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SUSTAINING THE PRODUCTIVITY AND COMPETITIVENESS OF THE AGRICULTURE, FORESTRY & NATURAL RESOURCES SECTOR AMIDST GLOBAL CLIMATE CHANGE: R&D STRATEGIES OF THE PHILIPPINES

Patricio S. Faylon and Anthony M. Foronda
Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), Department of Science and Technology
Paseo de Valmayor, Barangay Timugan, Los Baños 4030, Laguna, PHILIPPINES

ABSTRACT

An elevated concentration of greenhouse gases in the atmosphere has altered the world's climate and in the Philippines, this has increased climate-related disasters such as droughts, forest fires, landslides and floods which in turn have negatively impacted the agriculture, forestry and natural resources (AFNR) sector. Severe droughts in 1997 to 1998 affected 960,000 hectares of agricultural lands in 18 provinces resulting in damage estimated at P12 billion for rice and corn. Total fisheries production dropped 10.2% - a lost value of P7.2 billion. On the other extreme, from 2000 to mid-2008, tropical cyclones have resulted in damage averaging about P4 billion annually.

The fourth assessment report of the Intergovernmental Panel on Climate Change projected a 0.72^0C to 3.92^0C increase in temperature and –2% to 12% change in precipitation for Southeast Asia between 2010 and 2099. Should these projections become a reality, numerous damaging impacts are to be expected by the AFNR sector. Expected impacts include extinction of 20-30% of plants and animals, which are the backbone of the AFNR sector, and destruction of major agricultural crops, livestock, fisheries and watersheds in and adjacent to erosion-prone areas. To address these specific impacts, the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) is implementing a science and technology (S&T) program on global climate change for the AFNR sector.

The overall objective of the Council's S&T program is to contribute to meet international and national goals on poverty alleviation, food sufficiency, global competitiveness, and environmental sustainability. Toward these goals, the program aims to bring cheaper food on Filipino tables, implement aggressive programs for competitive agricultural products, implement initiatives for sustainable environment and support the AFNR industries. An S&T program is implemented through strategies on policy advocacy, capacity building, technology transfer and research and development (R&D).

PCARRD's R&D activities on global climate change seek to sustain the productivity and competitiveness of the AFNR sector amidst global warming. These activities cover two areas: assessment of vulnerabilities and impacts of global warming, and development of strategies for adaptation and mitigation. In addressing these areas, the Council consequently will generate two major products: agricultural and natural resources management systems adapted to climate change, and adaptation strategies for sustainable development. In the long run, these outputs will contribute to minimizing GHG emission from agriculture and forestry activities.

Using specific environmental indicators, we have identified priority areas for developing measures to help the AFNR sector become more resilient to climate extremes. The R&D priorities under these areas include: determining local vulnerabilities to and impacts from events related to extreme climate; developing more efficient and effective disaster/hazard management; advancing appropriate water and soil/watershed conservation; enhancing indigenous genetic conservation, maintenance, improvement, and utilization; advancing integrated pest management; sustaining feed production and preservation; upgrading production systems; enhancing techniques for carbon sequestration and for GHG emission reduction; developing new biofuels; improving knowledge and information management; and formulating science-based policies on global climate change impacts, adaptation and vulnerability.

Presently, PCARRD is supporting long-term ongoing R&D programs on generating a sustainable supply of raw material to produce environment-friendly, alternative energy from Jatropha,

cassava, sweet sorghum and agricultural wastes. Furthermore, we envisage for 2009 and beyond, the following major R&D programs on global climate change adaptation for the AFNR sector:

