Overview of Food Security in the Pacific

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Presentation Outline

Basic Concepts of Food Security

- FS Definitions
- FS Determinants and Common Indicators

FS Issues in the PICs

- Non-Climatic issues
- Climate change issues

Adaptation Options to Improve FS in the PICs

- Policy
- Enhance climate change resilience of food systems
- Education and Awareness and etc..

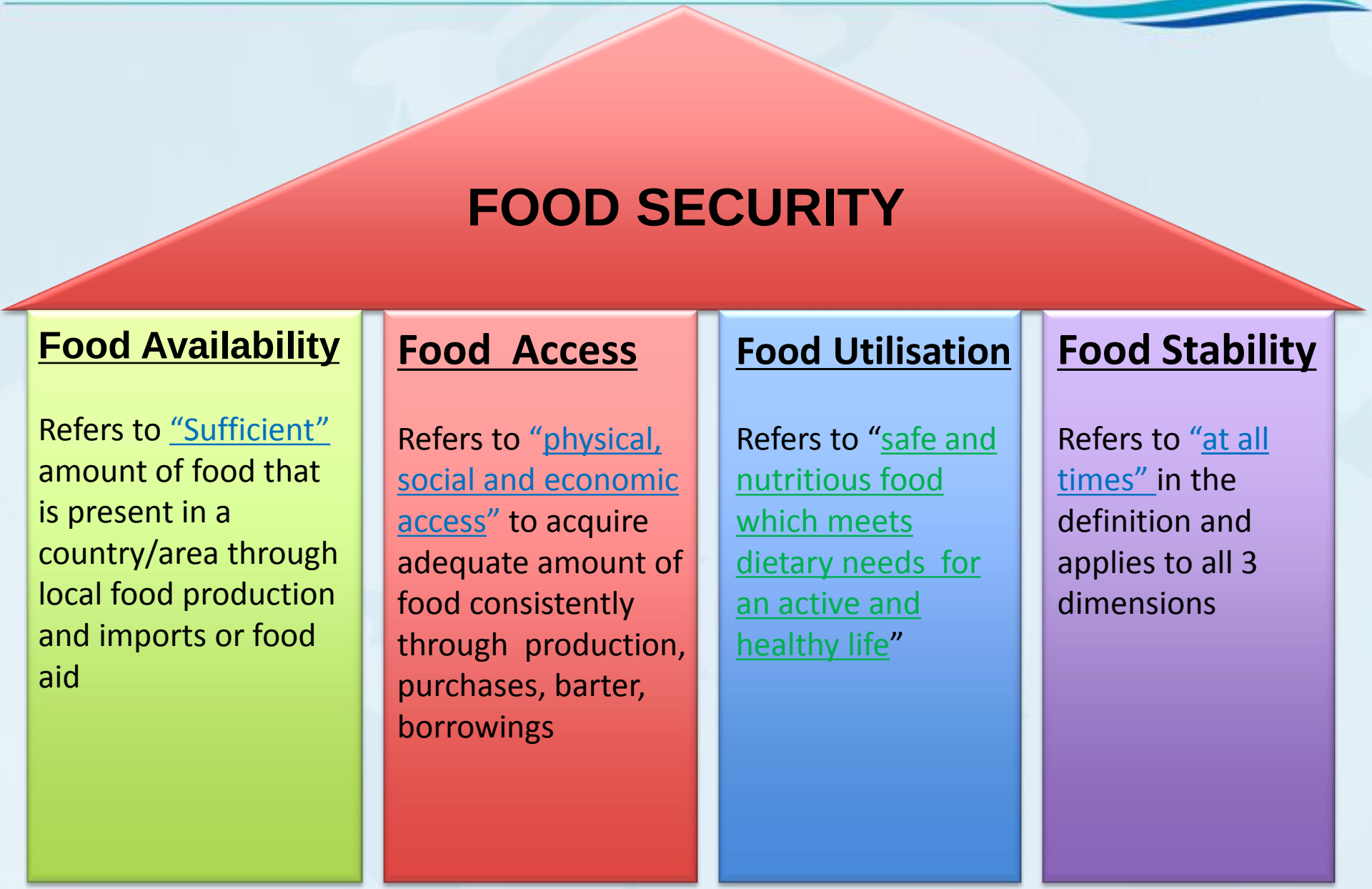
Food Security – what is it?

- Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. **(World Food Summit, 1996)**

Shorter Definition

- Food security refers to access by all people at all times to sufficient, safe and nutritious food for a healthy and active life.

FOOD SECURITY DIMENSIONS



Food Security Determinants and Indicators

1. **Food Availability Determinants:**
   a. Domestic Food Production

      Indicators:

      - Total food production
        - ✓ Land availability
        - ✓ Soil quality
        - ✓ Pests and diseases

   b. Food Import

      Indicators:

      - Total food imports
      - FBS

Food Security Determinants and Indicators

2. **Food Access Determinants**:
   a. Access to resources

   Indicators:

   - Access to land
   - Access to input supplies

   b. Food purchase

   Indicators

   - Income and expenditure
   - Food prices

Food Security Determinants and Indicators

3. **Food Utilisation Determinants:**
   a. **Consumption**

      Indicators:

      - Meal frequency
      - Dietary intake

   b. **Nutrition**

      Indicators:

