

# Climate Change and Agriculture



## OBJECTIVES

At the end of the session, the participants should be able to:

1. Discuss the contribution of agriculture to climate change
2. Define mitigation and enumerate mitigation options in agriculture
3. Identify effects of climate to agriculture
4. Describe climate change adaptation and INDCs

# THE CHALLENGE

“In a world of plenty, no one, not a single person, should go hungry”  
Ban Ki-moon (UN Sec General)

**Food Security**

**Climate Change**



Until 2050, we need 70% more food production to feed 5.3 billion people (Asia)

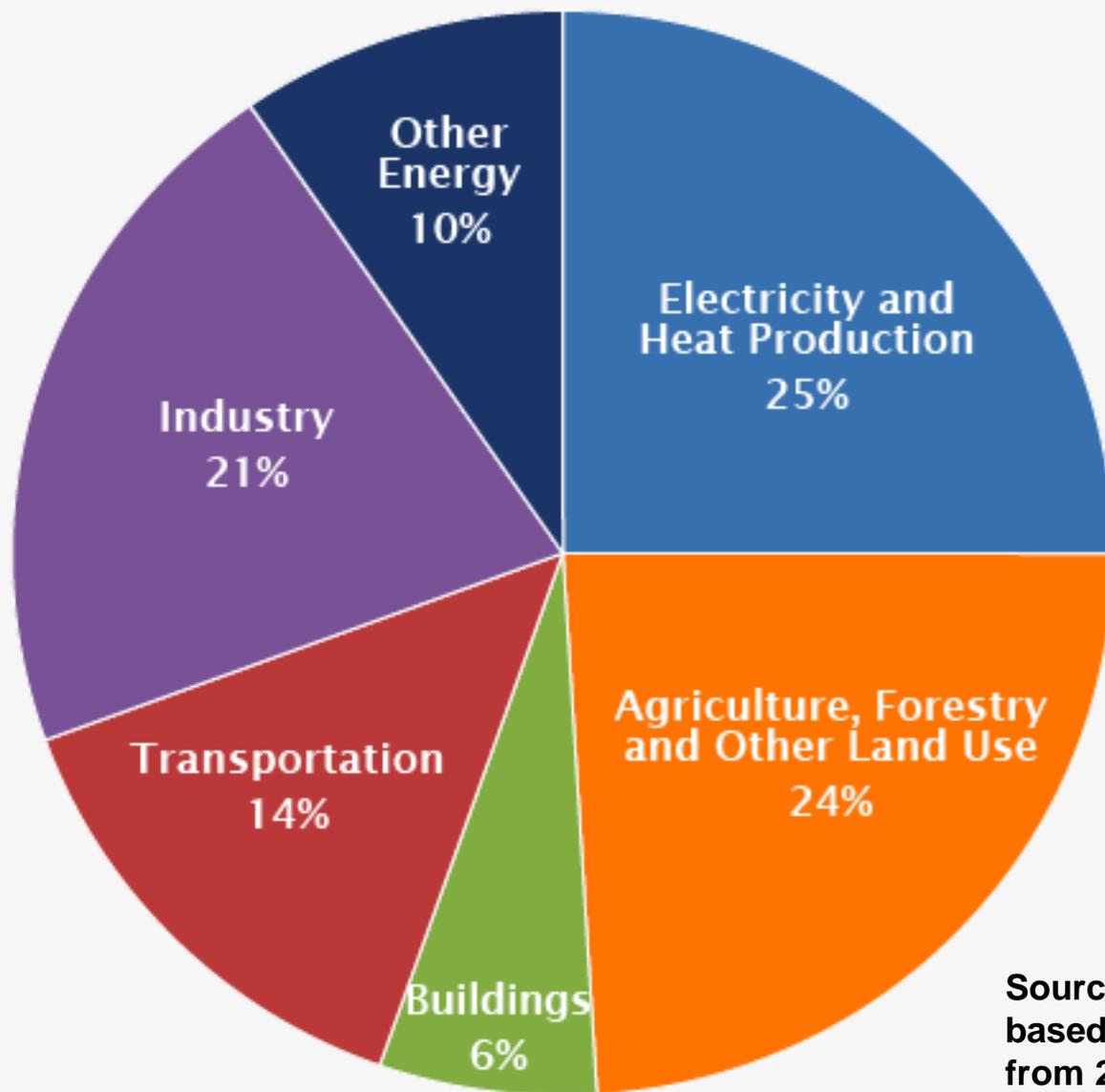
Paris Agreement to limit global warming to max. 2°C (if possible 1.5°C)

