Mitigating the Effects of Climate Change in Tropical Fruit Production Systems

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Track of Presentation

- Food Security and Tropical Fruit Production Systems
- Observational Evidences and Projections on Climate Change and Variability
- Effects of Climate Change and Variability on Tropical Fruit Production Systems
- Mitigation and Adaptation Measures to Climate Change
- Issues, Challenges and Opportunities

Average area harvested (in ha) of top 10 fruit crops in the Philippines

Fruit crop	2000-2004	2005-2009	2010-2015
Coconut	3189867	3344335	3547265
Banana	397942	433657	447661
Mango	147233	178979	188280
Coffee	133536	124785	118114
Pineapple	45634	54016	60111
Oil Palm	21001	34757	52680
Cashew	27892	27562	28423
Eggplant	20647	21243	21282
Calamansi	19765	20575	20549
Lanzones	16756	19742	20298

Average yield (in t/ha) of top 10 fruit crops in the Philippines

Fruit crop	2000-2004	2005-2009	2010-2015
Coconut	4.32	4.52	4.29
Banana	13.19	17.61	20.14
Mango	6.33	5.15	4.41
Coffee	0.80	0.80	0.70
Pineapple	36.27	37.16	39.79
Oil Palm	16.67	12.32	9.59
Cashew	4.03	4.11	5.41
Eggplant	8.48	9.32	10.24
Calamansi	9.14	9.64	8.40
Lanzones	2.85	1.97	1.13





Food Security and Tropical Fruits

DIMENSIONS of FOOD SECURITY

- Availability
- Affordability
- Accessibility
- Quality
- Nutrition

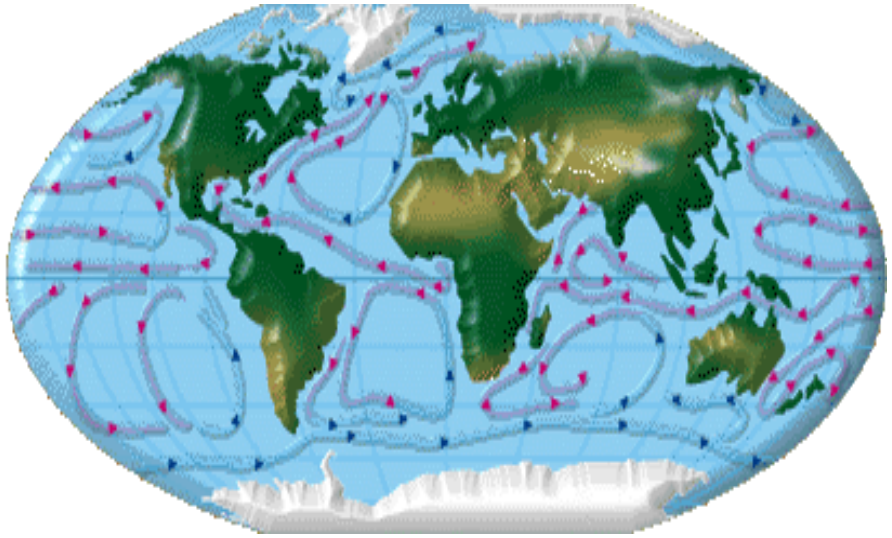
Some Threats to Food Security

- **Rapid population growth**
- **Land use change**
- **Urbanization**
- **Migration**
- **Climate change**

Causes of Climate Change

- **Natural causes**

Global Ocean Currents



Forest Fire

Volcanic Eruptions

Anthropogenic causes

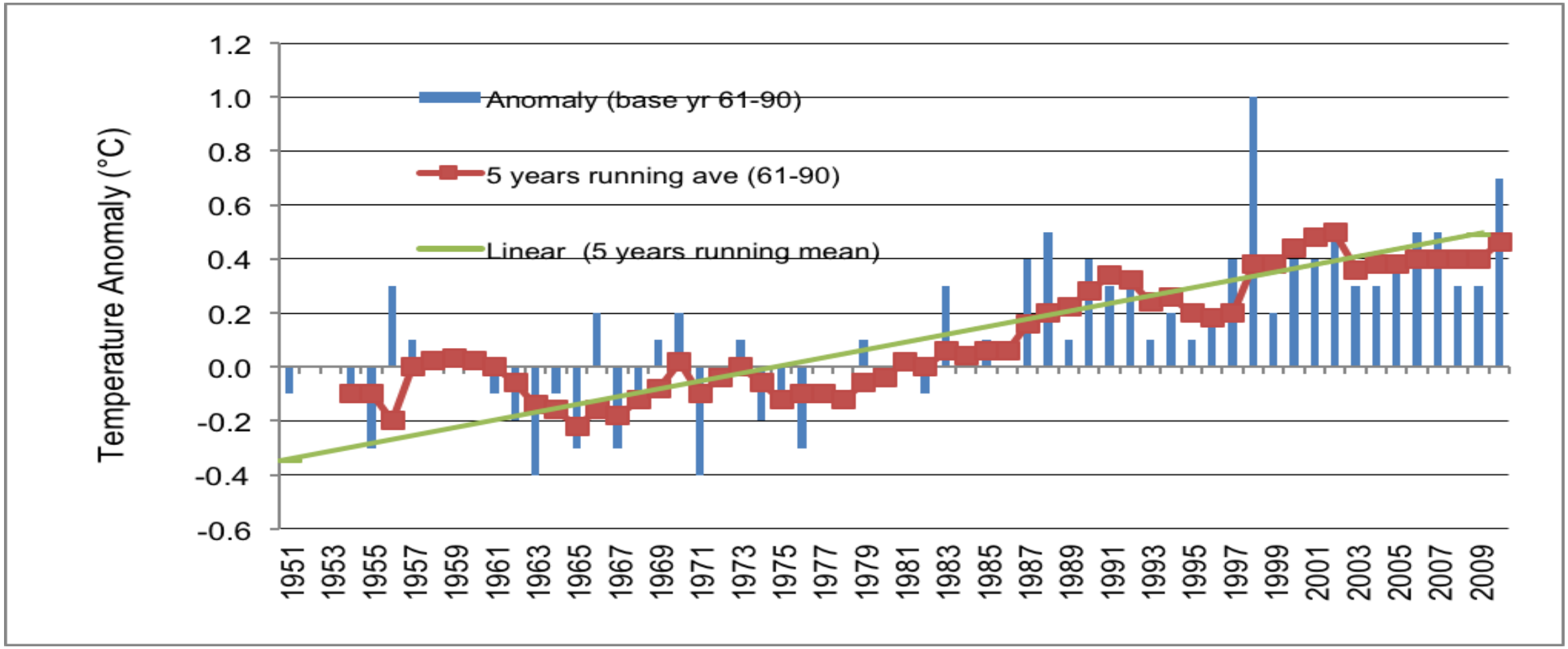
Deforestation

Emissions of aerosol to the atmosphere through fossil fuel and biomass burning and industrial processes