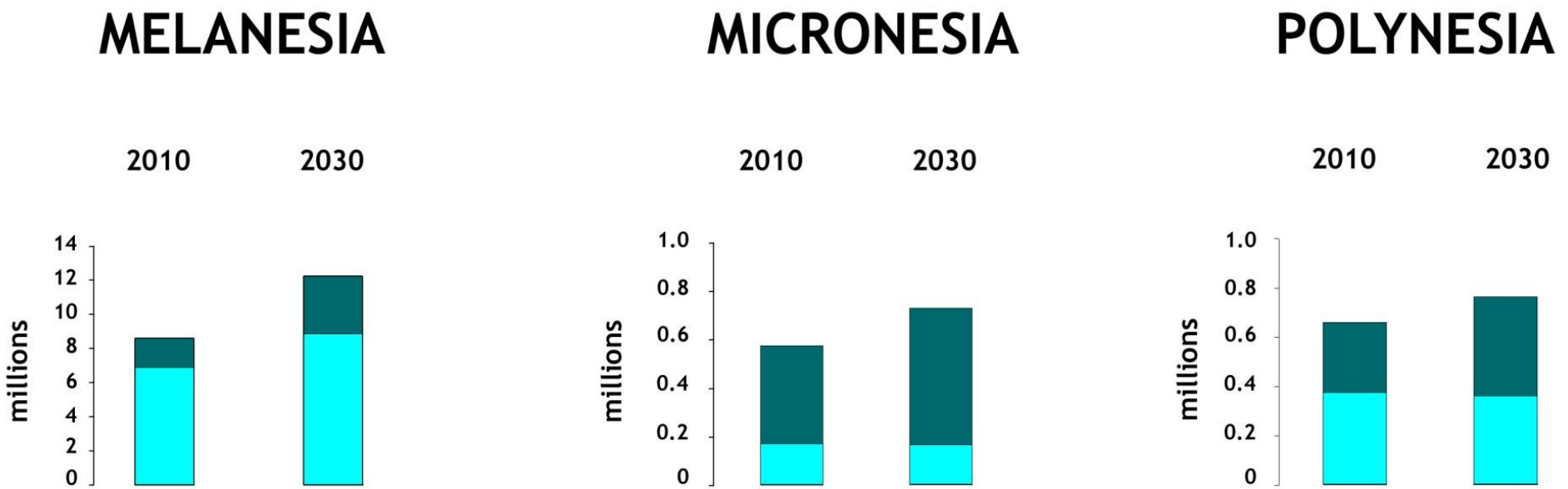
      - Health status
      - Anthropometric data (BMI)
      - Access to clean water

Food Security Determinants and Indicators

4. **Food Stability Determinants/Indicators**:
   a. weather/climate and natural and human-induced disasters
   b. price fluctuations

Food Availability Issues in PIs

Population Growth

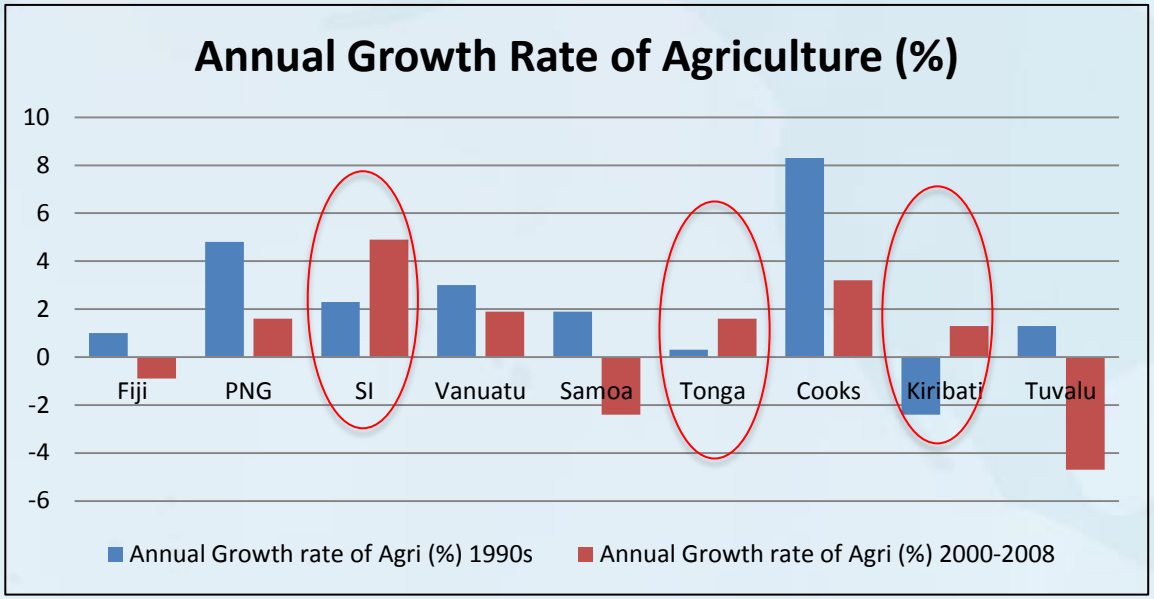


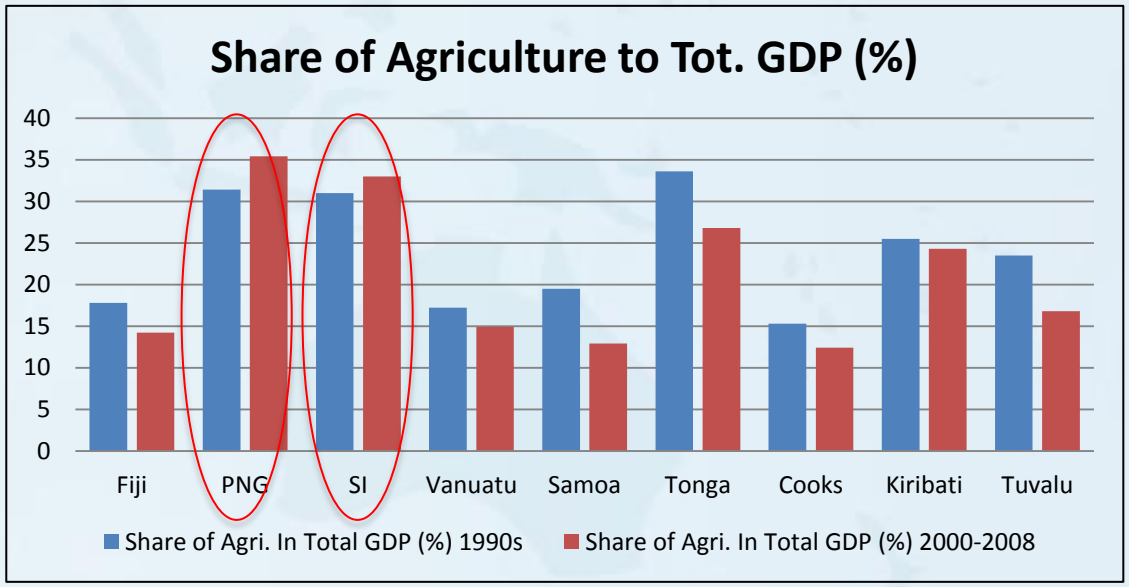
- Region's population will double in 2050
- Extra 115 000 tonnes of fish per year must be provided across region

