

# CLIMATE CHANGE, AGRICULTURE AND FOOD SECURITY

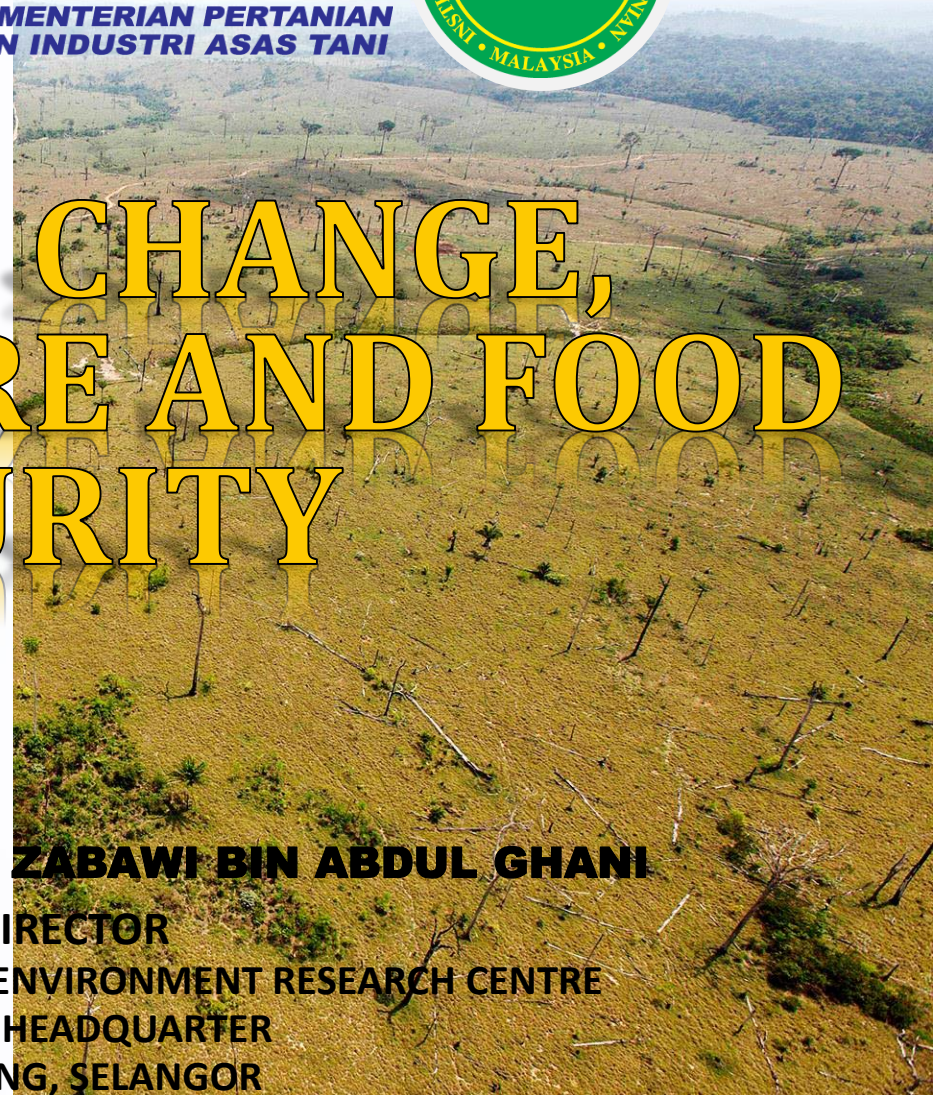
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# AGENDA

- 1 ▶ Introduction/Definition
- 2 ▶ Climate Change Scenario
- 3 ▶ Enabling National Policies
- 4 ▶ Climate Change and Agriculture
- 5 ▶ Adaptation strategies
- 6 ▶ Conclusions

# Climate change

Any change in climate over time that directly and indirectly affects human and their activities as well as natural systems and processes.