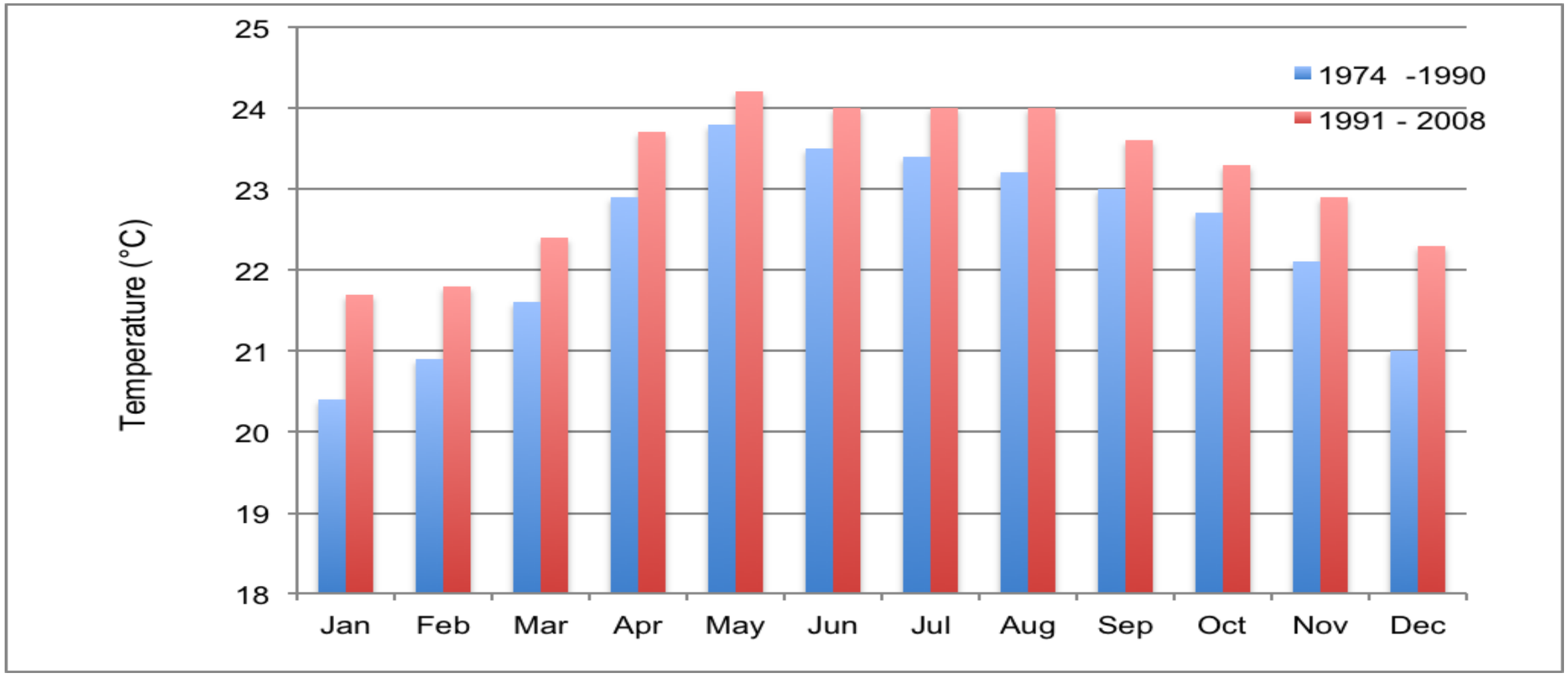
… also agricultural production systems, etc.

