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Potential Adaptation Strategies in Response to Climate Change for Agriculture and Fisheries in the Pacific Islands

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Outline

- Brief Description of the Study
- Climate Scenario Modeling Methodology – Agriculture
- Impacts of Climate Change
- Adaptation Strategies for Agriculture and Fisheries
- Policy Recommendations for Adapting to Climate Change

Brief Description of the Study



Countries under study:

- Papua New Guinea (PNG)
- Solomon Islands
- Fiji Islands

Objectives:

- Determine the impacts of climate change on food security
- Identify potential climate change adaptation strategies to address food security issues
- Provide policy recommendations to address food security threats arising from climate change

CLIMATE SCENARIO MODELING METHODOLOGY ON AGRICULTURE

Climate Change Model Components

- SPAM (*Spatial Production Allocation Model*)
 - Spatial distribution of crops based on crop calendars, soil characteristics, climate of 20 most important crops
 - DSSAT (*Decision Support System for Agrotechnology Transfer*)
 - Biophysical crop response to temperature and precipitation
 - IMPACT (*International Model for Policy Analysis of Agricultural Commodities and Trade*)
 - Global food supply demand model to 2050 with global hydrology and water simulation by river basin
 - DREAM (*Dynamic Research Evaluation for Management*)
 - Evaluate financial costs likely to be borne by the agriculture sector due to climate change
 - Financial benefits of the climate-change adaptation mechanisms (i.e., modifications to crop production practices) considered by the study
-

Pacific Climate Change Scenario

- Climate data
 - 2000 - WorldClim 1.4
 - 2050 - CNRM-CM3, CSIRO Mark 3, ECHAM 5, MIROC 3.2 medium resolution
- Scenario A1B (from IPCC AR4) - assumes
 - Relatively rapid economic growth
 - Global population peaking in mid-century
 - Rapid introduction of new and more efficient technologies
- Data downscaled by Jones et al. (2003) to a 5 arc-minute resolution
- GCM weather statistics
 - Monthly time interval refined by stochastically generating daily values
 - ✓ Rainfall
 - ✓ Temperature
 - ✓ Solar Radiation
- Data on soil profiles
 - Adapted by Dimes and Koo (2009) from Harmonized World Soil Database (HWSD ver. 1.1)
 - Climate and soils data enable analysis of impact on yield in every 10-km grid cell for the three Pacific countries