**In 2050, more than half of irrigated rice area in Asia will face 5%-25% loss due to CC**



# Agriculture's contribution to climate change

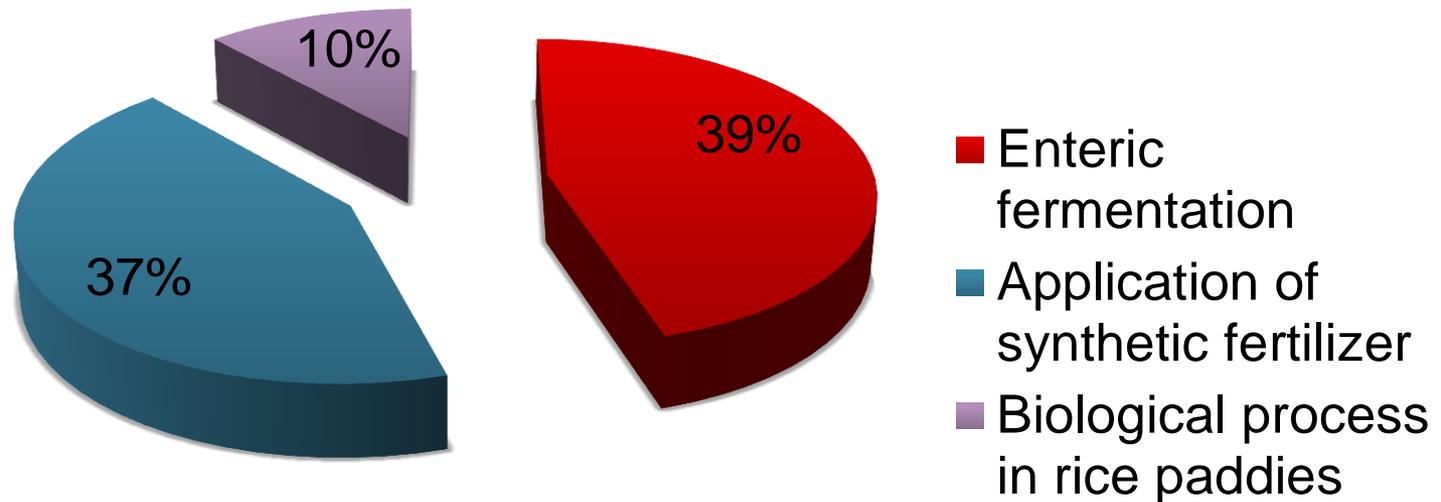
# Global Greenhouse Gas Emissions by Economic Sector