Climate Change: Observational Evidences and Projections

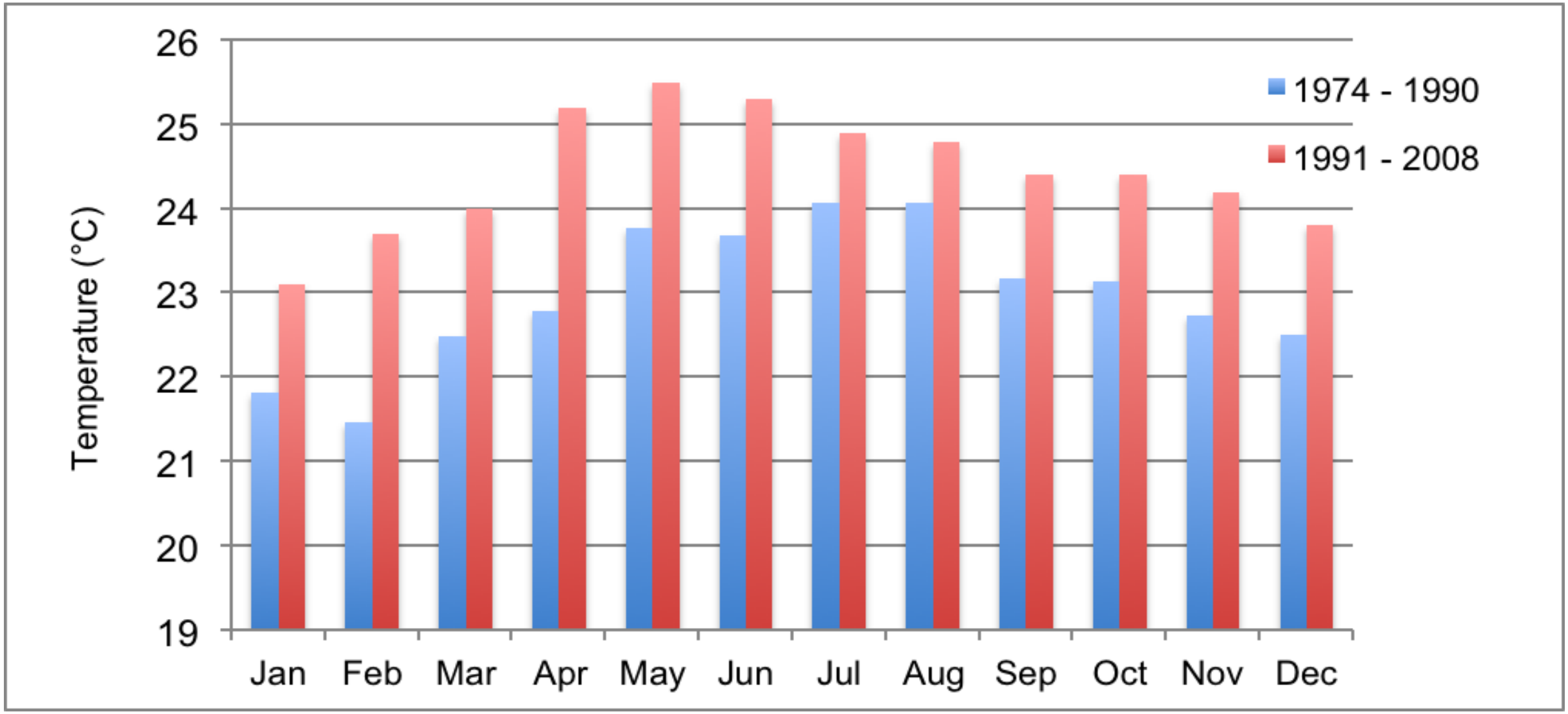
Local observational evidences of climate change