FS Availability Issues in PIs

Food Production

- Except SI, Tonga & Kiribati, average agriculture annual growth rate has declined since 1990s



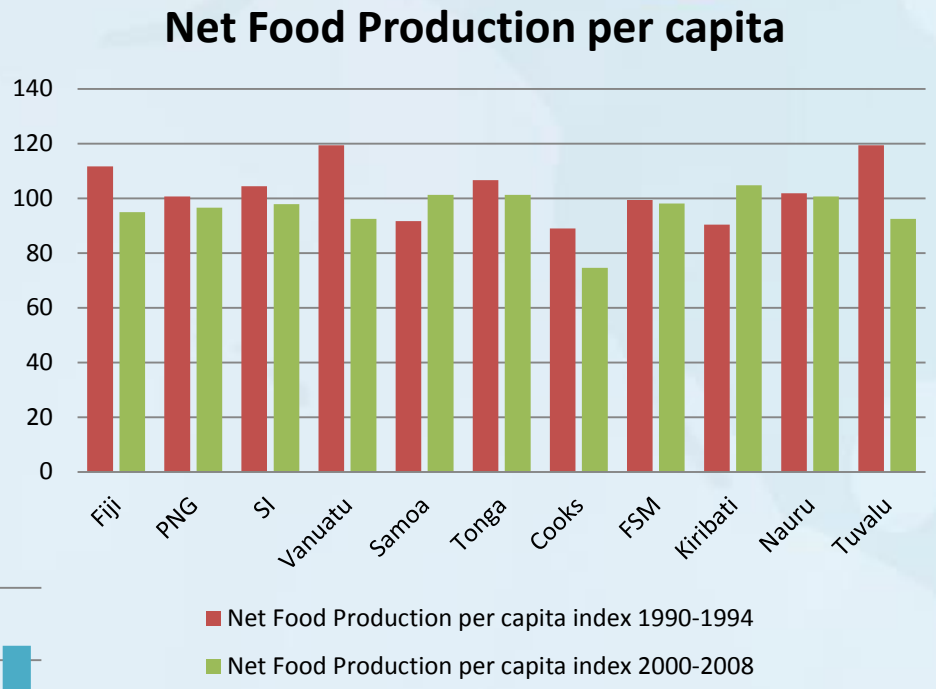


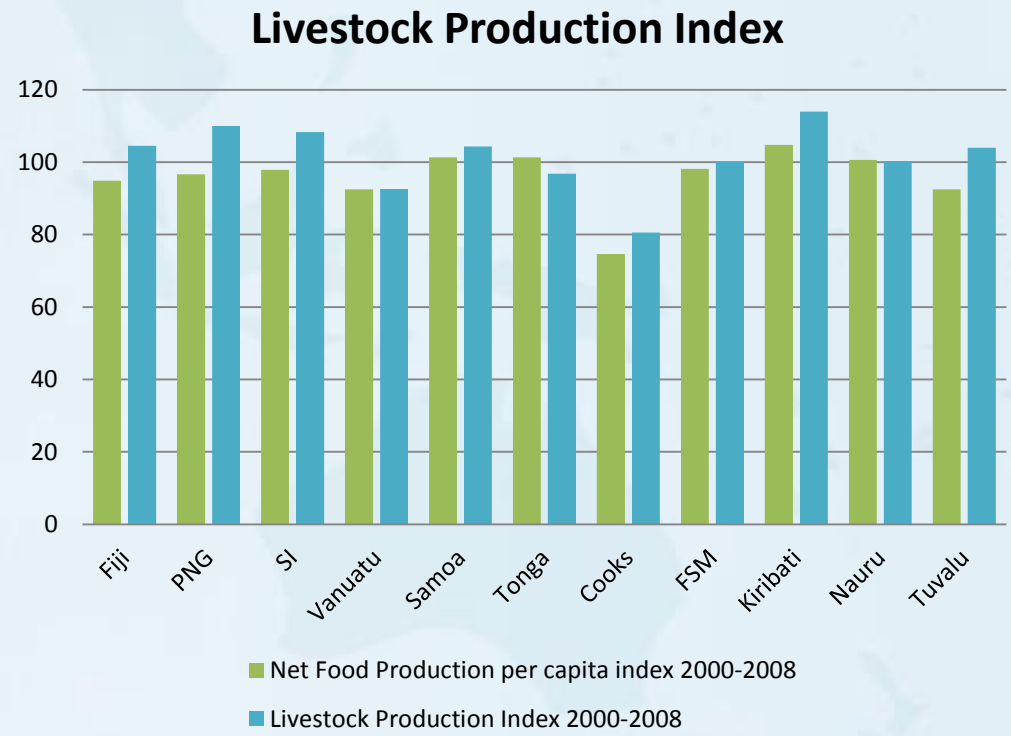
- Similar trend for share of agriculture to total GDP
- Share of agriculture to total GDP for PNG and SI are mainly due to increased export of coffee, palm oil & coconut oil

