ADAPTATION STRATEGIES FOR CLIMATE CHANGE IMPACTS ON MAJOR AQUACULTURE SYSTEMS IN THE PHILIPPINES

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INTRODUCTION

- The Philippines – "one of the most vulnerable countries to the impacts of climate change" (Lasco, 2012)
- Philippine Aquaculture (the farming of aquatic plants and animals)
  – the most vulnerable subsector of fisheries to climate change impacts followed by municipal fisheries and commercial fisheries

- PHILIPPINE FISHERIES PRODUCTION (2014)
  Aquaculture – 49.9%
  Municipal fisheries – 26.7%
  Commercial fisheries – 23.7%
- ECONOMIC LOSS DUE TO EL NINO (1997-1998)
  Aquaculture subsector – 85.2% of total production (PHP 7.25 billlion)
  (PCAMRD, 1999)

PHILIPPINE AQUACULTURE SYSTEMS

- PONDS
  Brackishwater – 240,000 ha




- Freshwater – 114,000 ha


- CAGES

Freshwater (lakes and reservoirs) – 15,000 ha


Brackishwater (tidal rivers) – 2,000 ha


Marine (coastal waters) – 5,000 ha

- PENS
  Freshwater (lakes) – 10,000 ha
  Brackishwater (tidal rivers) – 1,000 ha
  Marine (coastal waters) – 1,000 ha

- OPEN WATER (coastal waters)
- Seaweeds – 100,000 ha

- Oyster/Mussel – 5,000 ha

ADAPTATION STRATEGIES FOR CLIMATE CHANGE IMPACTS

- PONDS

Climate Change Impact: Floods

Strategies (observations):

- Increase pond dike height by 1-2 meters above flood level to prevent overtopping

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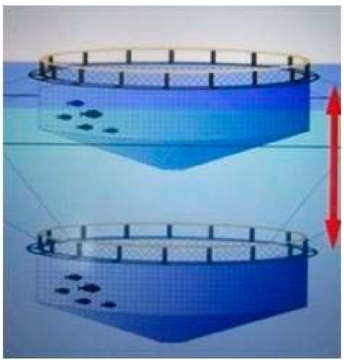
- Install net enclosures within the pond to minimize loss of stock with flooding

- CAGES Climate Change Impact: Typhoons

Strategies (aquafarm experiences):

- Use of submersible net cages in shallow lakes

- Use of submersible net cage in deep coastal waters (Source: JICA)



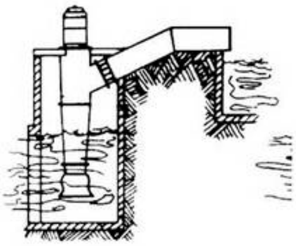
- PONDS

  CC Impact: High ambient temperature
  (38-40 degrees Celsius)

  Strategies (observations/experimental):

  - Increase pond depth to 2-3 meters for water storage (rain harvesting)

- Use of shallow well pump for water supply



- Use of nylon netting for artificial shade

– Use of *Pistia stratiotes* (a floating aquatic weed) for artificial shading of freshwater ponds with tilapia (experimental)

Experimental design

* Control - no shading

* Shading with three frames of 5-cm diameter PVC pipes (10 feet long each) with total area of 28 sq.m. or 12% of 200-sq.m. pond

* Shading with six frames of 5-cm diameter PVC pips (10 feet long each) with total area of 56 sq.m. or 24% of 200-sq.m. pond

Treatments	Mean Water Temperature
Control (no *Pistia*)	32.18 degrees Celsius
Three Frames of *Pistia*	*32.50* degrees Celsius
Six Frames of *Pistia*	*30*. 58 degrees Celsius

Preliminary Findings:

1) The six frames of *Pistia* reduced water temperature than with three frames compared to no shading.
2) There was less oxygen, lower pH and less plankton density in the water at 6 am in the pond with 6 frames than in the pond with 3 frames and in the control pond.
3) Better growth of the fish was observed in the pond with 24% shading of *P. stratiotes* than that in the control pond.

- Open Water Seaweed Culture in Coastal Waters
  Climate Change Impact: High Sea Surface Temperature (34-35 degrees Celsius) in the summer months of March-April

Strategies

- Use of floating monolines in deep coastal water with lower water temperature (observation)

– Applying fertilizer in floating rafts increases production and lessens susceptibility to "ice-ice" disease (experimental)

Guerrero *et al.* (2003):

"Use of 'Ocean Green' (20% ferrous sulfate) at 8 g/sq.m. increased yield of *Kappaphycus alvarezii* cultured in floating rafts by more than 30% on a cost-effective basis and lessened susceptibility to 'ice-ice' disease."

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