Mean temperature anomalies, 1951-2010 relative to 1951-1990. Source: PAGASA

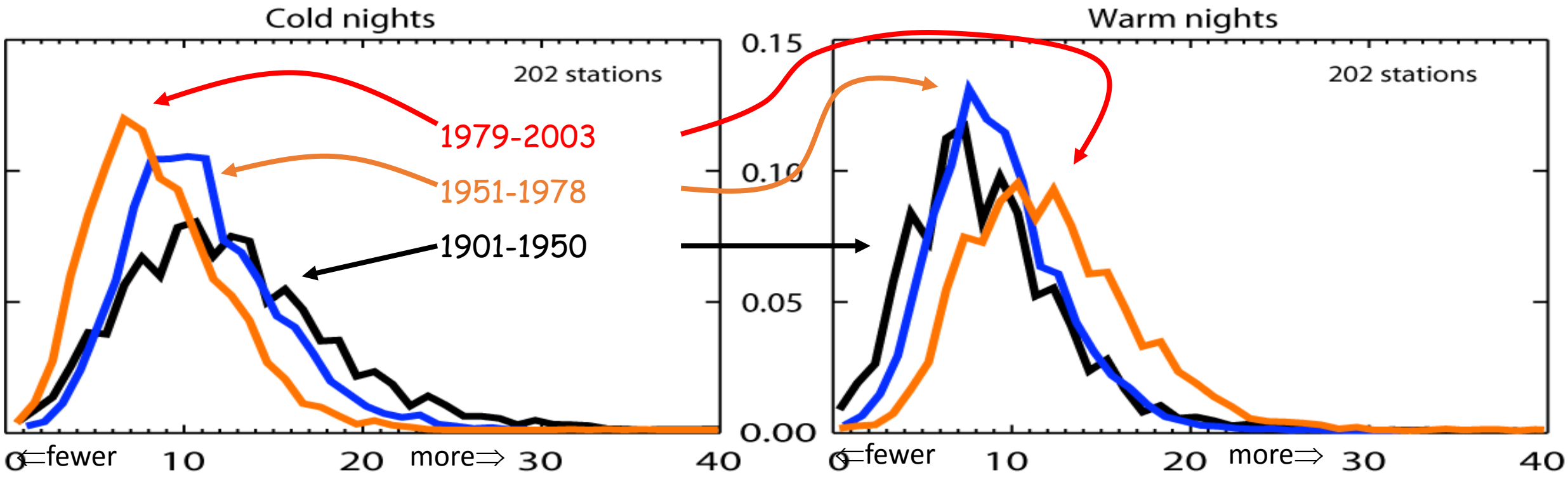


Monthly mean minimum temperature, Muñoz, Nueva Ecija, 1974-1990 and 1991-2008



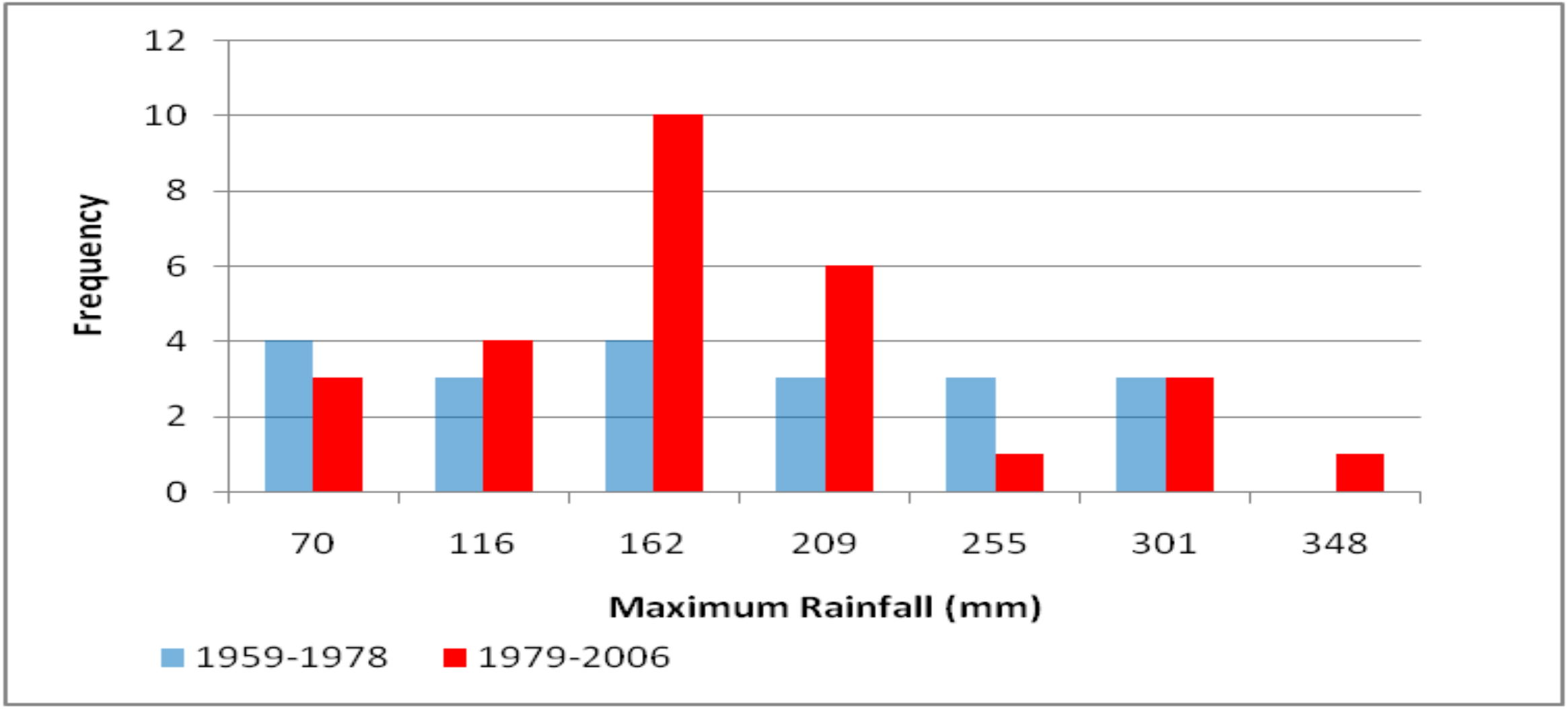
Monthly mean minimum temperature, Legazpi City, 1973-1990 and 1991- 2008

Warm nights are increasing; cold nights decreasing



Frequency of occurrence of cold or warm temperatures for 202 global stations for 3 time periods:
1901 to 1950 (black), 1951 to 1978 (blue) and 1979 to 2003 (red).

Alcamo et al., 2006.



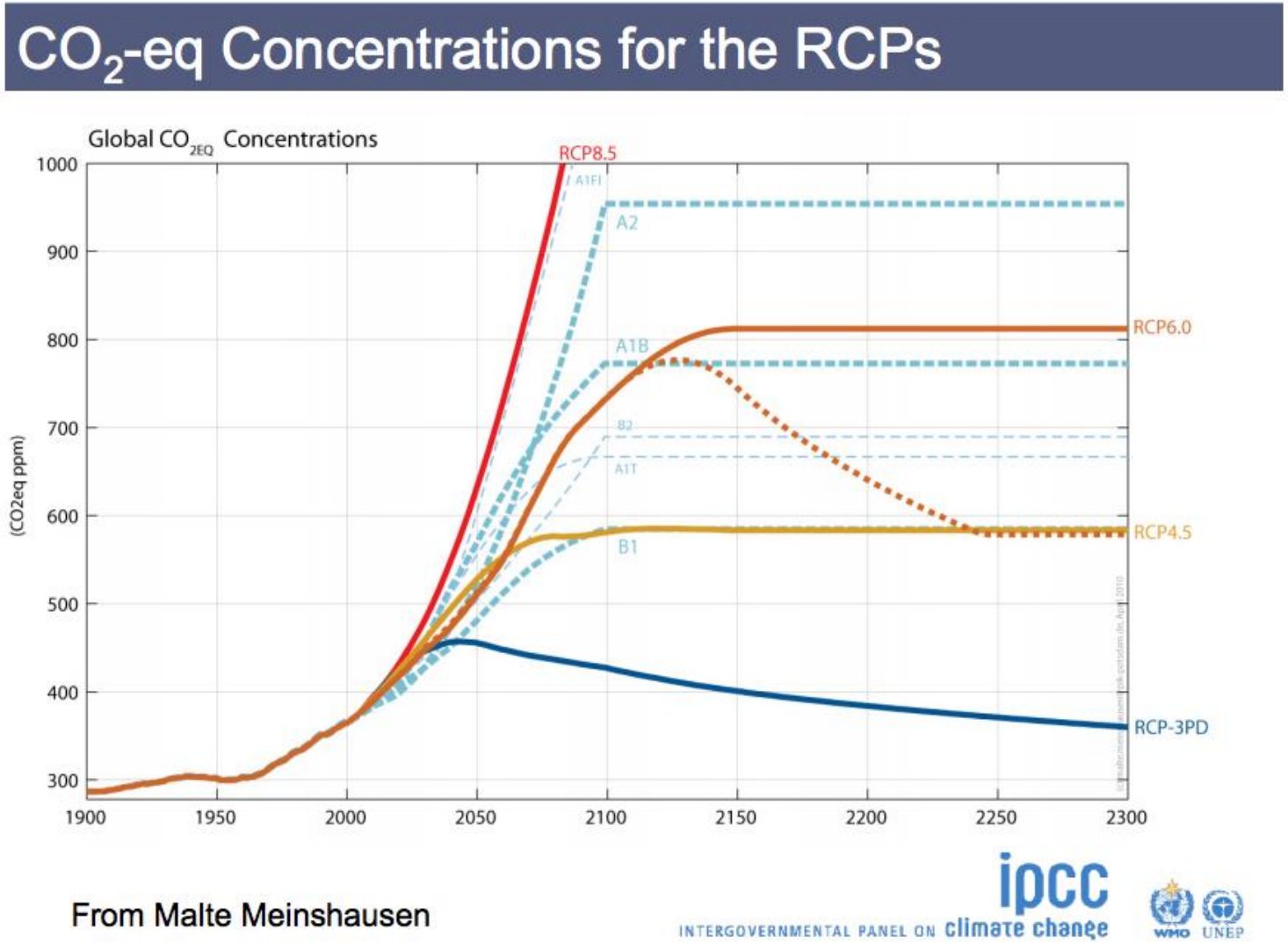
Distribution of maximum daily rainfall in Los Baños, Laguna, Philippines during two time periods, 1959-1978 and 1979-2006. Source: Lansigan, 2009.