Food Availability Issues

Food Production

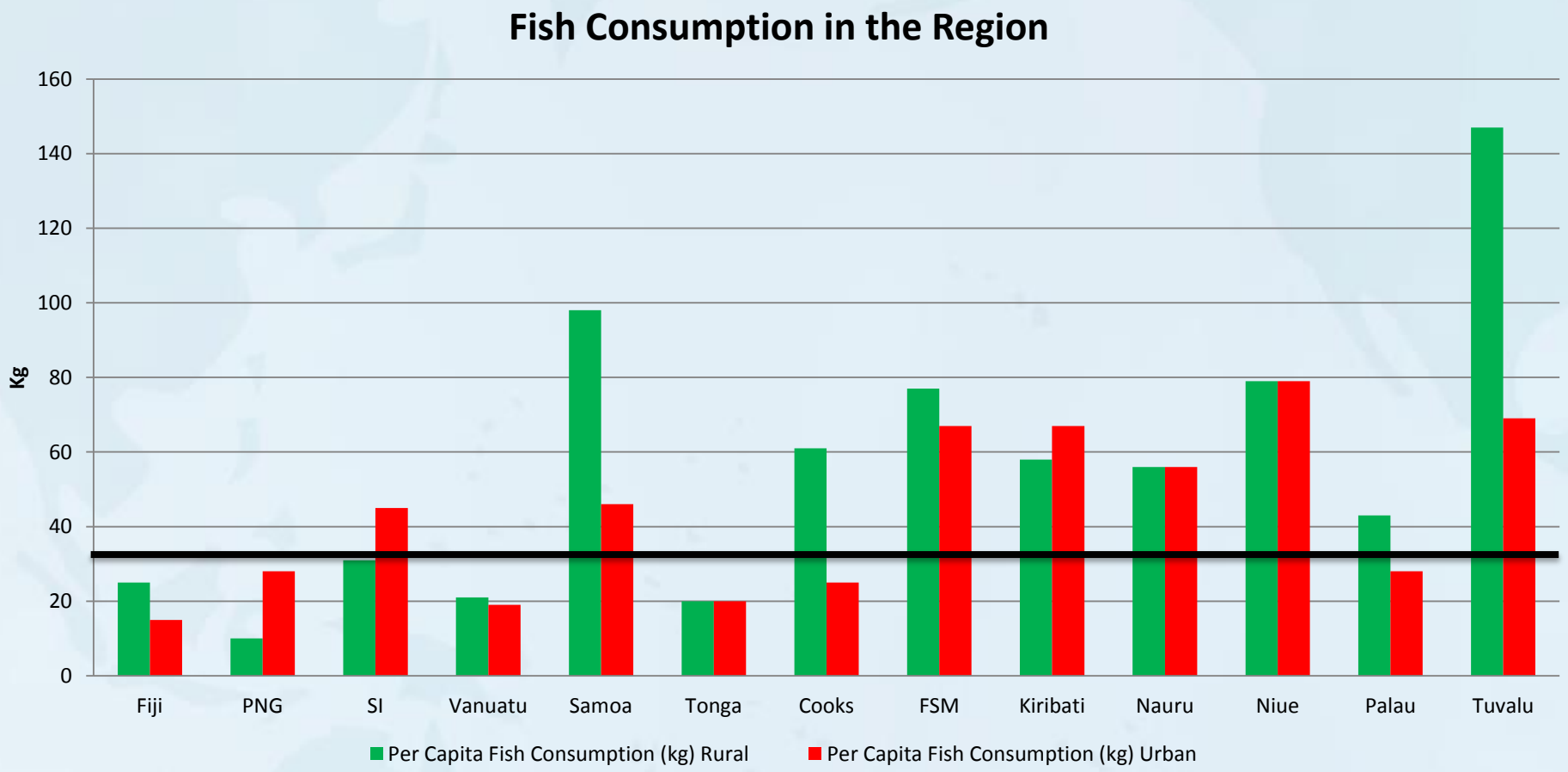
- Overall food production per capita is declining





- Overall livestock production is increasing throughout the region

Fish Availability/Consumption



- Most fish consumption comes from coastal fisheries
- Most countries (especially rural) above requirements (35kg/year)
- Even well managed coastal fisheries will not provide the future fish needs

FBS

Country	Kcal/person/day			
	1990	% Imported	2005	% Imported
Fiji	2592	38	3001	51
SI	1984	27	2433	56
Vanuatu	2498	34	2575	49
Samoa	2614	33	2769	65
Tonga	2918	39	2992	45
Kiribati	2589	29	2854	64
RMI	2819	67	2950	89

SPC/USAID Community HIES

ENERGY SUPPLY/SOURCE

Country	Community	Kcal/per/day	% Import
Fiji	Naboutini (Sabeto Catchment)	1672.2	54.4
	Nagado (Sabeto Catchment)	1655.2	51
	Sabeto Village (Sabeto Catchment)	1732.2	51.2
	Korobebe Village (Sabeto Catchment)	1693.5	51.1
SI	Sepa Village, Choiseul	1399.10	78.8
	Loimuni Village, Choiseul	1797.38	83.8
Vanuatu	Dives Bay, Ureparapara, Banks, Torba	1027.6	24.5
Tonga	Houma	950.7	48.2
	Tefisi	936.6	45.1
	Kolonga	852	39.1
Samoa	Sapapalii	2850	44
	Savaia	3021	48