## Impact:

Undermine development

Affect human well-being

Threaten security of natural resources

# Food Security



- **Access for all people at all times to sufficient, safe and nutritious food**

## Components





# Food security: Global challenges



- Rising in food prices
- Increase in agriculture input prices
- Increase in global population
- Increase in utilization of food commodities for bioenergy
- Impacts of climate change to production and biodiversity



# Food security: Domestic challenges



- Ensuring sufficient food supply
- Increase and sustain the productivity
- Balance utilization of agriculture land
- Mainstreaming of smallholders within the food system

- **Dry season with less rainfall**
- **Increase in irrigation water demand**

## Global Scenario of Climate Change


- **Disappearance of many species**
- **Increases in frequency of tropical cyclones**





# Climate change in Malaysia



# Climate change projection (2050)



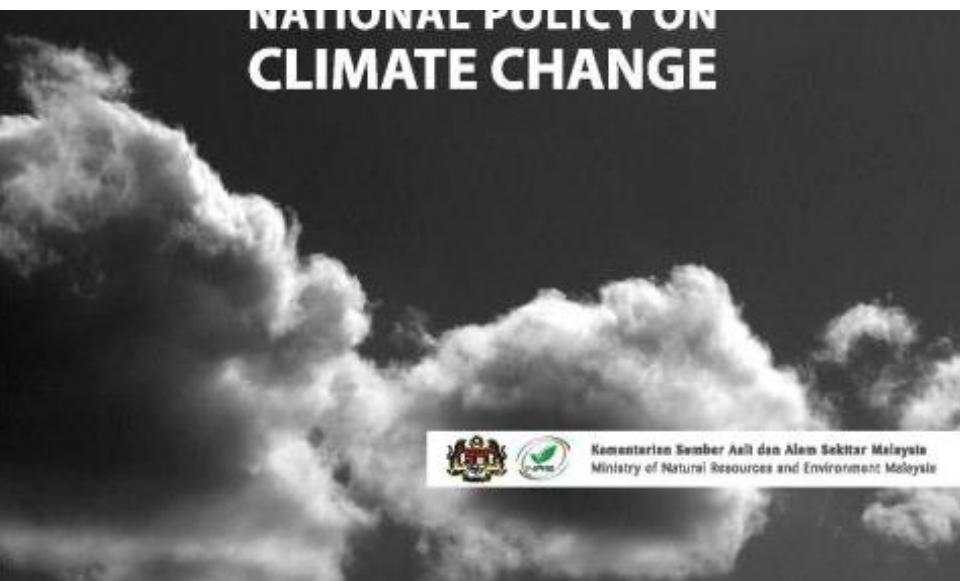
 Annual rainfall in Kelantan, Terengganu, Pahang and N-W Coast – increase up to 10%

-  Annual rainfall in Selangor and Johor – decrease by 5%
-  Mean air temperature increase by 1.2 - 1.4°C
-  Minimum temperature increase by 0.7-1.4°C
-  Maximum temperature increase by 1.6-2.0°C





# ENABLING NATIONAL POLICIES



# NATIONAL POLICY ON CLIMATE CHANGE

DASAR PERUBAHAN  
**IKLIM  
NEGARA**

NATIONAL POLICY ON  
CLIMATE CHANGE

Approved by Cabinet  
20 Nov 2009



Kementerian Sumber Asli dan Alam Sekitar Malaysia  
Ministry of Natural Resources and Environment Malaysia

1

Mainstreaming climate change through wise management of resources and enhanced environmental conservation resulting in strengthened economic competitiveness and improved quality of life

2

Integration of responses into national policies plans and programs to strengthen the resilience of development from arising and potential impacts of climate change

3

Strengthening of institutional and implementation capacity to better harness opportunities to reduce negative impacts of climate change

# National Green Technology Policy

## DEFINITION

Development and application of products, equipment and systems used to conserve the natural environment and resources, which minimises and reduces the negative impact of human activities.



