of rainwater harvesting
- Removal of invasive non active vegetations
- Inter-basins water transfer
- Desalination of seawater

DEMAND SIDE

- Improvement of water use efficiency by recycling
- Reduction in water demand for irrigation by changing crop calendar, crop mix, irrigation method, area planted and when necessary by importing agricultural products *i.e.* virtual water
- Expansion of water markets to allocate water to highly valued uses
- Expansion of indigenous practices for sustainable uses

APPROACHES

With little can be done on supply side,
adjustment to be focused
on demand side
by
using less
to produce more

Introduction of Adaptive Crop Varieties

Drought tolerant

- *Rice*: Dodokan, Silugonggo, S 3382, BP 23
- *Maize*: Bima3, Bantimurung, Lamuru, Sukmaraga, Anoman
- *Soybean*: Argomulyo, Burangrang
- *Peanut*: Singa, Jerapah
- *Mungbean*: Kutilang

Inundation tolerant

- *rice lines*: GHTR1; IR69502-6-SRN; IR7081-5-PMI; IR70213-9-CPA; IR70215-2-CPA

CAPILLARY IRRIGATION FOR SLOPING LANDS

Semin Village, Gunung Kidul

DRIP IRRIGATION

Selopamioro Village, Bantul

Works on Supply Side: On Farm reservoir

	
Gunung Sugih, Central Lampung	Playen, Yogyakarta

Channel Reservoir in Land Scarce Areas

Bunder Village, Gunung Kidul

Bogor, West Java

Closing Remarks

- Climate change will particularly affects fresh water resources, upsetting the timing and quantity of downstream flows

- To cope with imminent water scarcity in Java where little can be attained in supply side; reduce, reuse and recycle in demand side is imperative

- Proper governance and participatory approach in water resource management will ensure a fair and sustainable water utilization