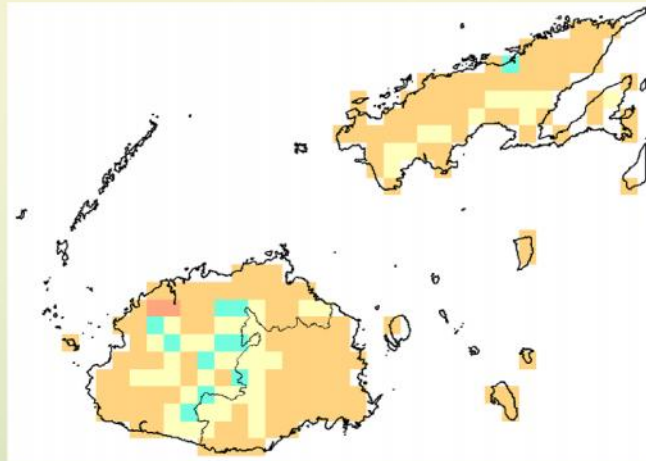
CLIMATE CHANGE IMPACTS ON AGRICULTURE

Climate Changes by Global Climate Model, 2000-2050 Climate, Fiji

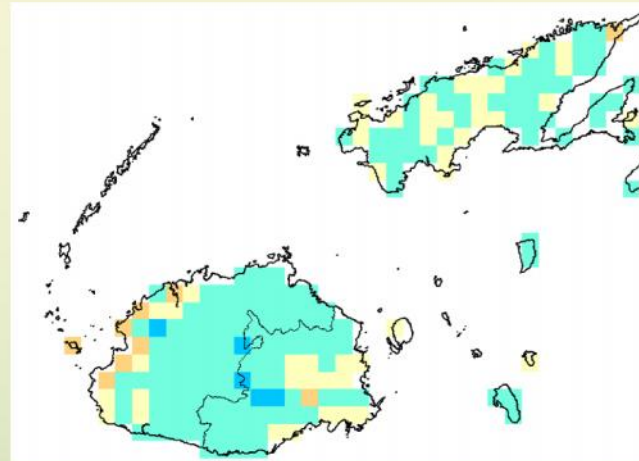
Global Climate Model	Temperature	Rainfall
CNRM	+1.8° C	Little change in wet season; drier dry season
CSIRO	+0.7° C	Wetter wet season; drier dry season
ECHAM	+1.3° C	A little drier wet season; a lot drier dry season
MIROC	+1.3° C	Substantially drier in both wet and dry seasons

- Annual precipitation levels projected to change by at least 20% in 2050 compared to the average precipitation level over 1950–2000
- Impact crop yields and output levels

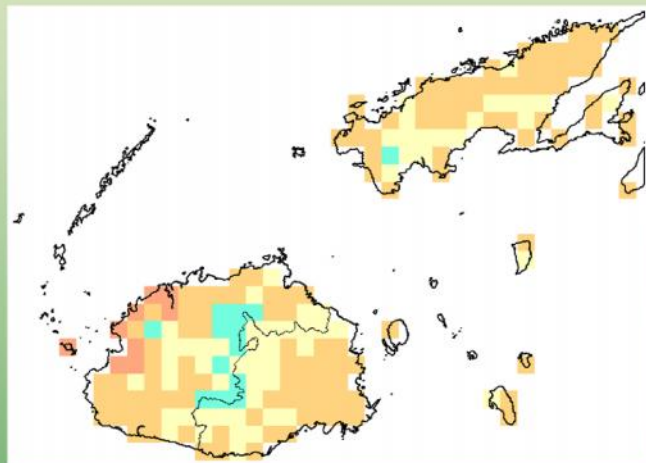
Rainfed **Sugarcane** Yield: Impacts of Climate Change, Optimal Planting Month and Cultivar, Fiji, 2000, 2050