Example:
Projected temperature changes – scenario

Case	Temperature change (°C at 2090-2099 relative to 1980-1999) [a, d]	
	Best estimate	*Likely* range
Constant year 2000 concentrations[b]	0.6	0.3 – 0.9
B1 scenario	1.8	1.1 – 2.9
A1T scenario	2.4	1.4 – 3.8
B2 scenario	2.4	1.4 – 3.8
A1B scenario	2.8	1.7 – 4.4
A2 scenario	3.4	2.0 – 5.4
A1FI scenario	4.0	2.4 – 6.4

Source: Climate Change 2007. Synthesis report 2007. IPCC. Geneva

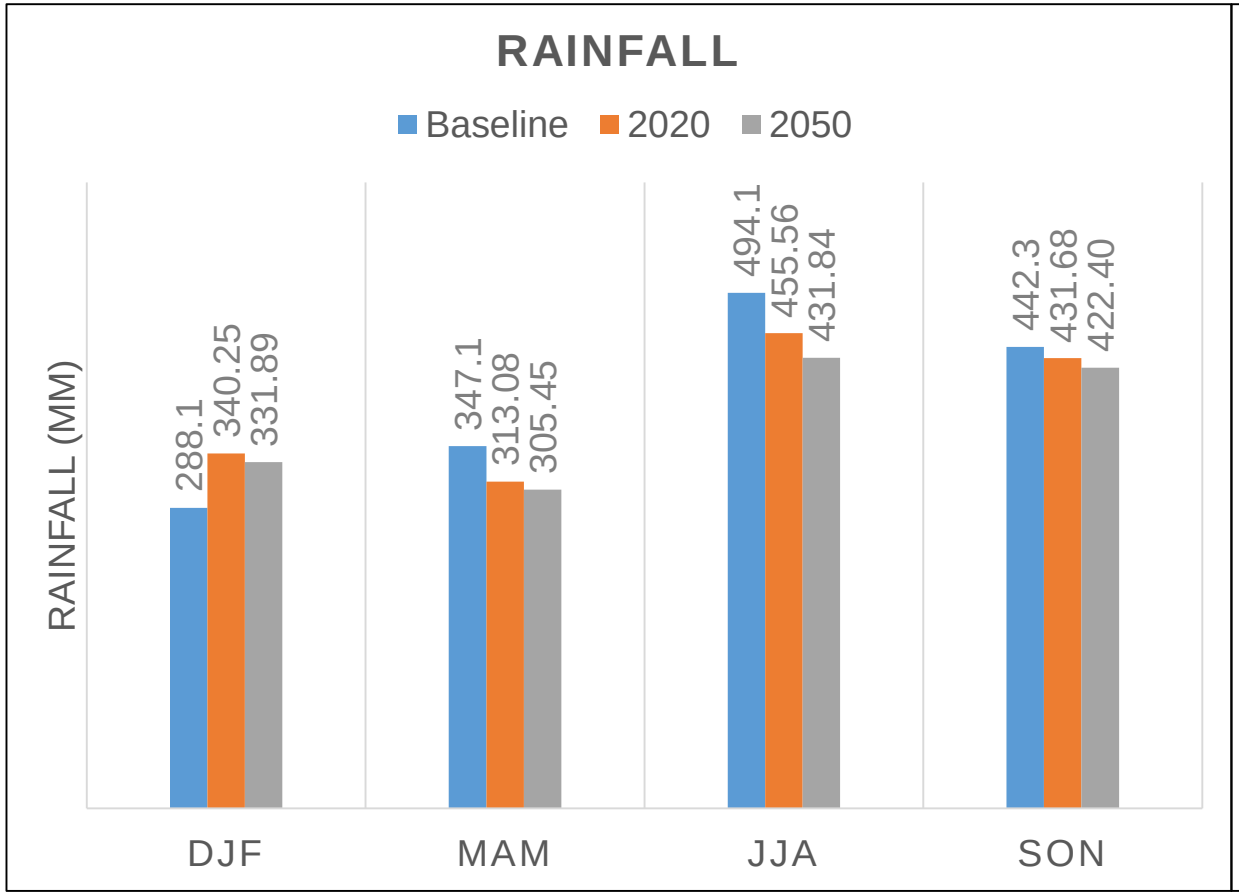
- Updated climate scenarios based on Representative Concentration Pathways (RCPs) 2010