1. Climate change impacts and adaptation strategies on natural resources, agricultural and rural communities in the Philippines. This will help provide the basis in formulating strategies and developing mitigating measures to address the impacts of global climate change at the community level.
2. Promotion of the use of compost and organic fertilizer. This program aims to promote the use of agricultural wastes for increased agricultural production, thus preventing the release of carbon into the atmosphere from the traditional practice of burning such wastes.
3. Carbon sequestration valuation of different vegetation types in the Philippines. This project shall set the basis for valuating the amount of carbon stored and sequestered by secondary growth, mossy, mangrove, and plantation forests in the country. It will also set the baseline for the future participation of the country in carbon stocks trading.
4. Carbon stocks trading localization: Developing models for community-based carbon sequestration and carbon trading mechanisms. The project will lay the foundation for community participation in carbon trading under the Clean Development Mechanism. This will particularly revolve around the current Community-Based Forestry Management program by the Department of Environment and Natural Resources.
5. National watershed management R&D program. This program will (a) establish permanent sites within priority sub-watershed in different regions, (b) conduct standardized research on climate, biophysical, social and institutional influences, and (c) develop, validate, and promote technologies for a more effective and efficient watershed management.
6. Policy advocacy support to streamlining global climate change policy in the Philippines. This initiative targets the enhancement of global climate change knowledge and/or awareness of the people through the (a) conduct of fora, seminars and symposia on climate change, (b) production of information, education and communication materials and (c) policy advocacy specifically in consolidating and formulating policies related to addressing climate change in the country.

KEYWORDS
Global climate change, vulnerability and impact assessment, adaptation and mitigation strategies, sustainable development, agriculture and forestry

Philippine R&D Strategies on Global Climate Change for the AFNR Sector

DR. PATRICO S. FAYLON
Mr. Anthony C.T.M. Foronda
Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD)
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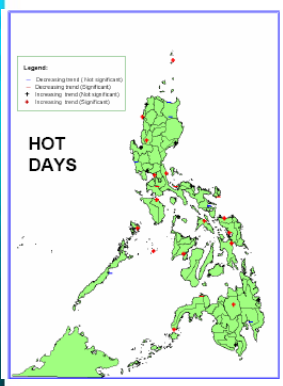
Outline

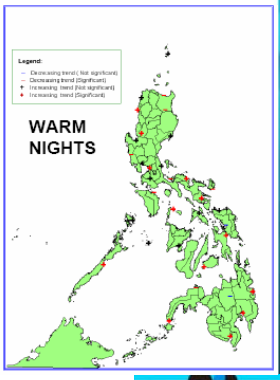
- Observed climate changes (indicators)
- Impacts on agriculture, forestry and natural resources (AFNR)
- Projected climate changes
- Implications to AFNR
- Science and Technology (S&T) framework
- Research and Development (R&D) strategies
- Ongoing and proposed R&D programs

Changes in Philippine Climate

+ 0.14ºC

Changes in Philippine Climate

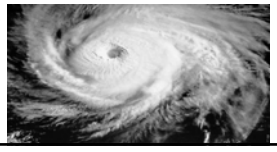


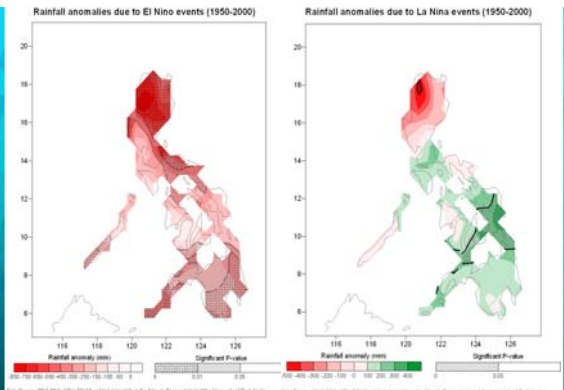


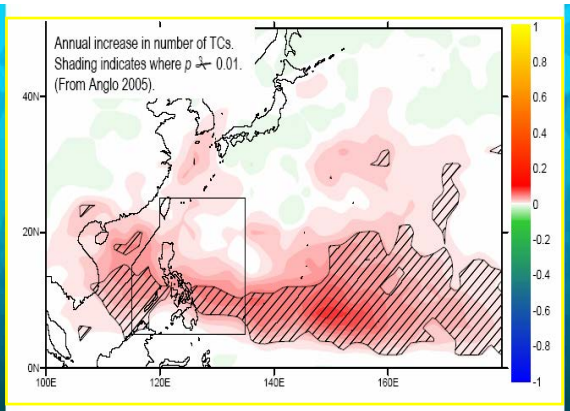
Source: Perez, 2007

Changes in Philippine Climate

- Increase in annual mean rainfall
- Increase in number of rainy days
- Increase in inter-annual variability of onset of rainfall
- Increase in the frequency of tropical cyclones