SPC/USAID Community HIES

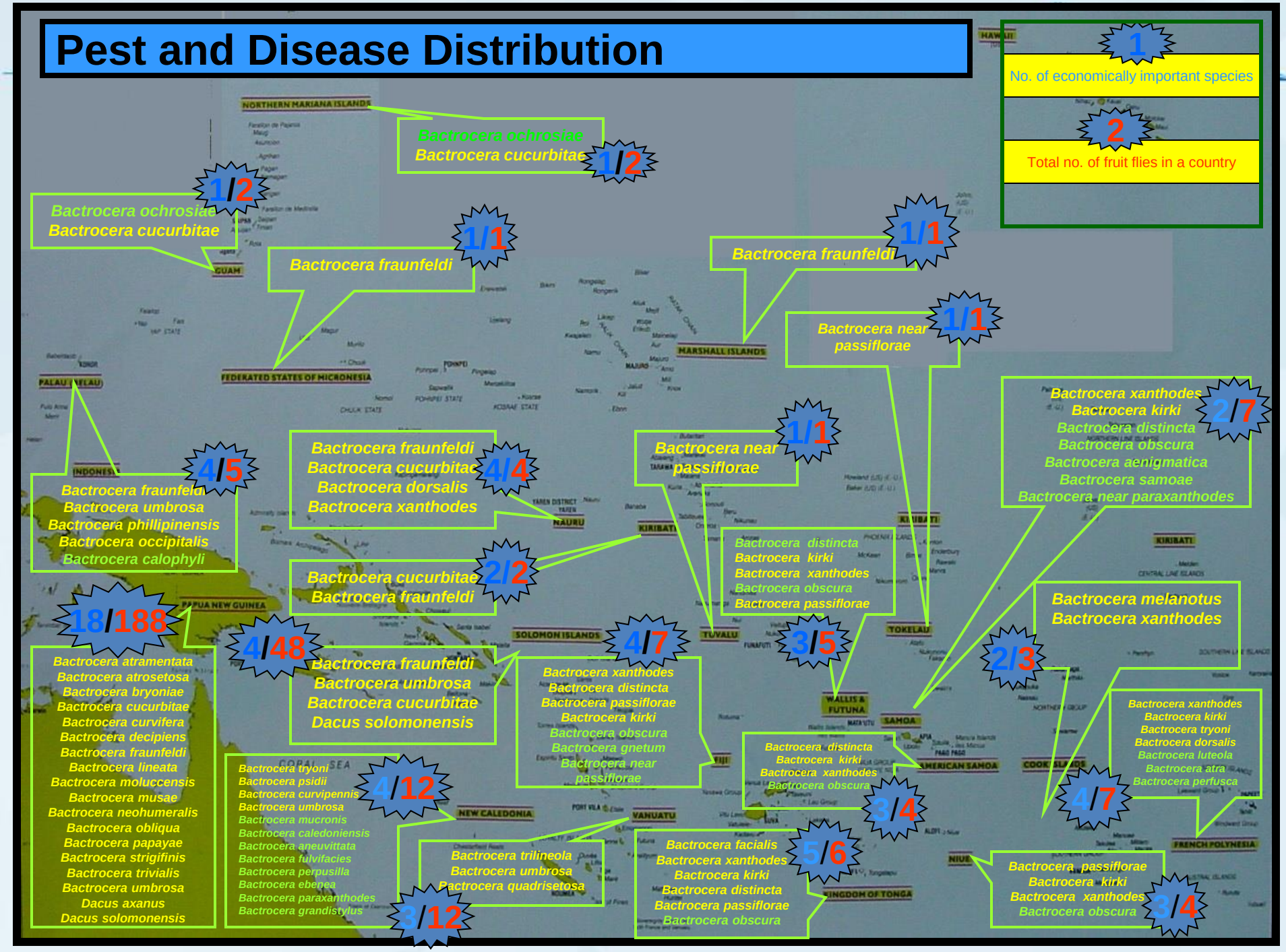
PROTEIN SUPPLY/SOURCE

Country	Community	g/per/day	% Import
Fiji	Naboutini (Sabeto Catchment)	47.4	62
	Nagado (Sabeto Catchment)	56.4	56.4
	Sabeto Village (Sabeto Catchment)	50.5	64.9
	Korobebe Village (Sabeto Catchment)	53.6	66.8
SI	Sepa Village, Choiseul	78.98	57.67
	Loimuni Village, Choiseul	116.32	84.71
Vanuatu	Dives Bay, Ureparapara, Banks, Torba	41.8	36.81
Tonga	Houma	55.83	53.8
	Tefisi	34.31	44.4
	Kolonga	64.56	67.5
	Sapapalii	1650	30
	Savaia	1400	49

Soil Health and productivity

Poor native soil fertility (atolls)