Source: IPCC (2014) Exit  
based on global emissions  
from 2010



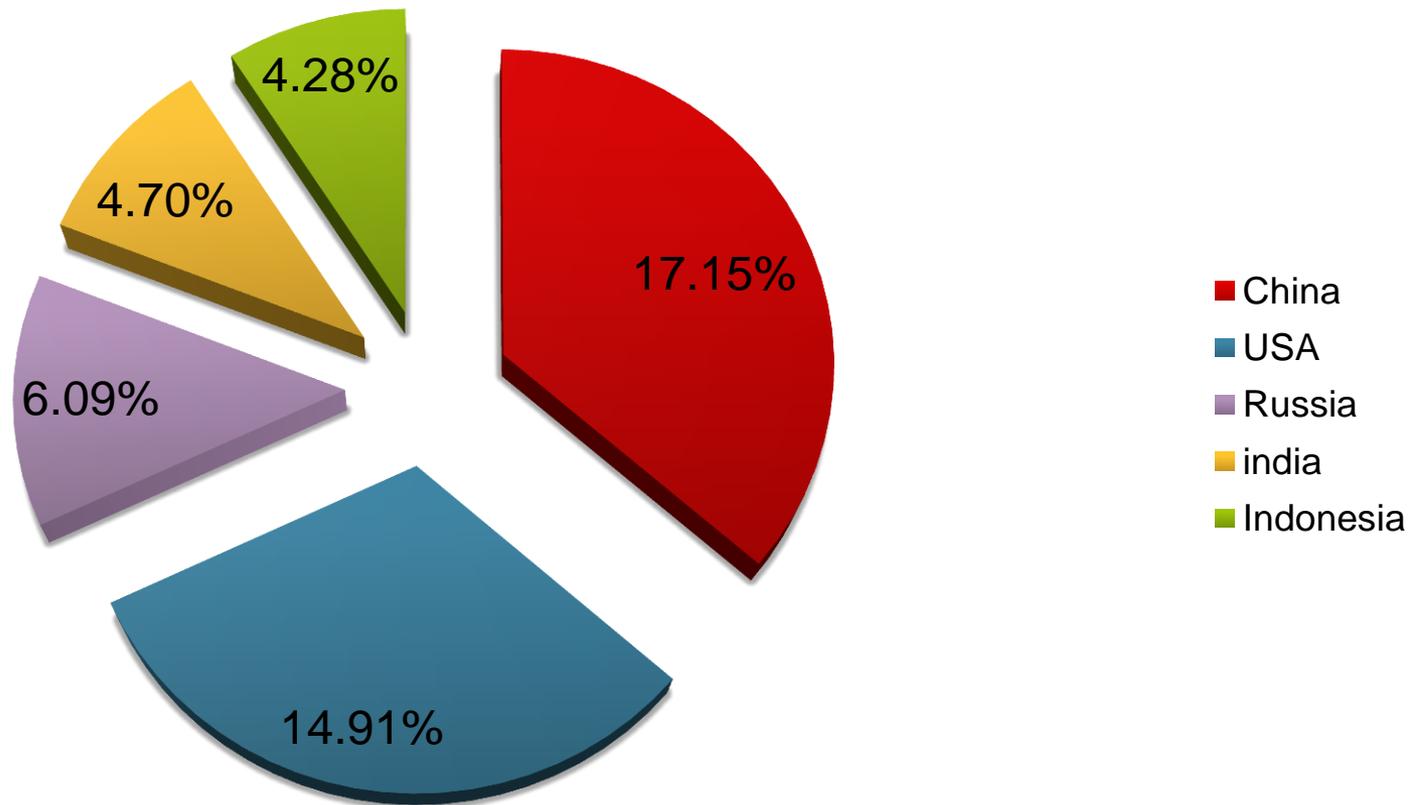
# GHG Emission from Agriculture (Global)



FAO, 2011



# Top Country Emitters – GHG emissions of the world MtCO<sub>2</sub> Average Global Shares (1990-2010) – Source: European Commission JRC/PBL, EDGAR



# ASEAN GHG Emissions 2010

Country	Country	GHG emissions (MtCO <sub>2</sub> e)	Percentage of global total (%)
	<a href="#"><u>Brunei</u></a>	20.93	0 %
	<a href="#"><u>Cambodia</u></a>	26.05	0.1 %
	<a href="#"><u>Indonesia</u></a>	814.71	1.9 %
	<a href="#"><u>Laos</u></a>	21.82	0.1 %
	<a href="#"><u>Malaysia</u></a>	282.60	0.7 %
	<a href="#"><u>Myanmar</u></a>	160.04	0.4 %
	<a href="#"><u>Singapore</u></a>	70.05	0.2 %
	<a href="#"><u>Philippines</u></a>	147.75	0.3 %
	Vietnam	263.98	0.6 %
	<a href="#"><u>Thailand</u></a>	346.34	0.8 %



# Mitigation of agriculture's contribution to climate change

“A human intervention to reduce the sources or enhance the sinks of greenhouse gases”.