Source: Perez, 2007

Impacts of Past Climate Extremes

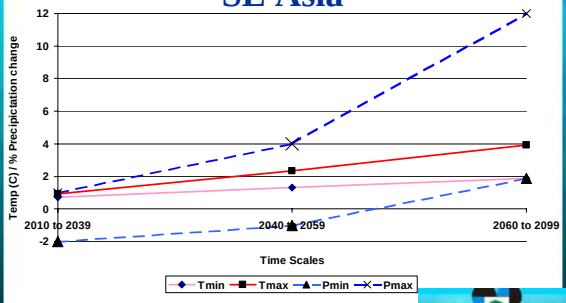
- Droughts affected agricultural lands
- Total fisheries production dropped
- Second growth forest and logged-over forests were burned
- Water level was reduced

Impacts of Past Climate Extremes

INCIDENTS	2000	2001	2002	2003	2004	2005	2006	2007	2008	TOTAL	Annual Average
Floods	839.000	1,206.000	527.151	255.738	118.572	138.389	64.135	29.478	1.200	3,179.663	353.30
Heavy rains	.	.	3.340	0.074	.	.	35.445	235.908	.	274.767	30.53
Dry spell/Drought	.	.	95.005	.	.	0.490	.	891.127	.	986.622	109.62
Tropical Cyclones	2,120.000	2,963.998	480.504	2,657.564	9,006.706	.	10,534.957	.	4,376.570	32,140.299	3,571.14
Others	.	.	2.455	17.200	70.086	16.570	102.529	29.581	.	238.421	26.49
TOTAL	2,981.000	4,169.998	1,110.555	2,947.756	9,299.095	172.019	10,823.801	1,252.035	4,377.770	37,134.029	4,126.00

Source: National Disaster Coordinating Council

Projected Surface Air Temperature and Precipitation in SE Asia

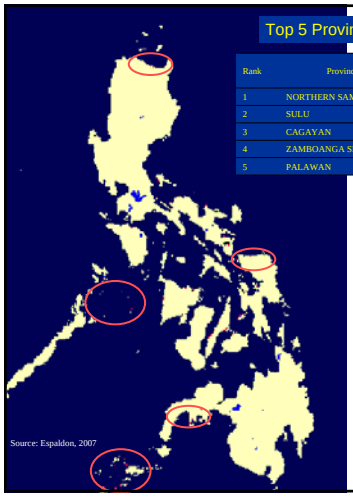


Implications to Philippine AFNR

- AFNR is most vulnerable
- 40% of major agricultural crops and livestock are vulnerable
- Fishery production may decline

Implications to Philippine AFNR

- Surface water quality will be degraded
- Coastal areas will be vulnerable
- Wetlands, mangroves and coral reefs are threatened
- Remaining upland forests will continue to be pressured



Top 5 Provinces which are vulnerable to 1-m SLR

Rank	Province	Region	Number of Municipalities vulnerable to a 1-m SLR	Area vulnerable to a 1-m SLR (ha)
1	NORTHERN SAMAR	VIII	11	5,356.94
2	SULU	ARMM	14	2,984.61
3	CAGAYAN	II	4	2,360.89
4	ZAMBOANGA SIBUGAY	IX	4	2,039.91
5	PALAWAN	IV	7	1,851.60

