



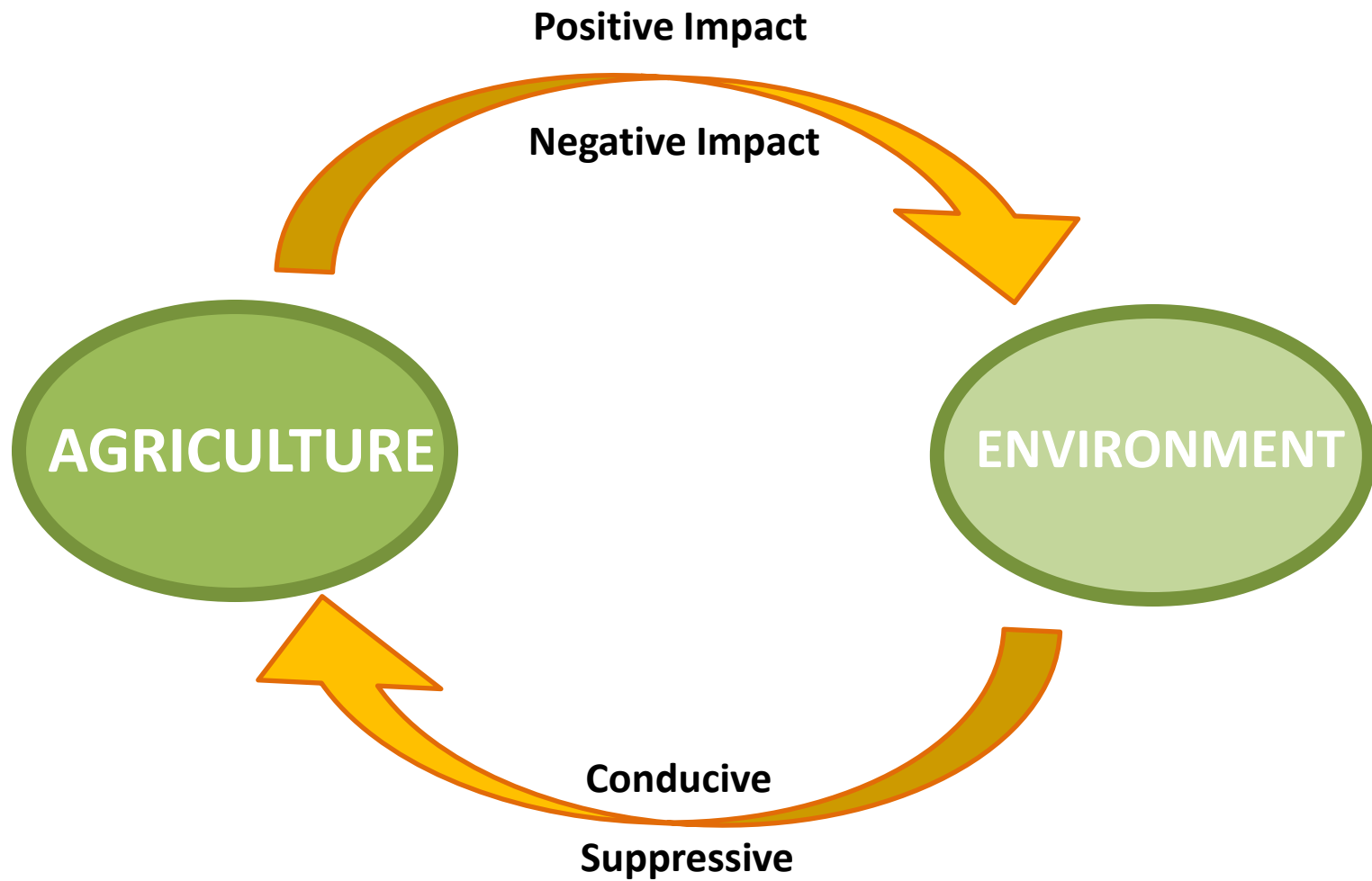
# Agriculture and Environmental Sustainability

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# Role of Agriculture

- ▣ Food production
- ▣ Production of raw material for industry
- ▣ Labor
- ▣ Basis of culture

# Agriculture – Environment: Reciprocal Interaction



# Agriculture – Activities

- ❑ Land clearing
- ❑ Determine crop species and varieties
- ❑ Soil and water management (tillage, mulching, terracing, irrigation, cover crops)
- ❑ Application fertilizers (inorganic, organic, bio)
- ❑ Pesticides herbicides, insecticides, fungicides
- ❑ Harvesting
- ❑ Product/input transportation