- ↗ minimises the degradation of the environment
- ↗ safe for use; promotes healthy & improved environment for all forms of life
- ↗ zero or low green house gas (GHG) emission
- ↗ conserves the use of energy and natural resources
- ↗ promotes the use of renewable resources

## OBJEKTIF

- ↘ To reduce the energy usage rate & at the same time increase economic growth
- ↘ To facilitate the growth of the Green Technology industry & enhance its contribution to the national economy
- ↘ To increase national capability & capacity for innovation in Green Technology development & enhance Malaysia's competitiveness in Green Technology in the global arena
- ↘ To ensure sustainable development & conserve the environment for future generations
- ↘ To enhance public education & awareness on Green Technology & encourage its widespread use

# National Agrofood Policy 2011-2020

## DASAR AGROMAKANAN NEGARA 2011-2020

Approved by  
Cabinet  
28 Sept 2011



1

To ensure enough food supply (availability, accessibility) and safe (food safety)

2

To transform agrofood industry to be more competitive and sustainable

3

To increase income of farmers and agro-entrepreneur



# CLIMATE CHANGE AND AGRICULTURE

- Contribute to GHG emission
- Vulnerability



# SOURCES AND CAUSES OF GHG

- Main GHG of concern in agriculture
  - Methane
  - Nitrous oxide



# Main sources of methane

- Flooded rice
- Enteric fermentation in livestock
- Manure management



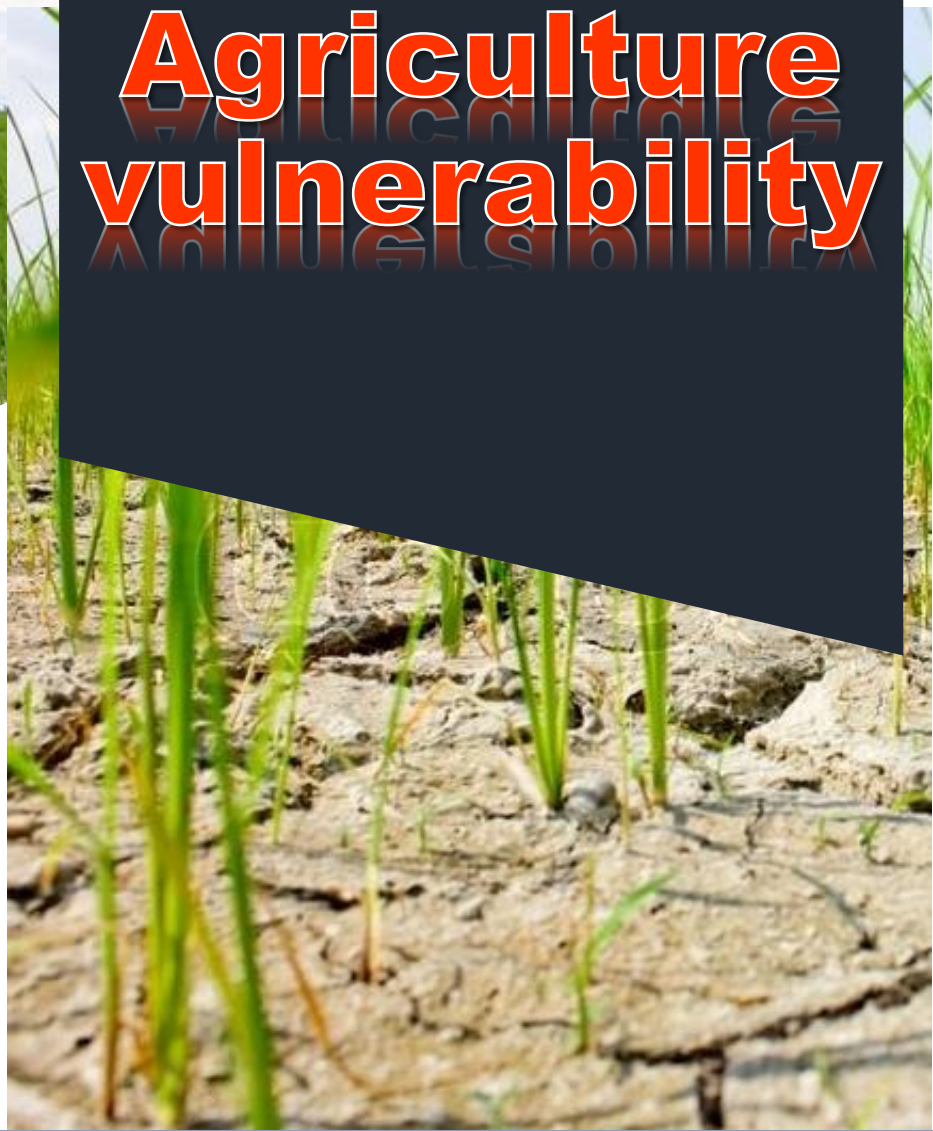


# Main sources of nitrous oxide

- **Agricultural soils**
- **Burning of agricultural residues**
- **Production and use of chemical fertilizer**