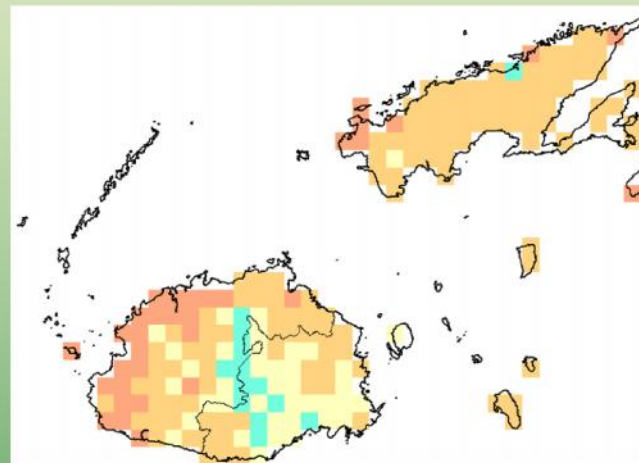
a. CNRM



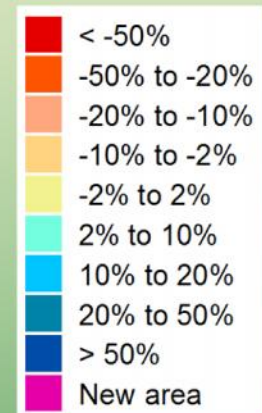
b. CSIRO



c. ECHAM

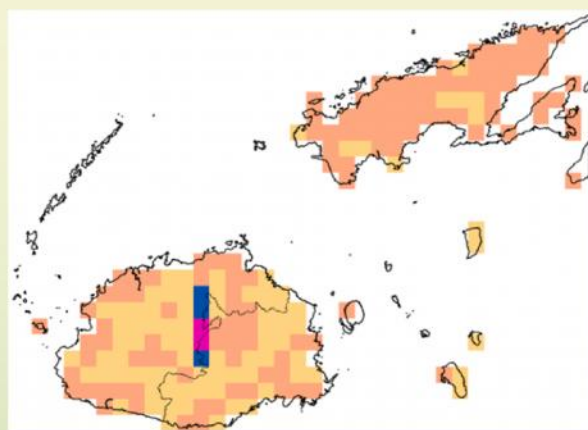


d. MIROC

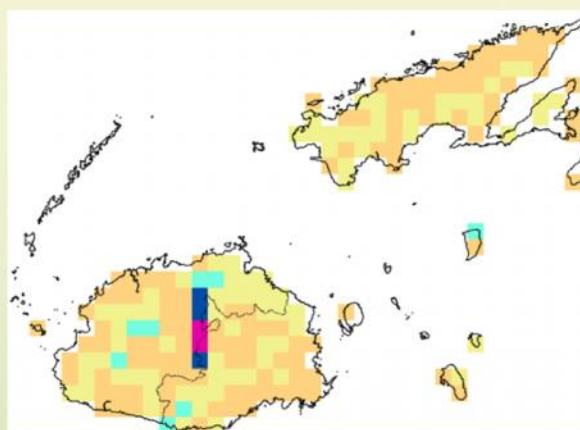


Source: IFPRI's calculations

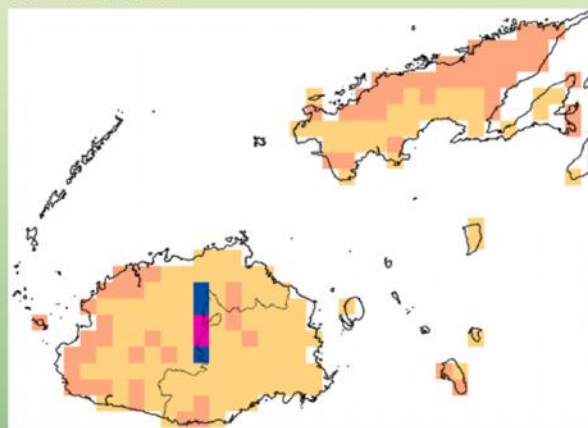
Rainfed **Taro** Yield: Impacts of Climate Change, Optimal Planting Month and Cultivar, Fiji, 2000 and 2050