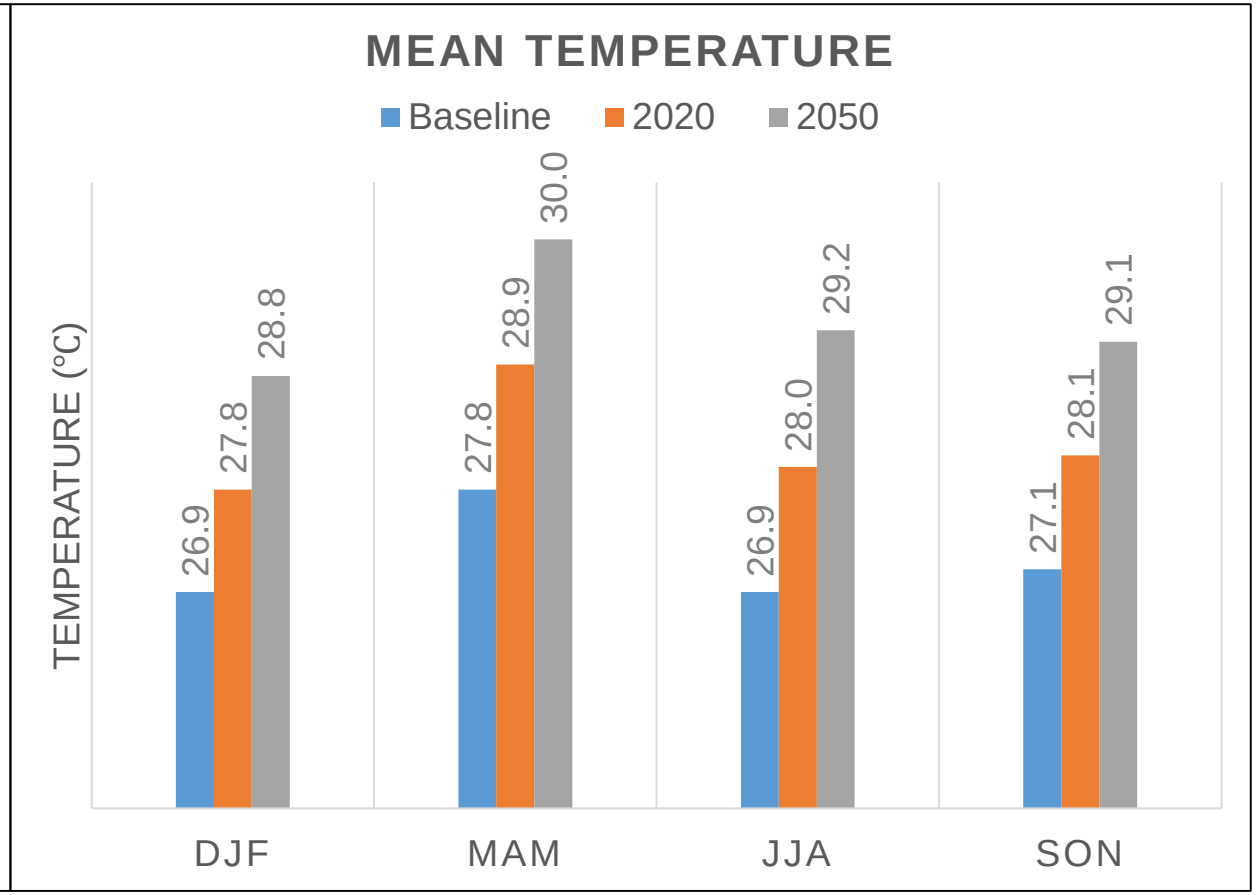


Note: Downscaled RCP scenarios still being processed by PAGASA at provincial level.