# Agriculture vulnerability



# Positive impacts

- Increased productivity from warmer temperature
- **Posibility of growing new crops**
- **Longer growing season**
- Increased productivity from enhanced carbon dioxide
- Accelerated maturation rates
- Decreased moisture stress

## Projected changes

- Warmer temperature
- Drier or wetter condition
- Increased frequency of extreme climatic events
- Enhanced atmospheric carbon dioxide
- Changing market conditions

- Increased insect infectations
- **Crop damage from extreme heat**
- Planning problems due to less reliable forecasts
- Increased weed growth and disease outbreaks
- Decreased herbicide and pesticide efficiency
- **Increased moisture stress and drought**

# Negative impacts

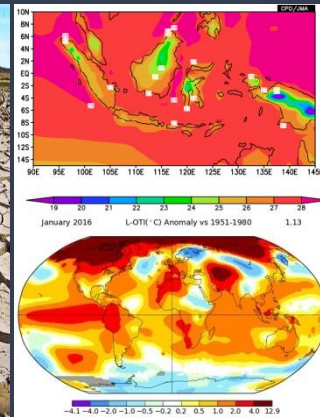
# CLIMATE VARIATION



Drought



Global warming



Typhoon



## Shortage of world food supply



# Drought

# Many states in state of worry over late rains

Rs 10

VULNERABLE SACHIN ♦ THE ANGRY CHILD

022

FOR SALE IN INDIA AND NEPAL ONLY

AUGUST 12, 2002

# INDIA TODAY

BOLLYWOOD'S BAD BOY

## WHAT'S WRONG WITH THE WEATHER

- Monsoon failure leads to drought in two-thirds of India
- Eastern Bihar gets twice the average rainfall causing floods
- Rising temperatures are drying the source of the Ganga

www.indiatoday.com



A farmer shows the state of his paddy that has dried up due to insufficient rain and water supply in Gidder village of Punjab.



## Drought situation is serious, says Centre

New Delhi: Rejecting members' demand for full central control over calamity relief, the government on Friday announced in the Lok Sabha it would provide all possible assistance, including postponement of farm loan recovery in 12 drought-affected states, to mitigate the plight of people.

Replying to a two-day debate on drought and floods in various parts of the country, agriculture minister Ajit Singh said the onus of controlling, managing and executing such relief was on states as they alone were in a position to identify the areas worst affected by natural calamities.

Termining the drought situation as "very serious", he said among the badly hit were western Uttar Pradesh, Bundelkhand area, Rajasthan, Haryana and Delhi, as also Karnataka, Kerala, Nagaland and Orissa.

Asking the affected states to immediately start utilising the Calamity Relief Fund (CRF), Singh said the Centre had already taken steps to extend benefits under the fund to all farmers in affected areas.

The minister said the Centre was also ready to release the next instalment of CRF, which would be due only in October, if states utilised it properly. If CRF is inadequate, steps would be taken to provide help under the National Calamity Contingency Fund, he said.

Regarding the demand for waiving and writing off loans, he said he was in the process of discussing the matter with the finance minister as it involved much wider arena and different authorities.

Singh said the Centre had already held a stock-taking meeting with agriculture and relief ministers of 12 drought-affected states, at which it was decided to ask Nabard and co-operative agencies to postpone loan recovery from states and other borrowers.

As a measure to minimise the sufferings of farmers, sugar mill owners have been asked to immediately pay the outstanding Rs 1,000 crore to cane growers, he said. The Centre is also examining the possibility of bearing the cash component under the 'food for work' programme to states facing acute resource crunch.