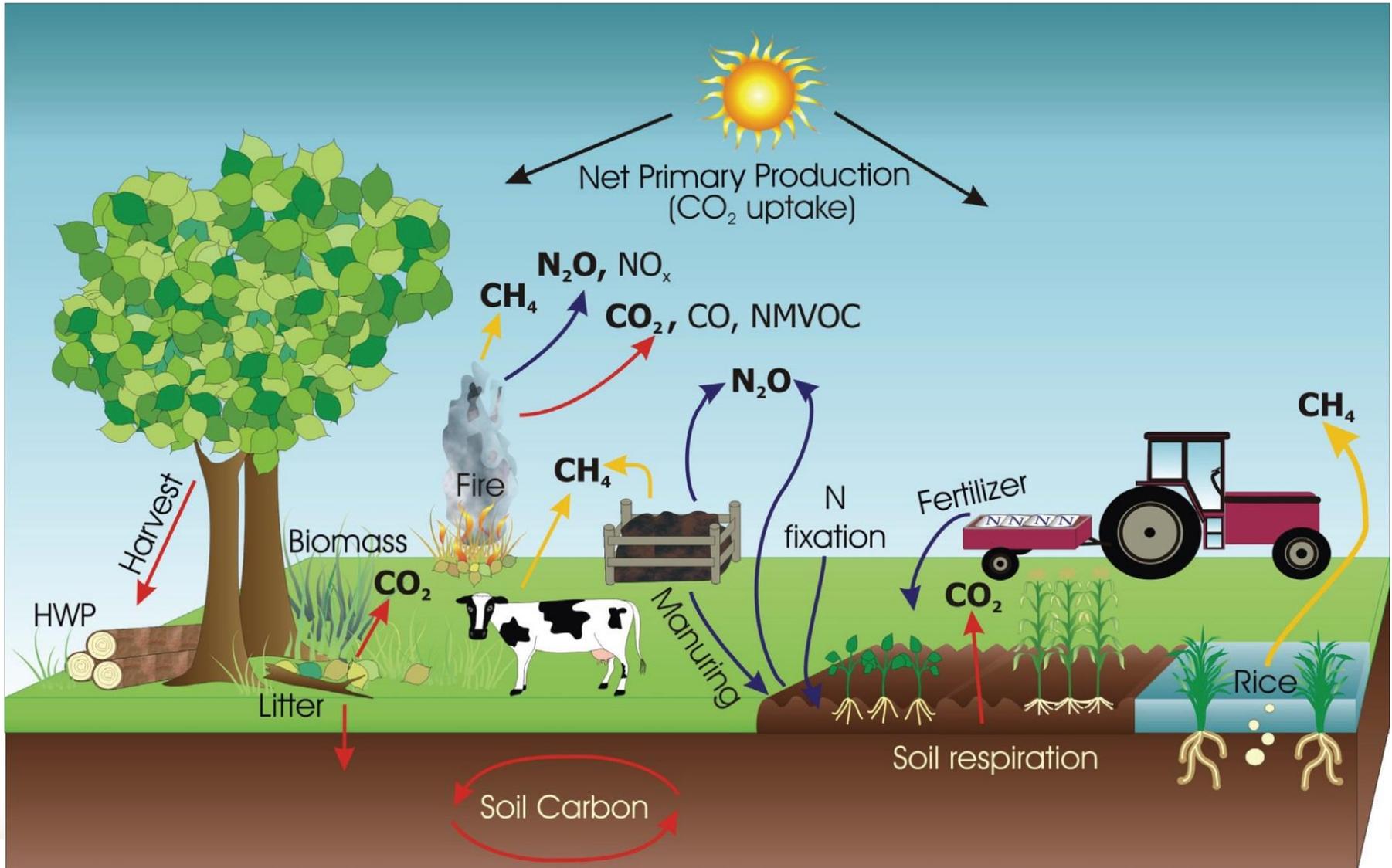
Source: Smith et al., 2007



# Three mitigation options of agriculture

1. Reduce direct emissions ( $\text{N}_2\text{O}$ ,  $\text{CH}_4$ )
2. Removals of GHG from the atmosphere →  
Carbon sequestration
3. Avoid creating new emissions → protect  
existing carbon storages (e.g. grassland  
and marshland)