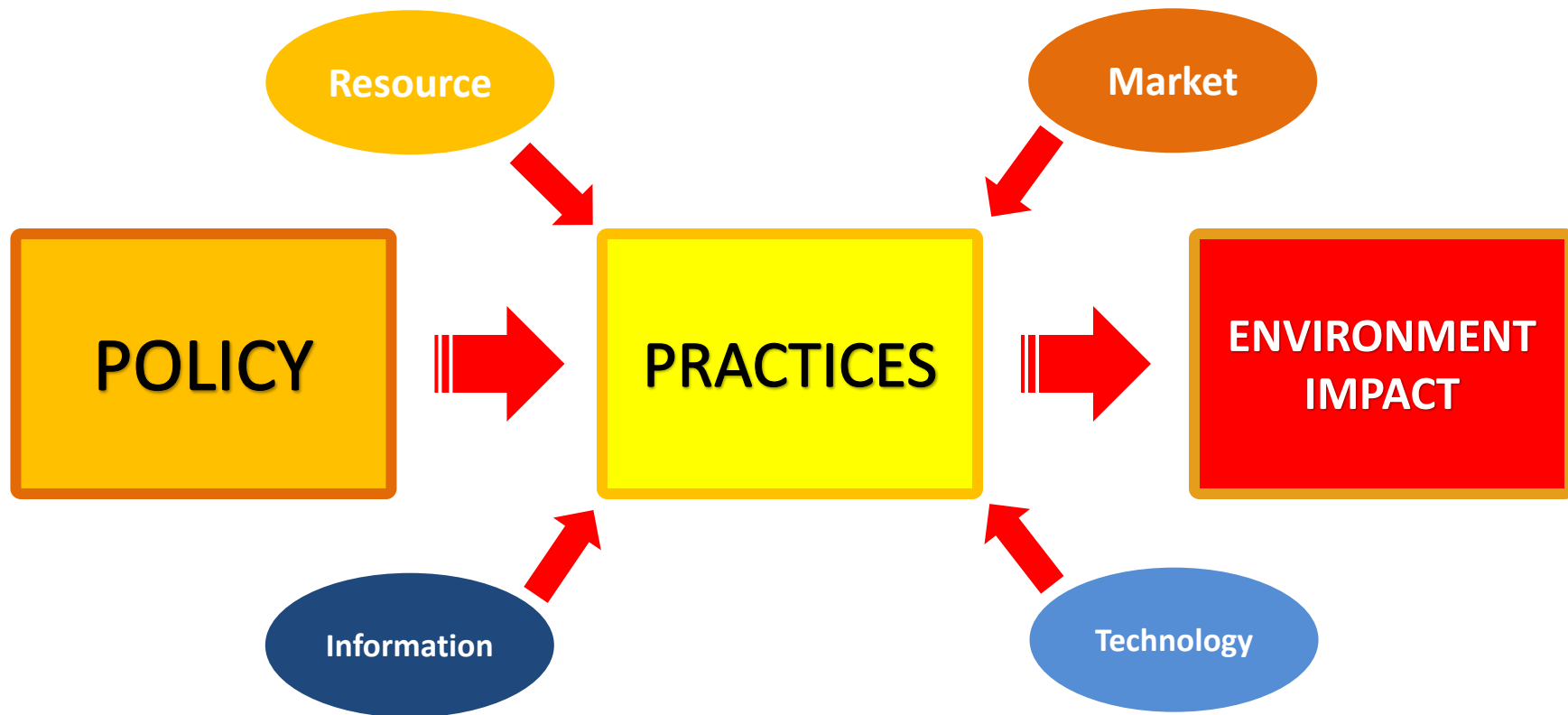
# Environment Affect Agriculture

- ❑ Water quality and quantity
- ❑ Buffering capacity against pests and diseases
- ❑ Soil quality
- ❑ Climatic factors
- ❑ Pollinator insects

# Level, Component, and Factors of Sustainability

- **Level influencing sustainability:**
  - Field
  - Farm
  - Community
  - National
  - International
- **Component of sustainability :**
  - Ecological
  - Economic
  - Social/Institutional
- **Factors influencing Sustainability:**
  - Policy
  - Practices

# How Agriculture Affect Environment



# Impact of Agriculture on the Environment

- ❑ Biodiversity (species, variety, microbes, below ground)
- ❑ Soil and water pollution
- ❑ Declining soil fertility (organic matter, salinity, pH, micro nutrients, water infiltration)
- ❑ Death of beneficial organism (aquatic and terrestrial)
- ❑ Insect pests and pathogens resistance
- ❑ Explosion of pests explosions and plant diseases epidemics
- ❑ Green house gases



## Bio-intensive IPM on Rice

(Superior PGPR- plant growth promoting rhizobacteria  
 , Straw amendment, 30 % NPK reduction, Zero pesticides)  
 Tegal- Indonesia (2011-2012)

	Yield (ton/ha) at i-th Growing Season		
	I	II	III
Conventional	6.25	6.29	6.37
Bio-IPM	5.64	6.27	6.88

	Benefit ( x 1 million rupiahs/ha) at i-th Growing Season		
	I	II	III
Conventional	11.99	12.45	13.56
Bio-IPM	12.75	13.86	15.6

Productivity achieve same level to conventional – 2<sup>nd</sup>  
 season, More benefit for Bio IPM from – 1<sup>st</sup> season,