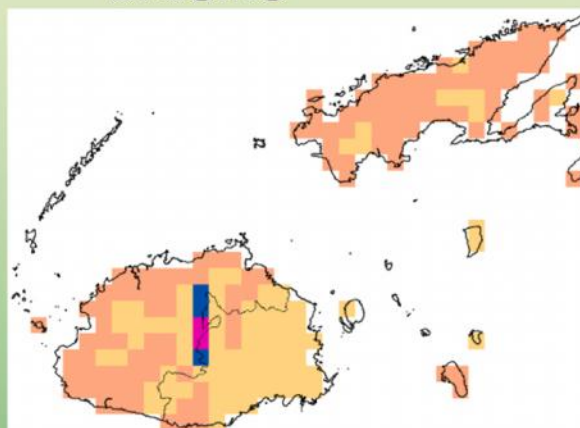
a. CNRM



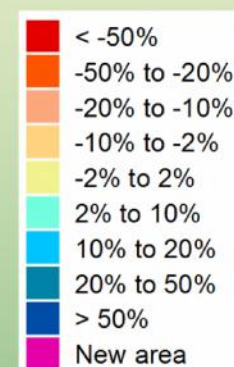
b. CSIRO



c. ECHAM

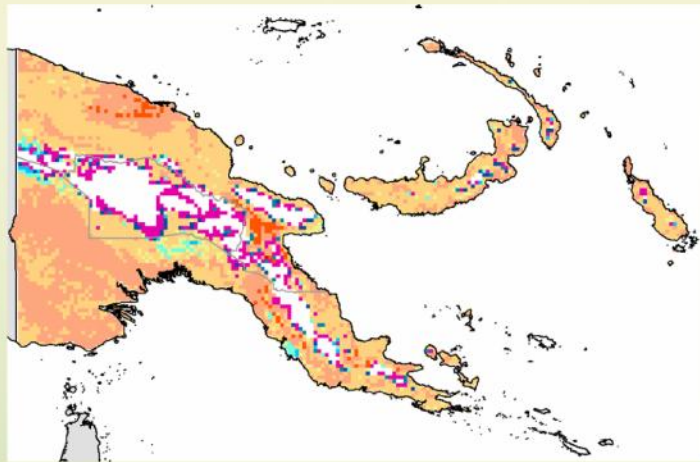


d. MIROC

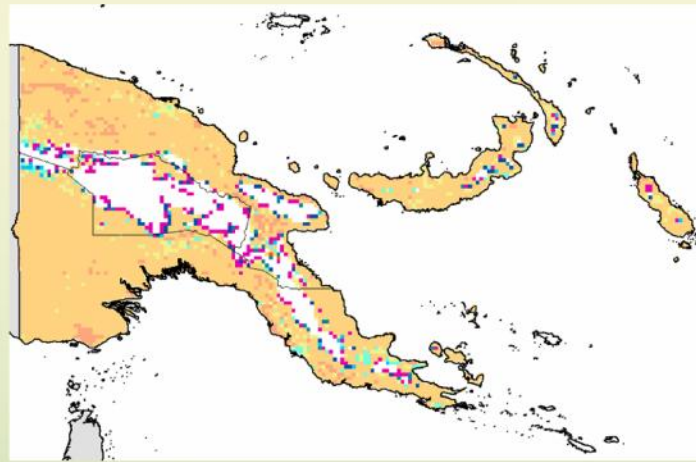


Source: IFPRI's calculations

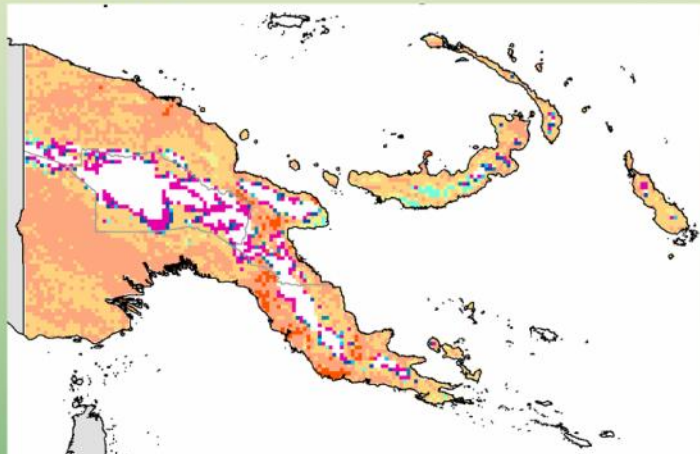
Rainfed **Taro** Yield: Impacts of Climate Change, Optimal Planting Month and Cultivar, PNG, 2000 and 2050