# Greenhouse Gas Emissions on the farm





## Mitigation options in agriculture

Cropland  
management

Restoration of  
degraded land,  
land use and  
forestry

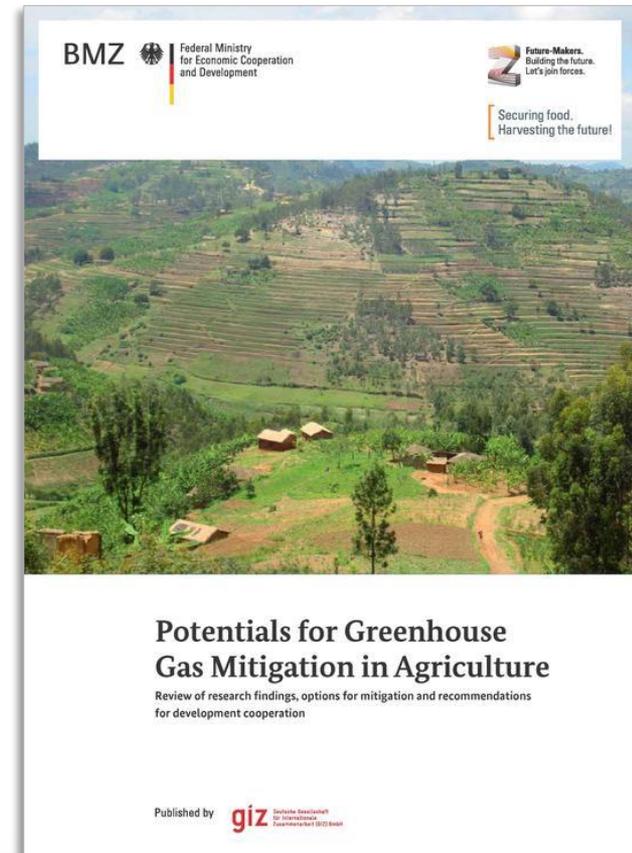
Livestock and  
grassland  
management

Soil and  
nutrient  
management

Agroforestry

Etc.

Source:





## Discussion

Which measures do  
you think have  
more/less **mitigation  
potential?**



# Agriculture is affected by climate change



## Agriculture suffers from climate change

- **Unsecure** cropping conditions and crop failures
- Displacement of **optimal growing regions**
- Changes in **pest** exposition, **invading species** and genetic losses
- Overall **yield** losses but with considerable regional differences
- ⇒ Major implications for **food security**

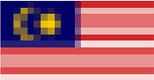


# Climate Change Impact on Crop Yields in Asia, 2050 (Source, IFRI, 2011)

Crop	Change in Production (%)
Rice	
Irrigated	-10.47
Rainfed	0.66
Maize	
Irrigated	-5.54
Rainfed	1.71
Soybean	
Irrigated	-6.73
Rainfed	8.58

# ASEAN GHG Emissions 2010



	Country	GHG emissions (MtCO <sub>2</sub> e)	Percentage of global total (%)
	<a href="#"><u>Brunei</u></a>	20.93	0 %
	<a href="#"><u>Cambodia</u></a>	26.05	0.1 %
	<a href="#"><u>Indonesia</u></a>	814.71	1.9 %
	<a href="#"><u>Laos</u></a>	21.82	0.1 %
	<a href="#"><u>Malaysia</u></a>	282.60	0.7 %
	<a href="#"><u>Myanmar</u></a>	160.04	0.4 %
	<a href="#"><u>Singapore</u></a>	70.05	0.2 %
	<a href="#"><u>Philippines</u></a>	147.75	0.3 %
	Vietnam	263.98	0.6 %
	<a href="#"><u>Thailand</u></a>	346.34	0.8 %

*"Climate Analysis Indicators Tool (CAIT) Version 2.0. (Washington, DC: World Resources Institute, 2014)".*



## Discussion

Who are the **most vulnerable** towards the effects of climate change in agriculture?