Stating that food output would be adversely affected due to drought conditions caused by poor monsoon, Singh said substantial damage had already been caused to coarse cereals like bajra, oilseeds and pulses. Paddy prospects would also be affected, though it may recover to some extent if rainfall takes place in the next 10 days, he said.

On the criticism that the meteorological department had failed in forecasting monsoons, he said there were so many variables in this science that it was not always possible to be accurate.

Singh expressed confidence that there would be no starvation anywhere due to drought and other calamities and said consumers would not be hit hard as the country had sufficient stocks of foodgrains and other commodities. An estimated 50 lakh tonnes of foodgrains would be in the supply in affected states, he said. Government would be next to the farmers in difficulty, he said.



# RICE

## **Crop modelling simulations (DSSAT 4.1):**

- 1** Daily temperature above 34°C will reduce potential yields
- 2** Increase of 2°C above the threshold temperature will reduce 13% of rice yield in MADA area
- 3** Occurrence of floods & drought early in the growing season could decrease up to 80% of yield



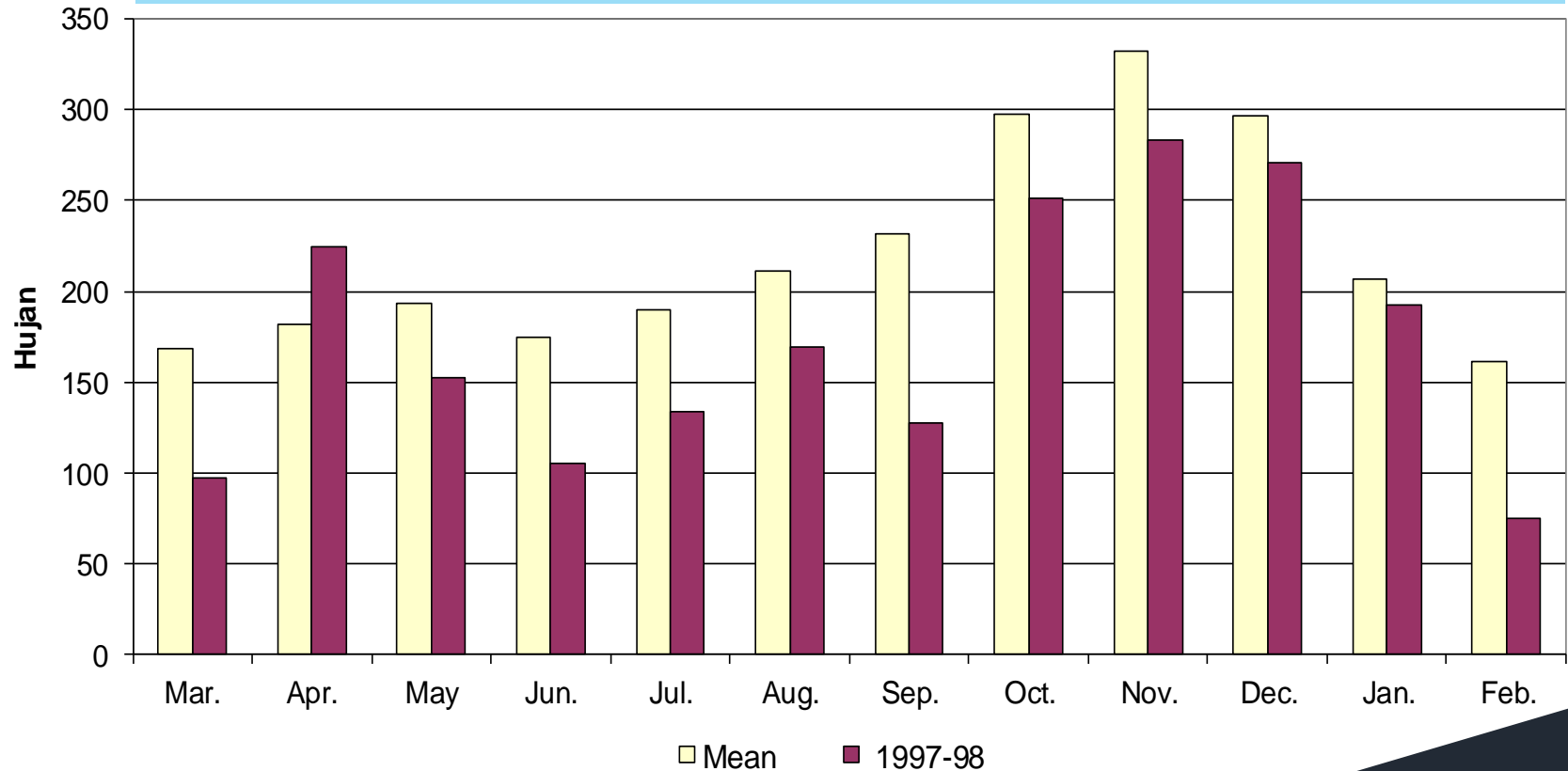
# LIVESTOCK

- ① Decrease in grain feed supply
- ② Poor quality feeds
- ③ Increase favorable zones for vectors
- ④ Unavailability of safe drinking water



# Observed changes in productivity of rice due to El-Nino

# Average rainfall



**The Malaysian climate:  
Mean and El Nino  
1997/98**



# Estimated loss of rice yield due to El-Nino: Malaysia 1980 - 1999

| Item  | Mean yield loss (%) |
|---|---------------------|
| Mean yield loss for non El-Nino Years (NEY) | 5.65                |
| Mean yield loss for El-Nino Years           | 6.8                 |
| Net El-Nino Effects                         | - 1.15              |



# ADAPTATION STRATEGIES

# Adaptation strategies



## Crop management

- 1 Short maturing variety
  - ↳ Less risky to water stress
- 2 Development of drought resistant varieties
  - ↗ Aerobic rice production
  - ↗ Develop high yielding varieties

# Irrigation management



- 1 Optimize water use efficiency
- 2 Dry rotation and dry seeding
- 3 Improved irrigation techniques
- 4 Reduce water loss and wastage



# Water resource management

- 1 Continued improvement of irrigation infrastructures
- 2 Enhanced management support services
- 3 Management & control system