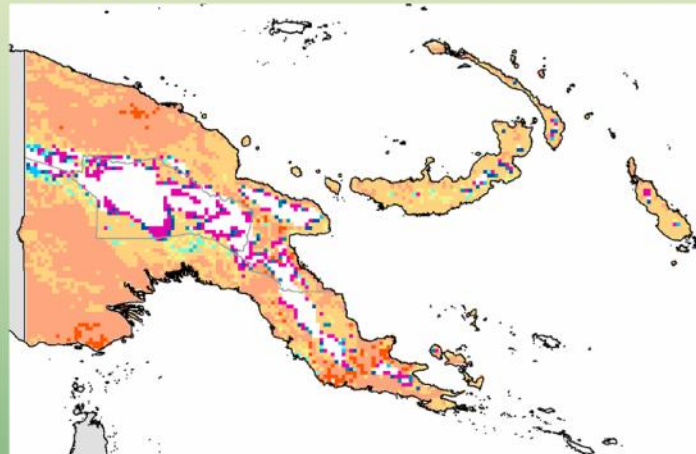
a. CNRM



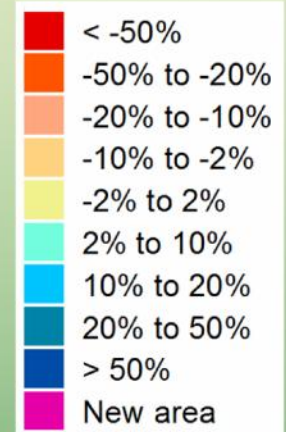
b. CSIRO



c. ECHAM

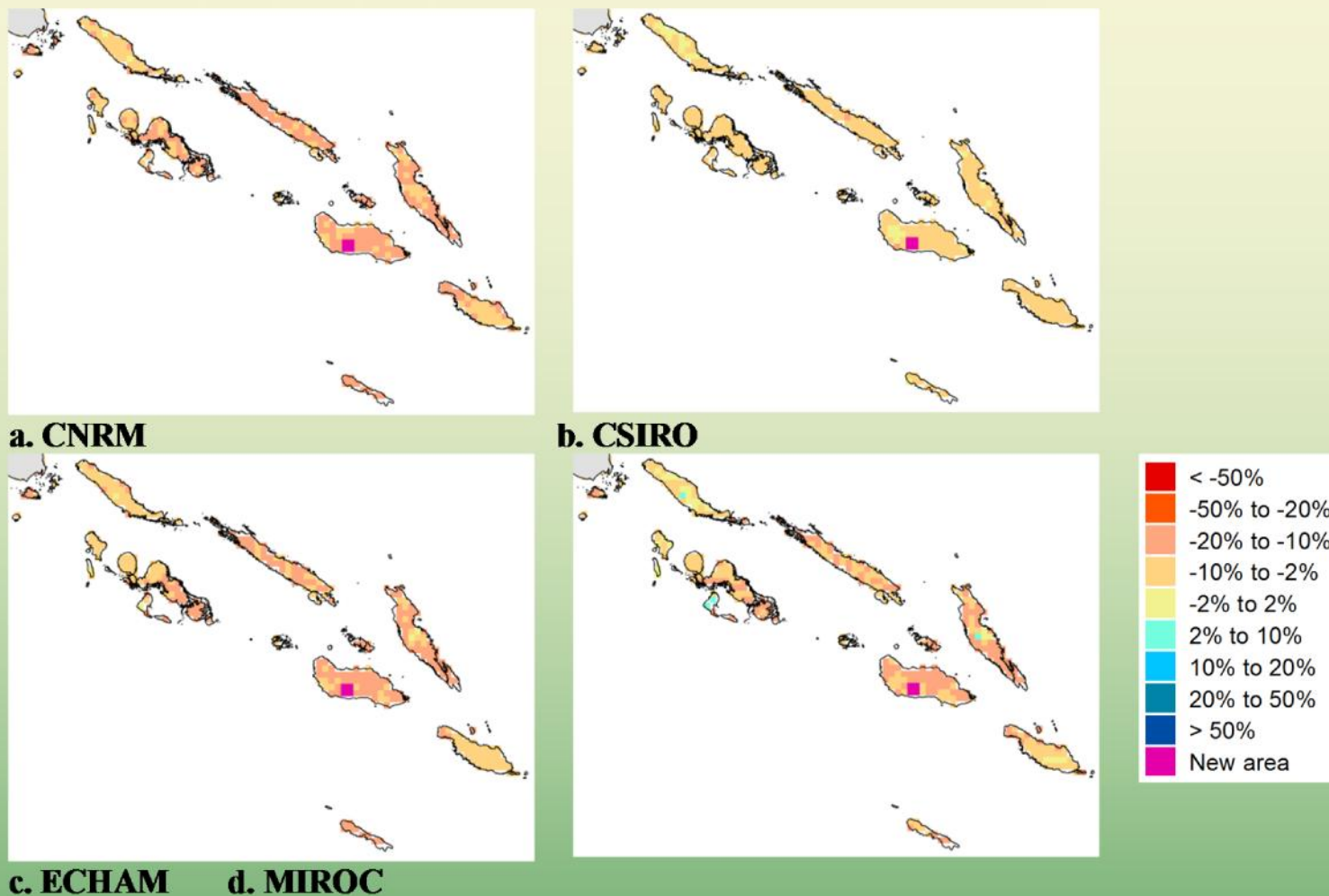


d. MIROC



Source: IFPRI's calculations

Rainfed **Taro** Yield: Impacts of Climate Change, Optimal Planting Month and Cultivar, Solomon Is, 2000 and 2050