# Adaptation of agriculture to the effects of climate change

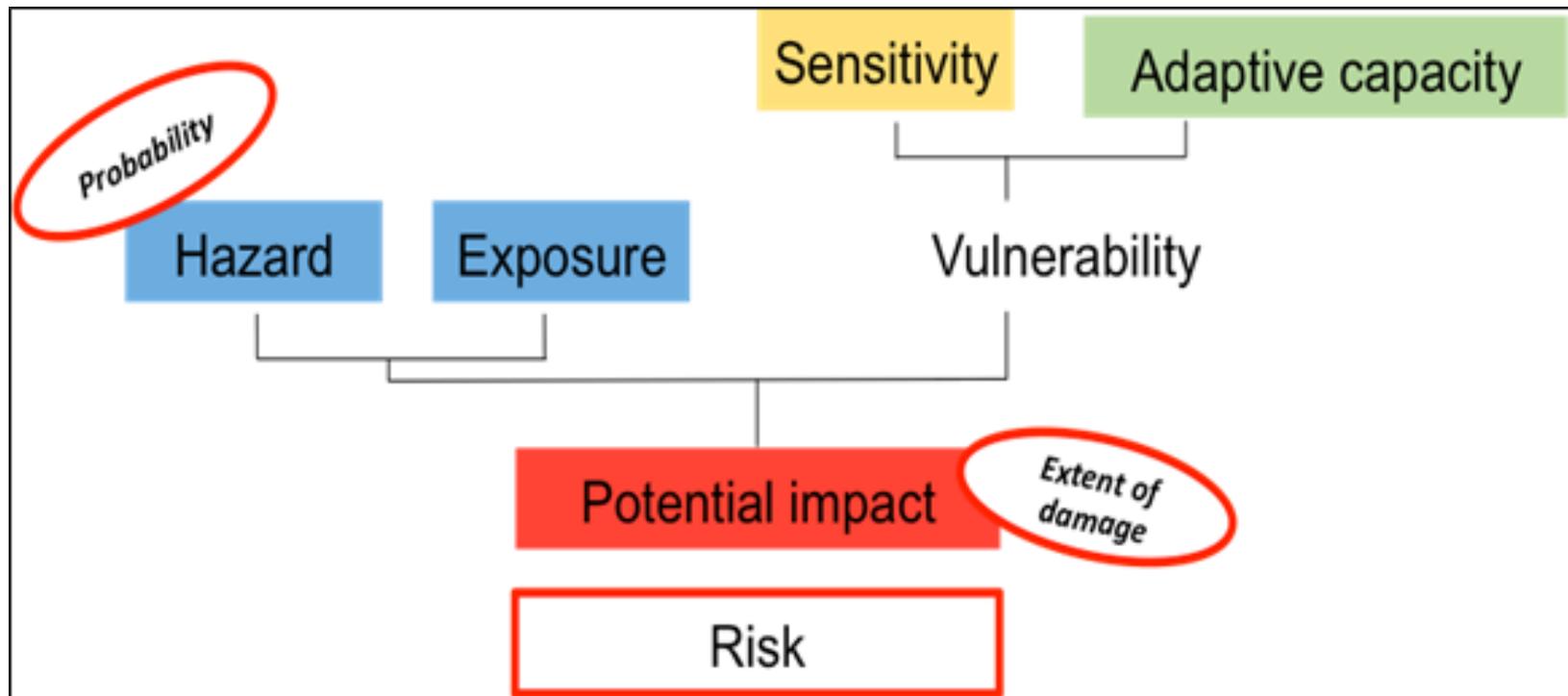
„The process of adjustment to actual or expected climate and its effects.

- In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities.
- In some natural systems, human intervention may facilitate adjustment to expected climate and its effects“.

Source: IPCC 5. Assessment Report. Glossary IPCC. Geneva



## Adaptation (according to IPCC AR5)



# Climate related hazards in the cassava value chain

Climate related hazards	Biophysical impact	Adaptation options	Relevant actors
Pest and disease outbreaks	Low yield and poor root quality due to weak growth and deformation	<ul style="list-style-type: none"> <li>• Use healthy planting materials</li> </ul>	<ul style="list-style-type: none"> <li>• Researchers (CARDI)</li> <li>• Agricultural extension services and relevant technical departments (GDA)</li> <li>• Academicians and students (RUA)</li> <li>• PDA</li> <li>• NGOs (CelAgrid and ABK)</li> <li>• CIAT</li> <li>• Farmers and farmer associations</li> </ul>
Heavy rainfall	Low yield and poor root quality due to slow growth of the cassava plant	<ul style="list-style-type: none"> <li>• Apply contour intercropping</li> <li>• Develop cover systems</li> <li>• Raise bed planting</li> </ul>	
Land degradation/ soil erosion	Low yield and poor root quality due to weak growth	<ul style="list-style-type: none"> <li>• Apply contour intercropping</li> <li>• Develop mulching systems</li> </ul>	
Lower fertility	Low yield and poor root quality due to stunting	<ul style="list-style-type: none"> <li>• Apply integrated nutrient management</li> <li>• Establish integrated farming systems</li> <li>• Develop mulching systems</li> </ul>	
Droughts	Low yield and poor root quality due to slow growth of the cassava plant	<ul style="list-style-type: none"> <li>• Use tolerant varieties</li> <li>• Calendar planting</li> <li>• Manage planting materials</li> </ul>	