Total area vulnerable to 1-m SLR = 28,886 ha

Number of municipalities vulnerable to 1-m SLR = 116

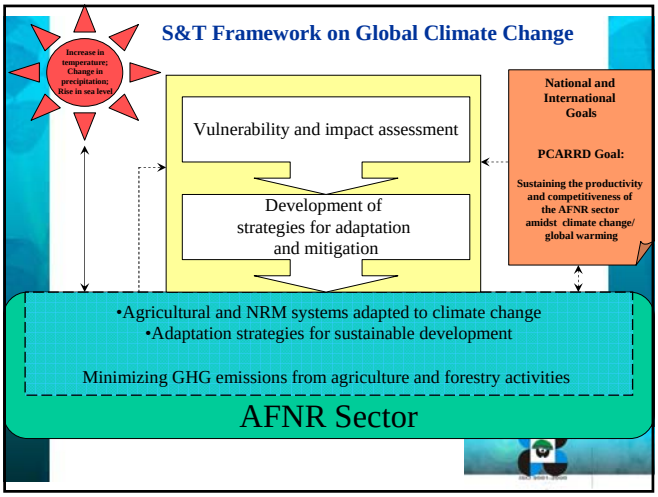
Implications to Philippine AFNR

- **Plants and animals are at increased risk of extinction; Philippine biodiversity ranks 17th in the world; 15th in endemism**
- **Forest loss may occur**
- **More agriculture areas will be damaged**
- **Communities are at increased risk**

S&T Strategy

- **Policy advocacy**
- **Capacity building**
- **Technology transfer**
- **Research and development**

S&T Framework on Global Climate Change



R&D Strategies on Global Climate Change for the AFNR Sector

What do we need?

R&D Strategies

- **Assessment of vulnerabilities and impacts of global warming**
  - ***Who/Which are vulnerable? From what? By how much? When?***
  - ***What and where are the impacts? From what? By how much? When?***
- **Development of strategies for adaptation and mitigation**
  - ***How can we significantly make the vulnerable entities more resilient?***
  - ***How can we avert or significantly decrease the impacts?***

Development of Strategies for Adaptation and Mitigation

1. Efficient and effective disaster/hazard management
2. Appropriate water and soil/watershed conservation
3. Indigenous genetic conservation, maintenance, improvement, and utilization

Development of Strategies for Adaptation and Mitigation

4. Integrated pest management
5. Sustainable feed production and preservation
6. Upgraded production systems

Development of Strategies for Adaptation and Mitigation

7. Techniques for carbon sequestration and for GHG emission reduction
8. New biofuels
9. Improved knowledge and information management
10. Science-based policies

Current R&D Initiatives

R&D Initiatives

<u>Efficient and Effective Disaster/Hazard Management</u>

- Decision support system for environmental hazards using GIS remote sensing
- Developing and testing a modality for rehabilitating calamity-stricken areas
- Intervention on the rehabilitation of calamity-stricken coconut areas

R&D Initiatives

<u>Appropriate Water and Soil/Watershed Conservation</u>

- Evaluation and adoption of improved farming practices on soil and water resources

R&D Initiatives

Techniques for Carbon Sequestration and for GHG Emission Reduction

- **Farm-managed clean production facility from small and medium scale swine industry for fuel and fertilizer production**

R&D Initiatives

New Indigenous Biofuels

- **R&D for national biofuels program**

Capacity Building

- Assessing carbon stock in forest ecosystem
- Upgrading of agromet station

Technology Transfer

- Farmer-managed system for managing groundwater system
- Sustainable upland farming through the establishment of “Barangay Sagip Saka” or Conservation Farming Villages

Future R&D Initiatives

In the pipeline

Assessment of Vulnerabilities and Impacts of Global Warming

- **Monitoring, evaluation and assessment of indicators**
- **Mapping climate change vulnerable areas of AFNR**

Efficient and Effective Disaster/Hazard Management

- **Developing technologies to increase resiliency of vulnerable AFNR areas**
- **Community-based mangrove rehabilitation**

Appropriate Water and Soil/Watershed Conservation

- **Management of priority watersheds**
- **Promotion of the use of compost and organic fertilizer**

Techniques for Carbon Sequestration and for GHG Emission Reduction

- **Carbon-flux monitoring in forest ecosystem**
- **Carbon sequestration valuation of different vegetation types in the Philippines**
- **Developing models for community-based carbon sequestering and carbon trading mechanisms**

Science-Based Policies

- **Policy advocacy support to streamline global climate change policy in the Philippines**

Conclusion

- **Global climate change has been and will be altering the AFNR ecosystem**
- **These changes may impact on the productivity and competitiveness of the AFNR sector, if the sector does not consider climate change in its activities**
- **Technologies and R&D strategies will create a niche for the Philippine AFNR to attain goals amidst global climate change**

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