Source: IFPRI's calculations

Impacts of Climate Change on Agriculture

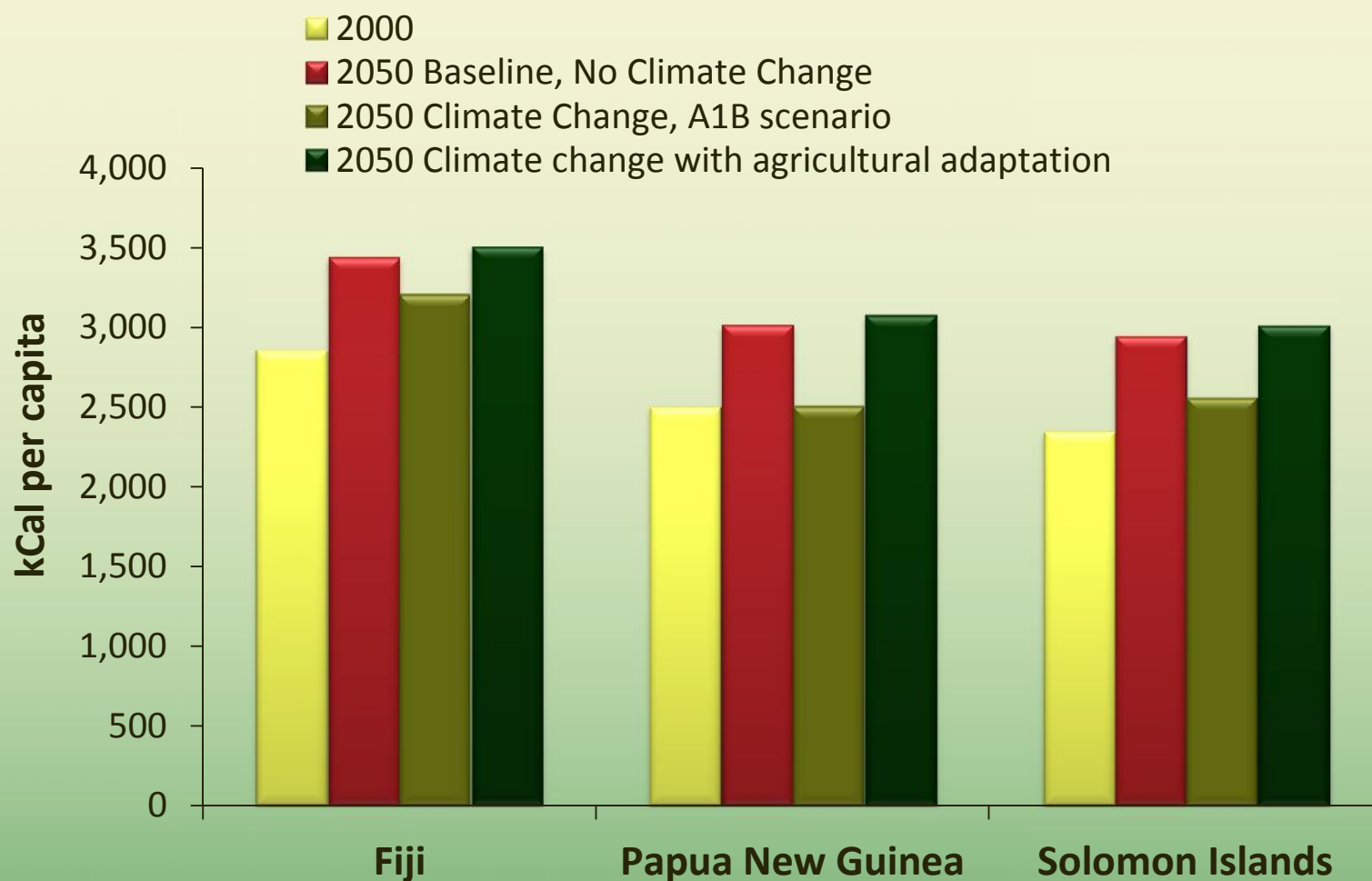
Crop yield reduction (%) due to climate change in 2050