## Discussion

How can we **measure** if  
an agricultural system or  
a farmer is more adapted  
to climate change?



# Agriculture in Nationally Determined Contributions



## **Agriculture in the (*Intended*) Nationally Determined Contributions - (I)NDCs**

- **189 countries** presented an INDC to the United Nations' Framework Convention on Climate Change (UNFCCC). The (I)NDCs are the key pillars of the **Paris Agreement**.
- **94%** of all countries **include agriculture sectors** in their mitigation and/or adaptation contributions (Mitigation: 73% Adaptation: 94% of developing countries).
- The agriculture sectors are most often referred to in the INDCs as providing **adaptation-mitigation synergies**, as well as socio-economic and environmental co-benefits.



## *Agriculture in the (Intended) Nationally Determined Contributions - (I)NDCs*

All ten ASEAN Member States submitted their INDC's, majority laid down commitments to reduce greenhouse emissions across identified sectors.

All ASEAN Member States have included adaptation strategies, plans and actions in their INDCs.



## Discussion

Did **your country** present an **INDC** to the UNFCCC? What does it say about **agriculture** (adaptation/mitigation)?



# Tools



## Tools Climate Change - Agriculture

The Sector Project Sustainable Agriculture prepared a practical overview on tools related to climate change and agriculture (draft version available, not published yet):

- ❖ Climate Change Impact Assessment
- ❖ GHG Measurement
- ❖ **Climate Risk/Vulnerability Assessment**
- ❖ Climate Change Adaptation and Mitigation in Agriculture
- ❖ Monitoring, Evaluation and Learning
- ❖ Web Portals

If interested, please contact [stephanie.heiland@giz.de](mailto:stephanie.heiland@giz.de)



## Tools on Climate Risk/Vulnerability Assessment

### **Community Based Risk Screening Tool – Adaptation and Livelihoods**

Theme : Adaptation, Vulnerability Assessment,  
Prioritization, Program Implementation

Objective - Improve livelihood in the short and long term

Outputs- List of livelihood resources most affected by CC,  
adjustments to existing projects and new activities, list of  
desired adaptation outcomes and important influencing  
factors to be monitored



# Conclusions

What are **your** main conclusions with regard to agriculture and climate change?

## Key Messages



Agriculture **affects** and is **affected** by climate change.



Therefore, ambitious **adaptation** and **mitigation** measures are necessary in agriculture.