Seasonal Changes in Davao del Sur under A1B Climate Scenario

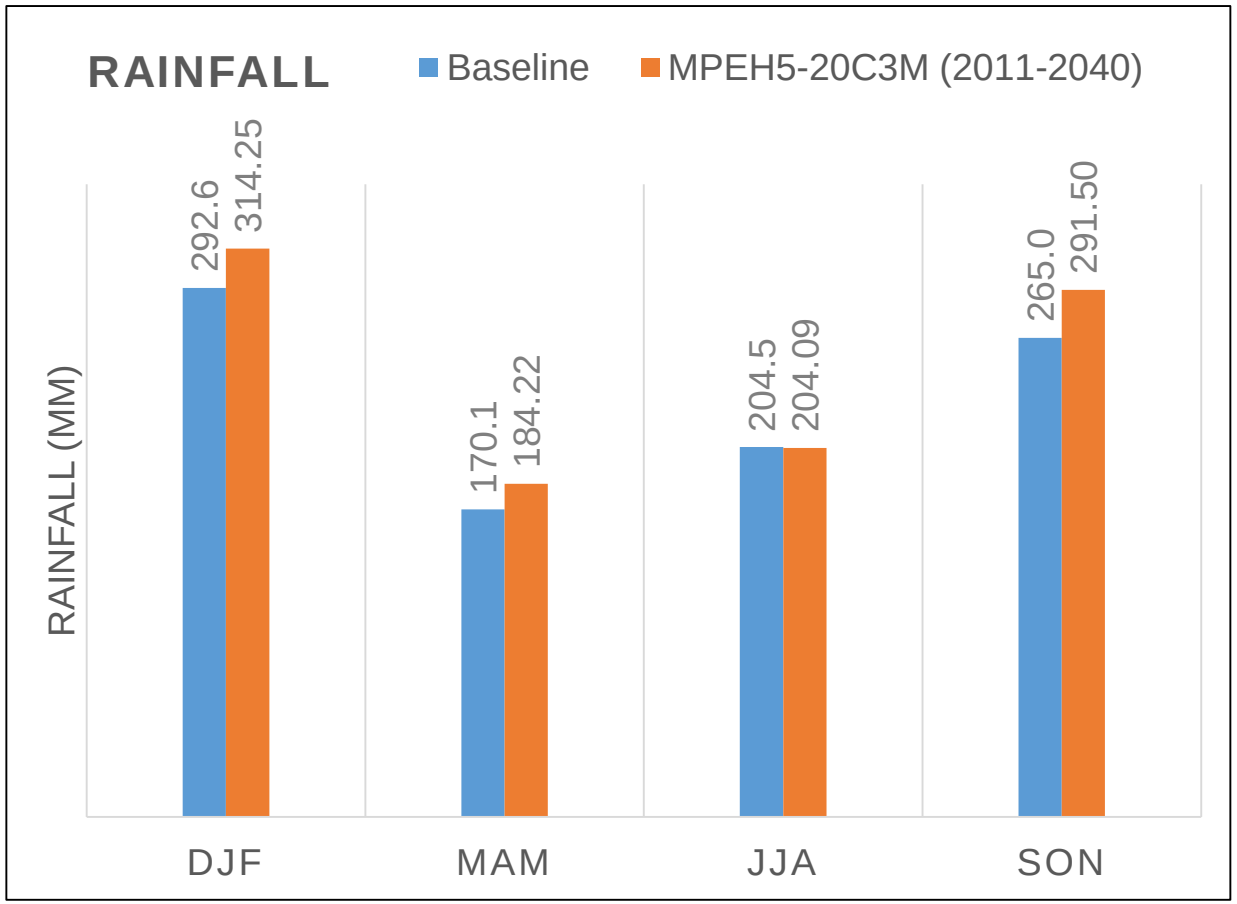
Source: PAGASA

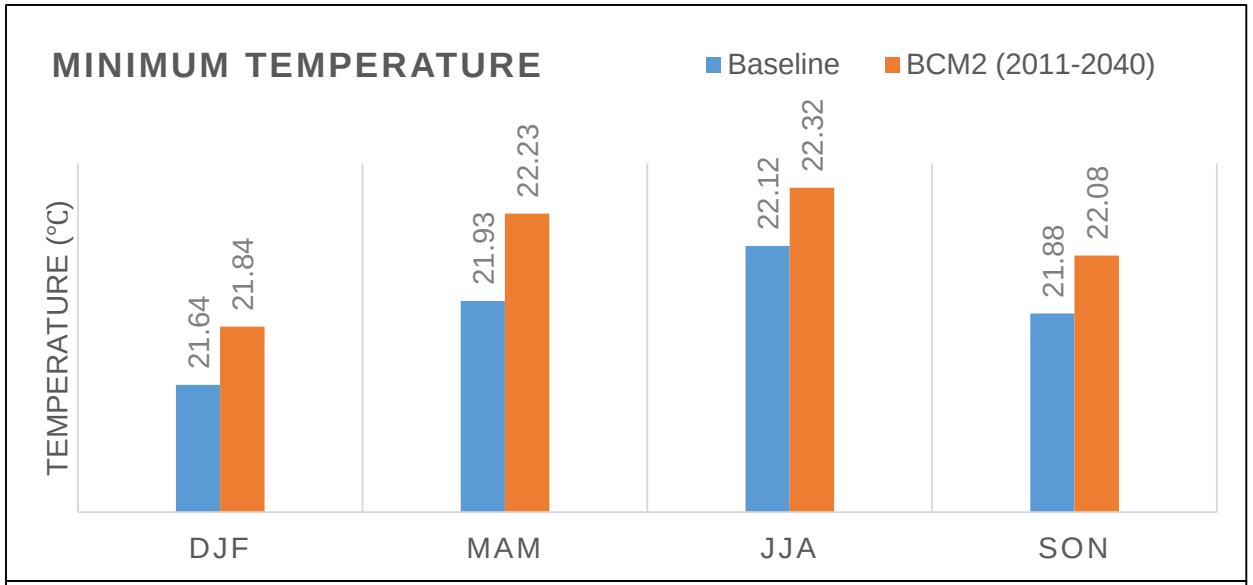


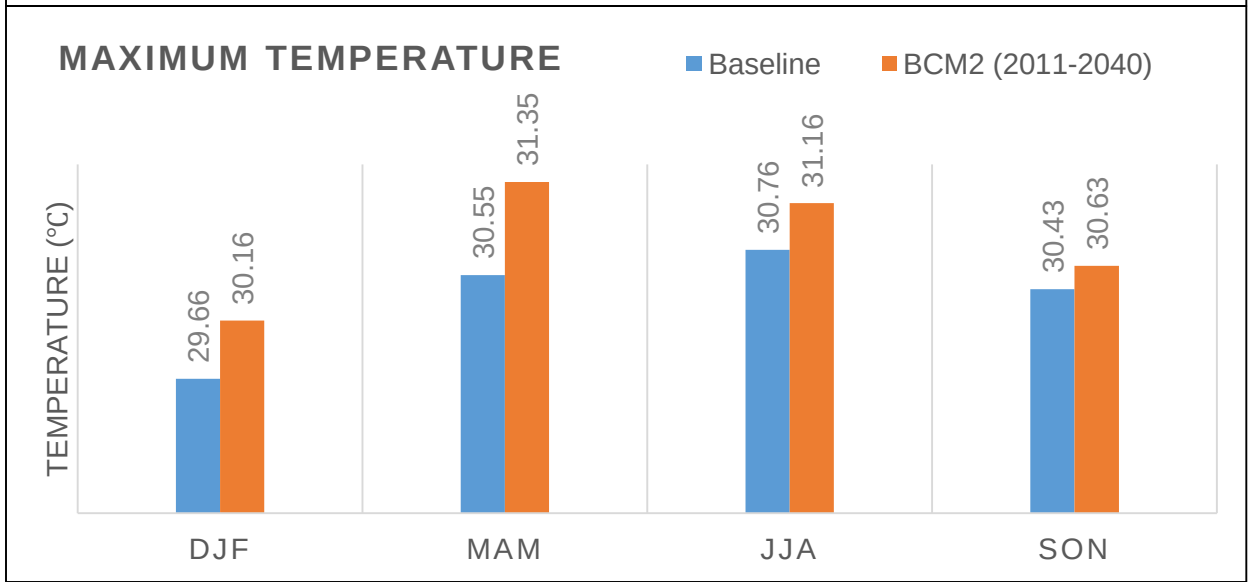


Seasonal Changes in Davao del Sur under A1B Climate Scenario

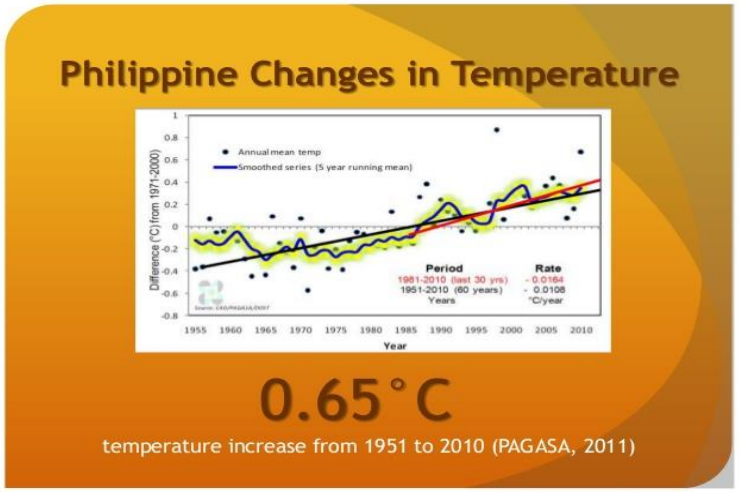
Source: FAO-AMICAF Philippines





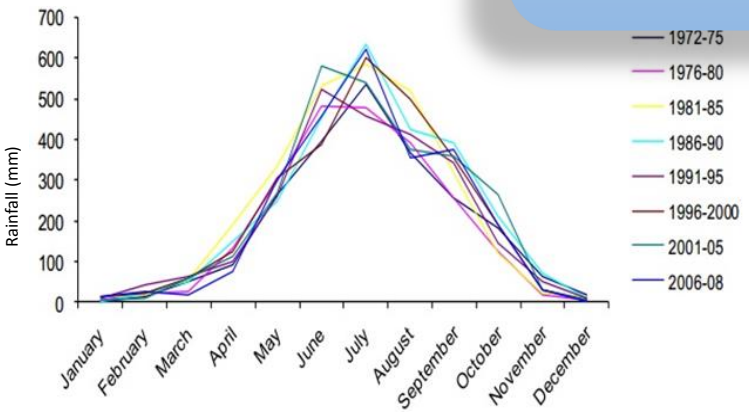


Climate Hazards Threatening Agriculture

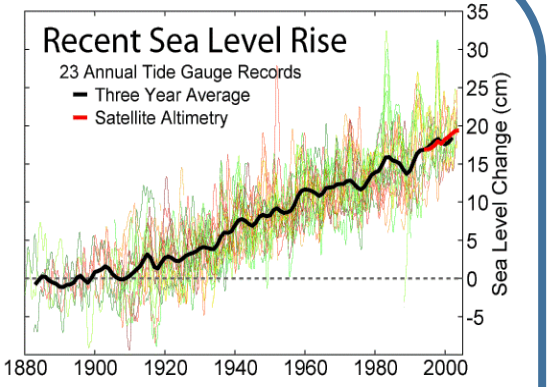


Temperature increase

More intense weather and climatic events



Erratic rainfall patterns



Sea level rise

Effects of Climate Change and Variability in Tropical Fruit Production

Effects and Impacts of Climate Hazards on Tropical Fruit Production Systems

Reduced crop yields

Disturbed crop growing seasons

Losses and damages due to extreme climate events

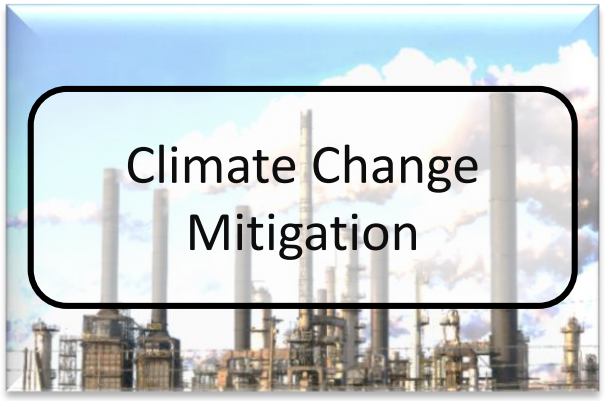
Mitigation and Adaptation Measures and Good Practices

Responses to Climate Change

- **Mitigation** – reduce the causes of climate change ; focus on priority sectors/ activities e.g. transportation, energy, land use.

- **Adaptation** – reduce the adverse effects and impacts of climate change; focus on climate-sensitive sector

Global Climate Change



Greenhouse gas emissions

Climate change Impacts

- Reduce magnitude of global warming
- Reduce greenhouse gas emissions
- Primary focus on energy, transport, land use

- Reduce vulnerability to CC impacts
- Reduce human and material losses
- Primary focus on climate-sensitive sectors and economic activities

Mitigation Strategies:

- **Reducing GHG Emissions**
  - Nutrient/ fertilizer management
  - Improved water management

- **CO_2 Sequestration**

- **Reducing Global Warming via Solar Radiation Management**

Responding to Changing Climate

Mitigation and Adaptation

Technological and Institutional Options

Structural and Non-structural Measures

Good agricultural practices

Technological Measures

Improved varieties of tropical fruits

- heat-, drought-, flood-, salinity- tolerant;
- resistant to pests and diseases, etc.

Improved agricultural water management

Efficient nutrient management

Adaptation Strategies and Measures:

- **Improved crop yield forecasting**
  - Flowering initiation based on GDD (Growth Degree Days) given seasonal climate forecasts (SCF)
  - Maturity period under climate variability
  - Early warning systems or advisories on pests and diseases under anticipated climate conditions