Crop	Fiji	PNG	Solomon Islands
	%		
Sugarcane	8	-	-
Rice	4	8	15
Taro	15	13	16
Cassava	37	30	28
Sweetpotato	-	11	15

Climate Change Scenarios

Variables	Baseline	Climate Change (CC) Scenario	CC Scenario + Adaptation
Climate change took place	None	Yes but no adaptation to agriculture	Yes with adaptation strategies for agriculture
Climate related parameters	Climate based on 1950-2000 climate	IPCC SRES A1B scenario, four GCM	IPCC SRES A1B scenario, four GCM
Assumptions	Best estimates of population and income growth, agricultural growth under current policies and investments	Changes in crop yield due to CC relative to baseline estimated by DSSAT and input into the IMPACT model	<ul style="list-style-type: none"> • Agricultural research and extension expenditures <ul style="list-style-type: none"> ✓ 5% per year growth through 2030 ✓ Reaching 2% of agricultural GDP • Optimization of crop varieties to climate change • Increase in Nitrogen fertilizer use on crops by 30-50 kg/ha • Fish and meat production = 10% increase in annual growth rate

Daily per capita calorie availability under alternative scenarios (kCal per capita), 2000, 2050



Source: IMPACT model results

Number of persons at risk of hunger under alternative scenarios (thousands)

Country	2000	2050		
		Baseline, No Climate Change	Climate Change, A1B scenario	Climate change with agricultural adaptation
Fiji	na	na	na	na
Papua New Guinea	1,275	2,156	2,616	2,054
Solomon Islands	45	114	165	109

Note: na means data is not available

Source: IMPACT model results

Number of malnourished children under age 5 under alternative scenarios (thousands)

Country	2000	2050		
		Baseline, No Climate Change	Climate Change, A1B scenario	Climate change with agricultural adaptation
Fiji	na	na	na	na
Papua New Guinea	172	138	217	136
Solomon Islands	9	6	10	6

Note: na means data is not available

Source: IMPACT model results

ADAPTATION STRATEGIES

Agriculture Sector

1. Develop nontraditional agricultural exports and value-adding products; but increase investment on traditional staple crops
2. Reduce risk of climate change through development and use of
 - High-yielding cultivars resilient to multiple types of climate shocks
 - Adoption of improved crop production practices
 - Increased use of fertilizer and irrigation

Agriculture Sector

3. Invest in agricultural research

- Establish regional centers of excellence
- Test varieties for adaptation to local conditions
- Undertake cost-benefit analyses of evaluated technologies
- Build national and regional research capacity
- Strengthen linkages with international agricultural research centers to facilitate access to broader genetic diversity, advanced bioinformatics, and gene sequencing

4. Develop and promote extension services

- Provide improved market support to farmers
- Disseminate information related to efficient crop production technologies and agricultural practices

Fisheries Sector

1. Tuna - Improve and encourage larger inshore national catch
 - Use networks and tools - low-cost inshore fish-aggregating devices
 - Develop technologies for small-scale fishers
2. Aquaculture – improve and support management
 - Incorporate local participation and communities into the management of marine resources
 - Introduce necessary regulations - e.g., prevent downstream pollution from excessive feeding of fish in operations
 - Improve biosecurity mechanisms to protect biodiversity
3. Negotiate payment of increased access fees both by distant-water fishing nations and local fishing nations
 - Reorient government spending of the revenue collected from these fees to improved governance, institutional strengthening and broad policy changes to enhance local fisheries markets