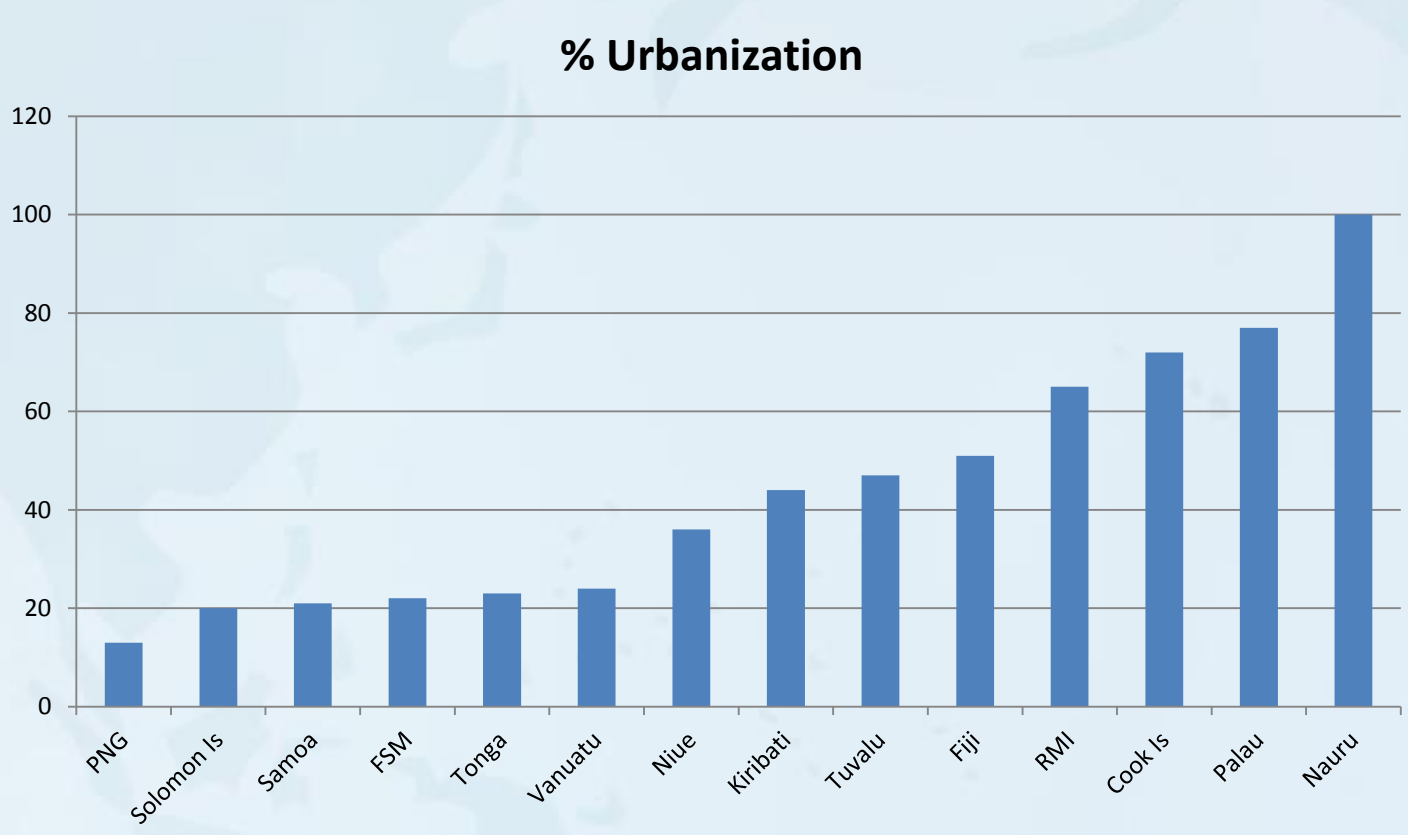
Pest and Disease Distribution



Land Degradation - Deforestation

- The Environment/Forest provide important source for food and livelihood for many of the PICs
- Deforestation is threatening these important food security and livelihood sources

Food Access Issues



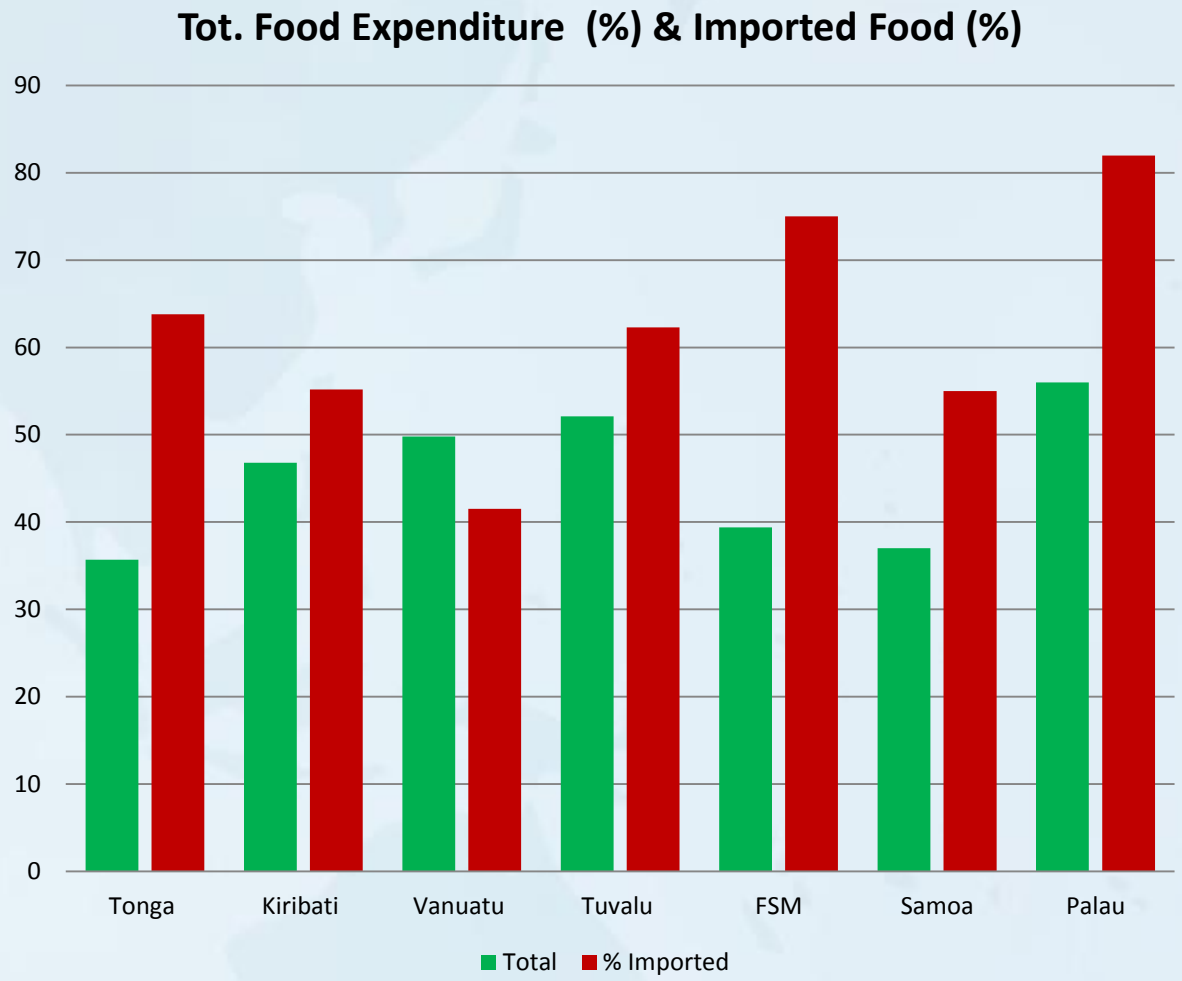
- No longer grow own food
- Increasing control of supermarkets on diet
- High prices forcing to buy cheap, poor quality food import
- Unemployment = low labor productivity = Loss of traditional knowledge