Adaptation Strategies and Measures:

- **Improved cultural management in tropical fruit production systems**

  - Nutrient management
  - Water management & soil moisture sensors (i.e. irrigation)
  - Effective crop protection management
  - Adaptive cropping calendar (e.g. based on cumulative rainfall threshold and duration, expected yields, etc.

Adaptation Strategies and Measures:

- **Climate risk management through agri-insurance and calamity support fund**
  - Risk transfer mechanisms (e.g. contract growing)
  - Risk sharing arrangements (e.g. owner & caretaker)
  - Support fund for victims of calamities
  - More objective crop insurance products - e.g. weather index-based insurance (WIBI) for hazards such as droughts, typhoons, pests and diseases, etc.

Some Implementation Issues in Agri-Insurance Program

- Availability of reliable weather-based indices for agri-insurance products
- Inadequate weather gauging network especially in agricultural production areas
- High premium for insurance coverage

Promoting Climate-smart Agriculture

- **Use of advances in sciences and technology in tropical fruit production systems**
  - Crop modeling and simulation
  - Seasonal climate forecasting
  - Remote sensing
  - EWS and advisories on occurrence of pests and diseases
- **Instrumentation for monitoring environmental conditions** (e.g. AWS, soil moisture sensors, etc.)
- **Intelligent cultural management practices** – i.e. science-based measures

Some Issues and Challenges in Climate-smart Agriculture

- Need for effective and responsive agricultural technologies delivery systems
- Mainstreaming of climate adaptation initiatives at local levels – i.e. often project-based
- Promotion of good agricultural practices (GAPs) as potential CCA options
- Effective coordination and governance among agencies involved, e.g. training programs, extension activities, etc.

Concluding Remarks

- **Climate change is now a reality**: there are observational evidences and plausible projections.
- CC and CLIVAR have **adverse effects and impacts** on tropical fruit production systems.
- Good practices, innovative and science-based measures to mitigate the adverse effects, and cope with CC and CLIVAR.
- Implementation issues, research and development challenges need to be addressed.

Thank you for your attention.

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