- 4 Indegeneous water storage system

# Adaptation: Livestock



- Improve genetics to achieve shorter finishing period before marketing
- Incorporate more local genetic materials that are adapted to local environmental and more heat resistant

- Integrate animal production with tree crops
- Develop alternative feed additives (natural – herbal)
- Utilise more local feed resources
- Provide controlled environment incorporated with manure management



# Climate change and food security



# Food production and availability

- Directly: Changes in agro-ecological conditions
- Indirectly: Growth & distribution of incomes
- Example: Changes in temperature and precipitation bring changes in land suitability and crop yields

## Food stability

- Increases in the frequency and severity of extremes events (cyclones, flood and drought) caused greater fluctuations in crop yields and food supplies

# Food accessibility

- Increase in temperature expected to increase in prices due to low production
- Decreased purchasing power
- Damage of infrastructure due to extreme events

## Food utilization

- Main concern is changing in climatic conditions can initiate a vicious circle where infectious disease causes hunger more susceptible
- Ability of individuals to use food effectively by altering the condition for food safety and changing the disease pressure from vector, water and food-borne diseases



# Food Security Action Plan:

Transforming the Agriculture Sectors  
& Ensuring Sufficient Food For the  
Nation

# Food Security Action Plan

Increase rice production

Increasing rice stockpile

Idle land management

Green book campaign

Strengthening marketing & distribution capability

Incentives

Increasing agricultural production & productivity



# CONCLUSIONS

- 1 Climate change will affect all economic sectors with agriculture being one of the sector most intensively attack
- 2 Climate change adaptation is needed in all agro-ecosystems





# CONCLUSIONS

- 3 New agriculture technology and approaches based on policy needs can be implemented to adapt to climate change
- 4 Climate change affects food security (availability, stability, accessibility and safety)





We do not inherit the  
earth from our ancestors  
but

**We borrow it from  
our children**

# Let save our planet from climate change for future generations



 **Smile,**  
*and the World smiles with you!*

# Institut Penyelidikan dan Kemajuan Pertanian Malaysia (MARDI)

#betterMARDI

*Thank you*