Food Access Issues

Land Access

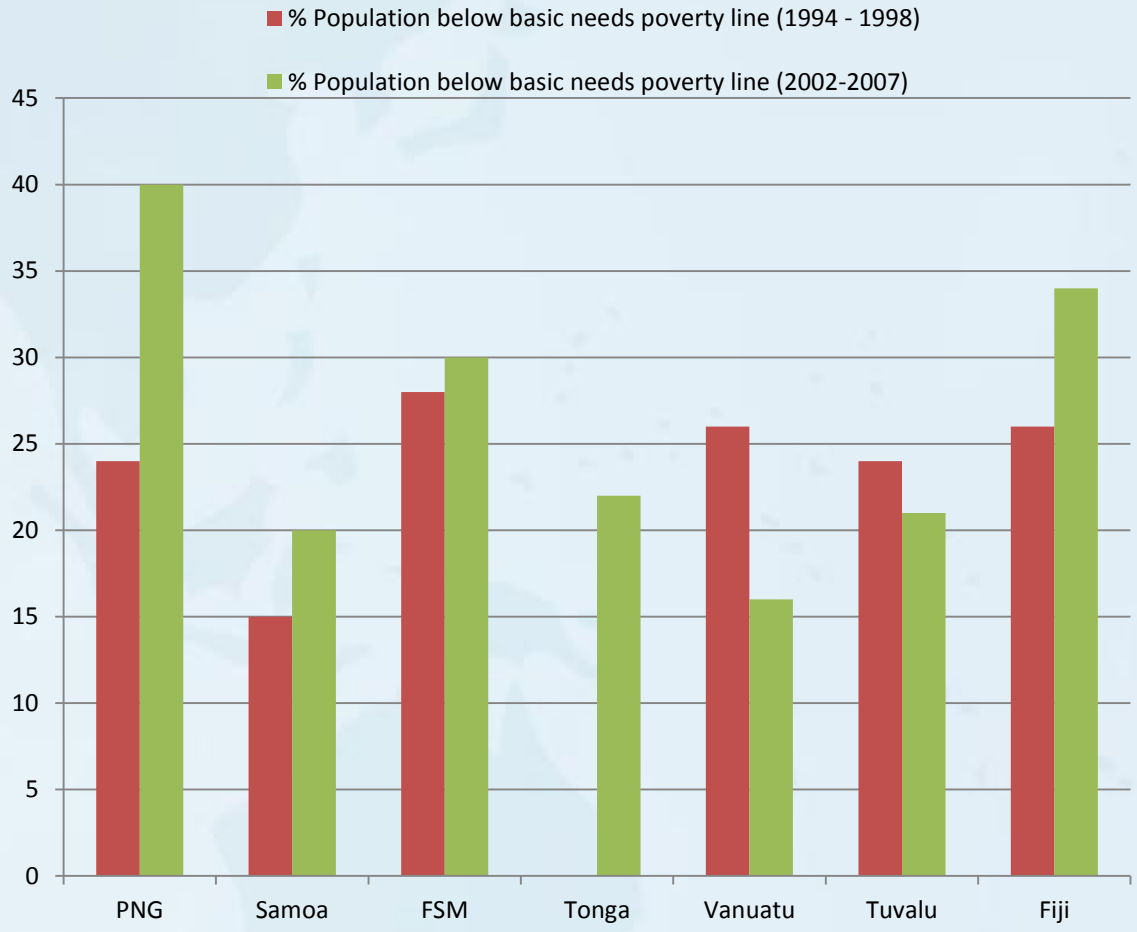
Village	% HH have land	Average size (acre)	Land Quality	% Grow own food
Divers Bay	100	6.42	• Good (23%) • Average (77%)	100
Sepa	96	2.89	• Good (63%) • Average (30%) • Poor (7%)	89.2
Loimuni	92	1.32	• Good (33%) • Average (40%) • Poor (17%)	70.37