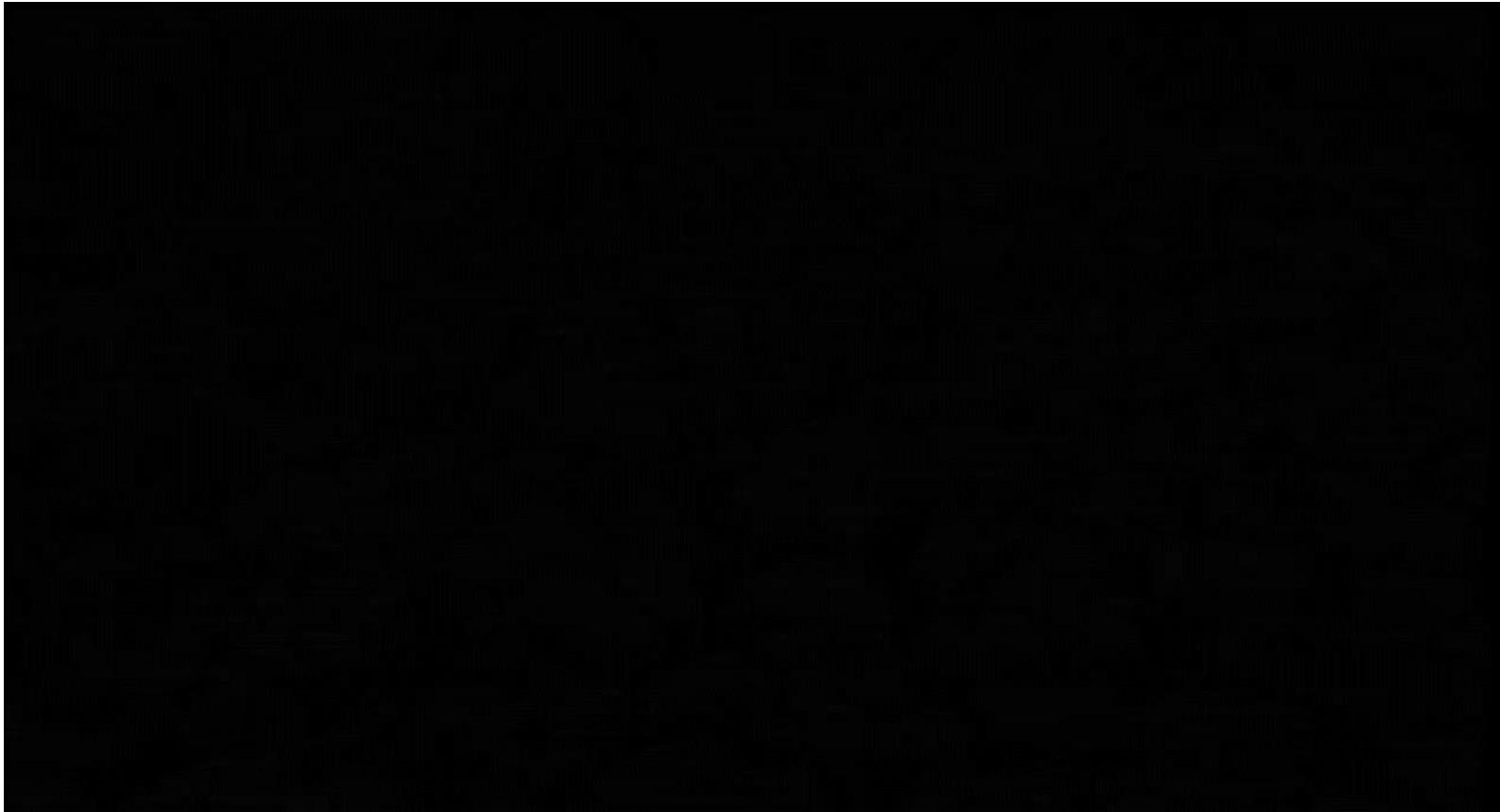
Agriculture plays a major role to reach the objectives of the **Paris Climate Change Agreement**.



There are many **tools** that help to implement adaptation and mitigation measures in agriculture.



## Video: Weathering Extremes





# Thank you!

**giz** Deutsche Gesellschaft  
für Internationale  
Zusammenarbeit (GIZ) GmbH

On behalf of



Federal Ministry  
for Economic Cooperation  
and Development



## IMPRINT

This power presentation is part of the MOSA training that has been developed by GIZ on behalf of BMZ .

**You are welcome to use the slides, as long as you do not alter its content or design (including the logos), nor this imprint.**

As a federally owned enterprise, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH supports the German Government in achieving its objectives in the field of international cooperation for sustainable development.

GIZ also engages in human resource development, advanced training and dialogue.

**Published 2016 by  
Deutsche Gesellschaft für  
Internationale Zusammenarbeit (GIZ) GmbH  
Sustainable Agriculture Project  
Dag-Hammarskjöld-Weg 1-5  
65760 Eschborn, Germany**

### Contact

E: [naren@giz.de](mailto:naren@giz.de)

I: [www.giz.de/sustainable-agriculture](http://www.giz.de/sustainable-agriculture)

On behalf of



Federal Ministry  
for Economic Cooperation  
and Development