Source: Report of IPB- Tegal  
 Project, 2012

# PRACTICES: Bio-IPM – Ecosystem Resistance against Brown Planthopper Outbreak



Sukoharjo Central Java 2009



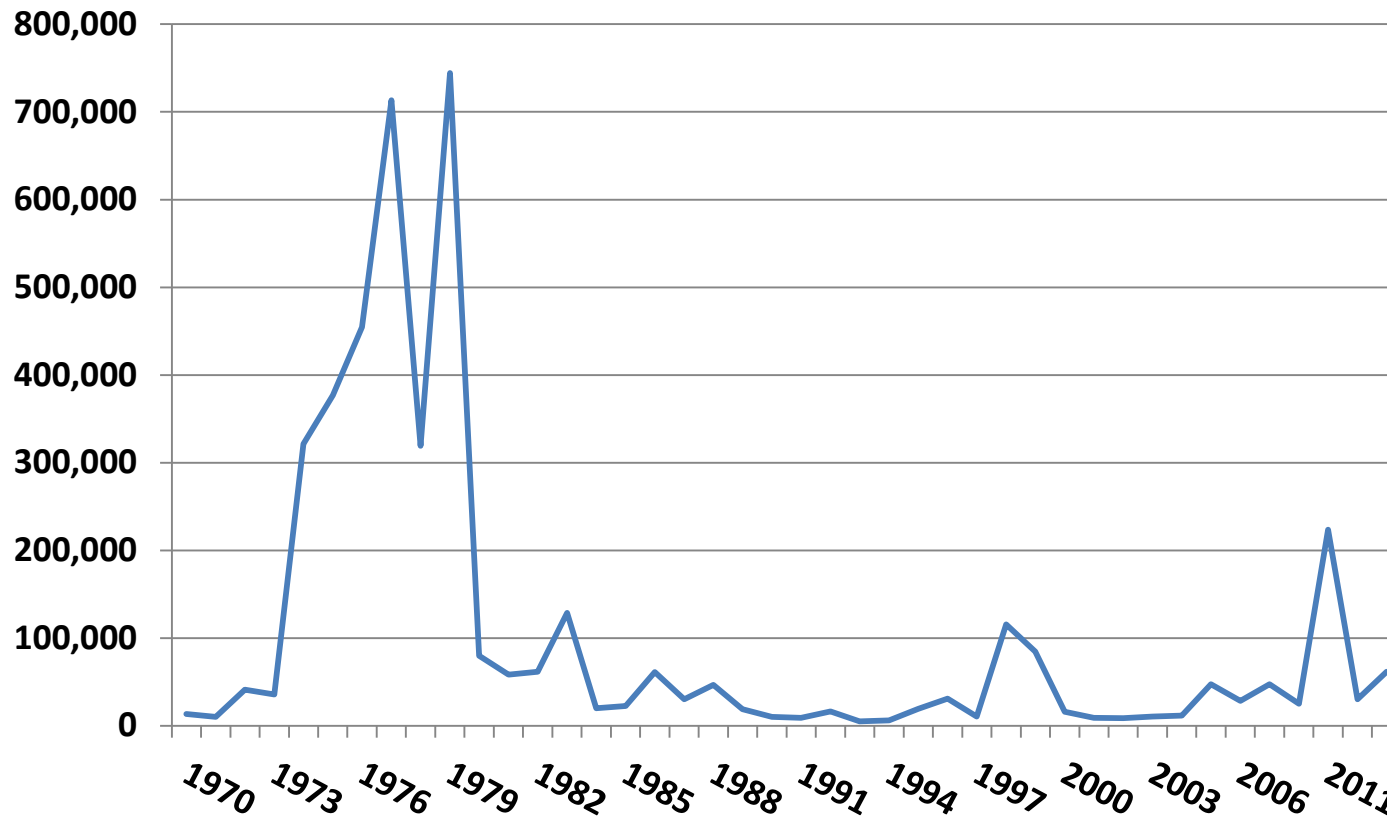
Karawang West Java 2014

# Integrated Pest Management on Rice in Indonesia

- ▣ Presidential Decree : Inpres No 3. th 1986
- ▣ Ban of 57 pesticides brand (mostly organophosphate and pyrethroids, causing resistance and resurgence of brown planthopper)
- ▣ Recruitment of 3 000 pest observers
- ▣ Establishing plant protection agencies in 5 main rice producer provinces
- ▣ Farmers field school on IPM: 1989 – 1998: ca. 700 000 farmers

# Area Rice Affected by Brown Planthopper

Affected area (ha)



BPH 'mild'  
outbreak  
1998: 2010  
after  
president  
decre

Sources: Directorate of food crops protection, Ministry of Agriculture, Indonesia

## Field to Farm

- ❑ Increase diversity (plants, microorganisms, fauna)
- ❑ Minimize chemical inputs
- ❑ Soil and water conservation (top soil and soil organic matter)

## Community to National

- ❑ Diversify food consumption
- ❑ Strengthening farmers and government official capacity
- ❑ 'Green' technology development
- ❑ Incentive system

**THANK YOU**