Fisheries Sector

4. Invest in socioeconomic/policy and technical research done by regional and national institutions
5. Improve and promote extension services
 - Support markets for fishers and fish farmers
 - Build community awareness on the importance of environmental protection
 - Disseminate fishery and aquaculture technologies
6. Further develop climate models and projections of the impacts of climate change and appropriate adaptation responses

POLICY RECOMMENDATIONS

Overall Aims of Policy for Adapting to Climate Change

1. Rationalize land tenure policy
 - Retains indigenous ownership of land
 - But allows commercial use rights to be put into place - creation of land banks and incorporated land groups
2. Increase investment in agricultural and fisheries research and harmonize these at the regional level
 - Establish centers of excellence that link national research institutions and access services from international agricultural and fisheries research centers
3. Revitalize extension systems in a way that incorporates local participation and effective coordination of public- and private-sector providers including NGO

Overall Aims of Policy for Adapting to Climate Change

4. Increase investment in rural infrastructure that directly links to market development
5. Promote aquaculture and coastal fisheries
 - Provide technological, institutional, and management support at the local and community levels
 - Promote adoption of, and adherence to best aquaculture and fishing management practices
6. Develop and implement integrated data management, monitoring, and evaluation systems for the agriculture and fisheries sectors at all levels - community to national

Governments, NGOs, communities and other stakeholders of FIJI, PNG, SOLOMON ISLANDS

www.adb.org; www.ifpri.org

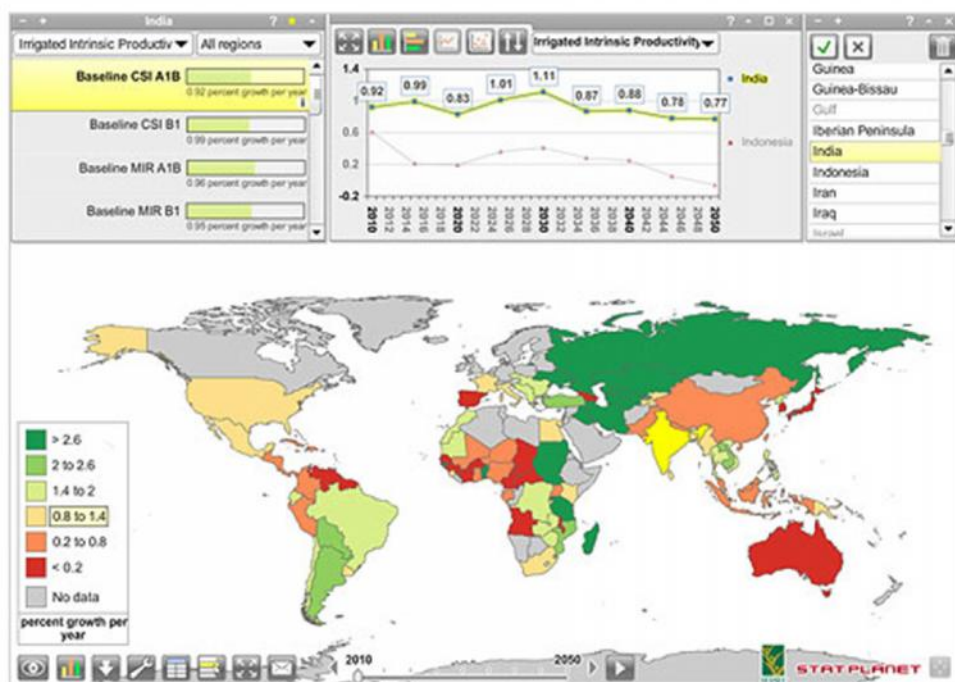


Vinaka Vakalevu
Tenkyu
Tanggio tumas
Thank you
Marami pong
salamat

Climate Change

Food Security CASE Maps

IFPRI StatPlanet Climate Visualization Tool



Food Security CASE Maps

CASE Maps Guide

Climate change animations

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