Food Access Issues



Food Access Issues

Poverty

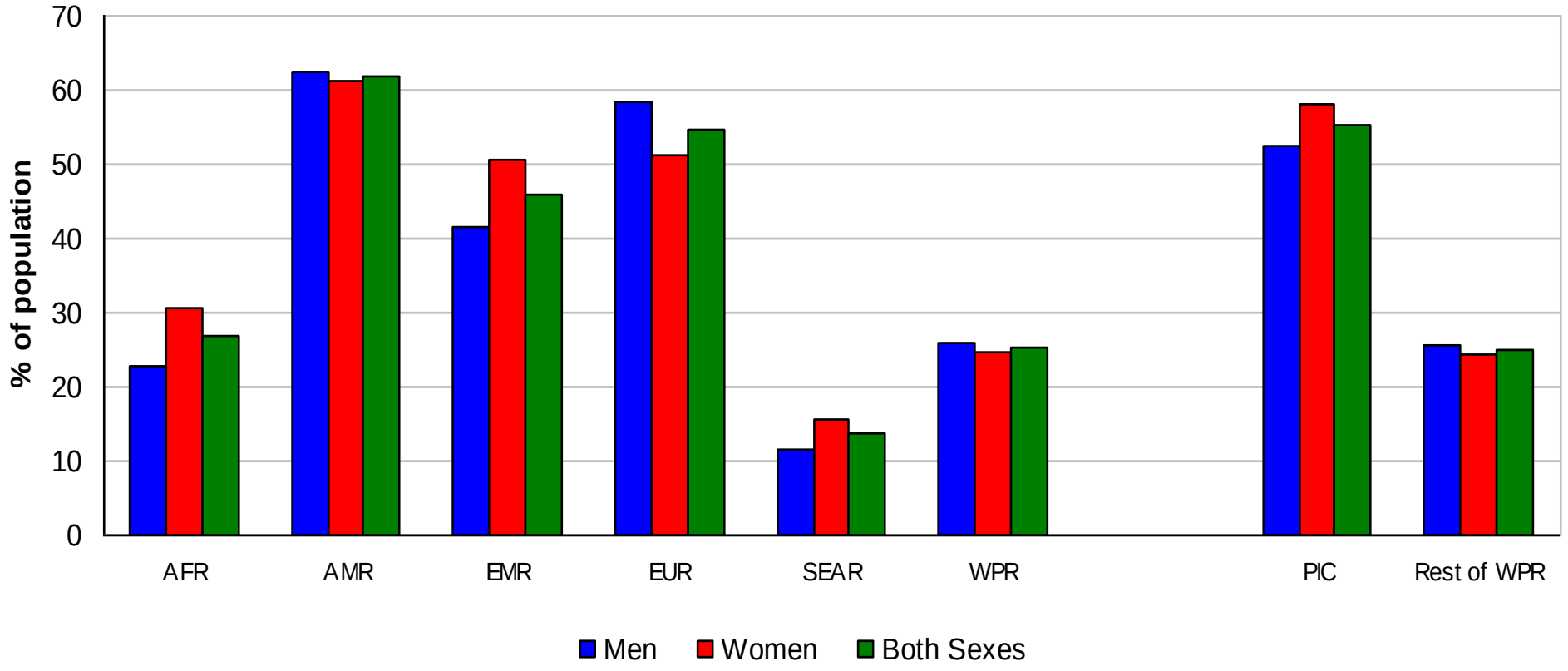


Food Utilisation Issues
Impact of Globalisation and Trade Policies

Period/Events	Changes
Explorers, traders, and missionaries	• Subsistence /Sustainable Systems • Healthy diets – no evidence of malnutrition
Spain (1886-1899)	• Introduction of maize, cassava, sweet potatoes, chickens and pigs
Germany (1899-1914)	• Copra export
Japan (1914-1939)	• Rice and sugarcane farming projects throughout Micronesia for export • Reliance on local food • Little evidence of malnutrition (Survey by US Navy, 1940's)
US (1945-1986)	• US subsidies and food aid increased in Micronesia (1962) • Diet started to change (main energy source were rice and imported tinned meat) • Food aid continued to increase in 1970 to 1990 (& to present) • Prevalence of Obesity in 1970's; Diabetes in 1980's - >500%; 1990's Increased dramatically • **School lunch program consist of mainly rice, tinned meat, mixed fruits (biggest contribution to diet change)**

Utilisation Issues

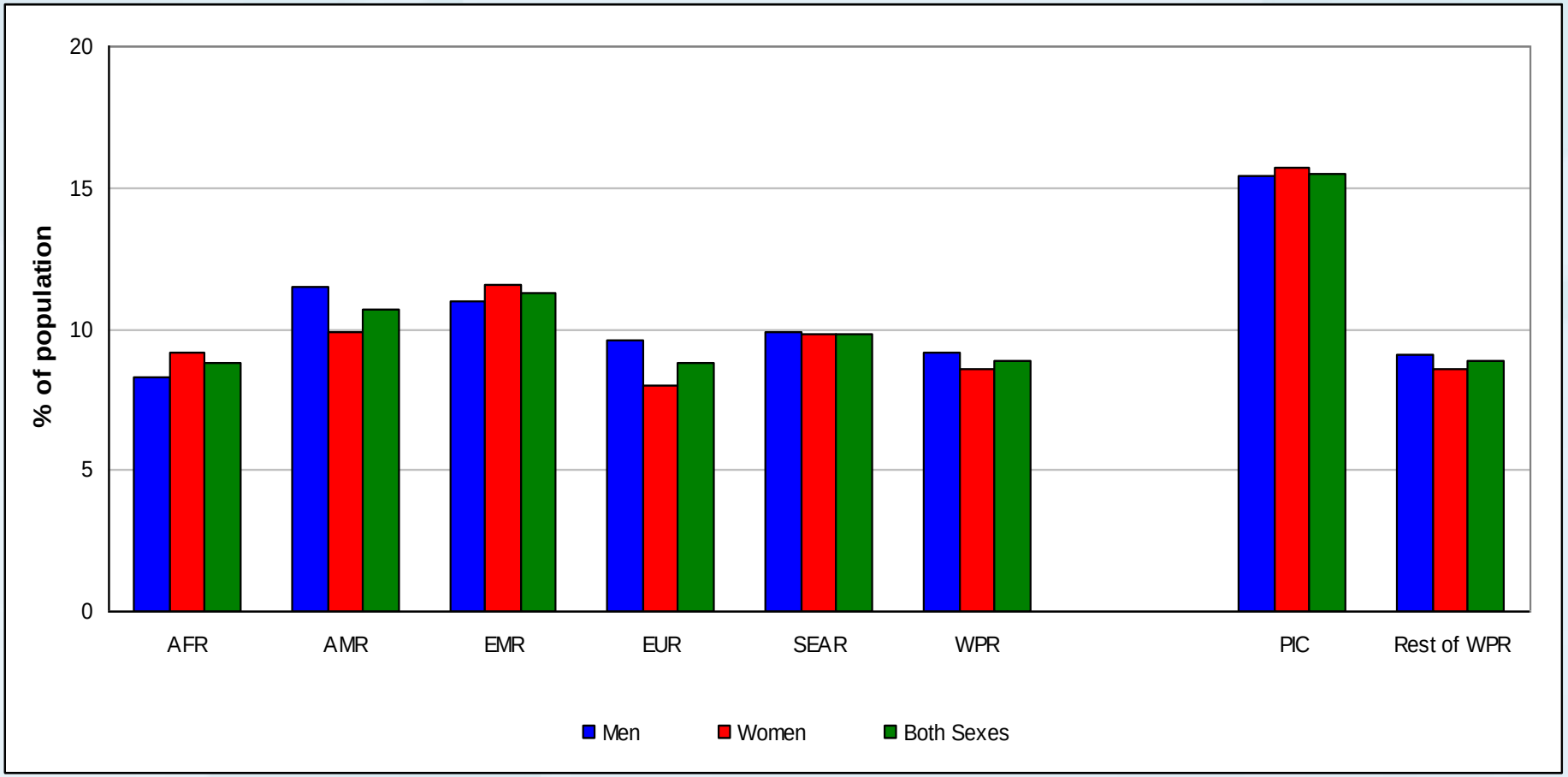
Age-standardized prevalence of overweight* in adults aged 20+ years by WHO Region and for PIC, 2008



* Defined as BMI ≥ 25kg/m^2

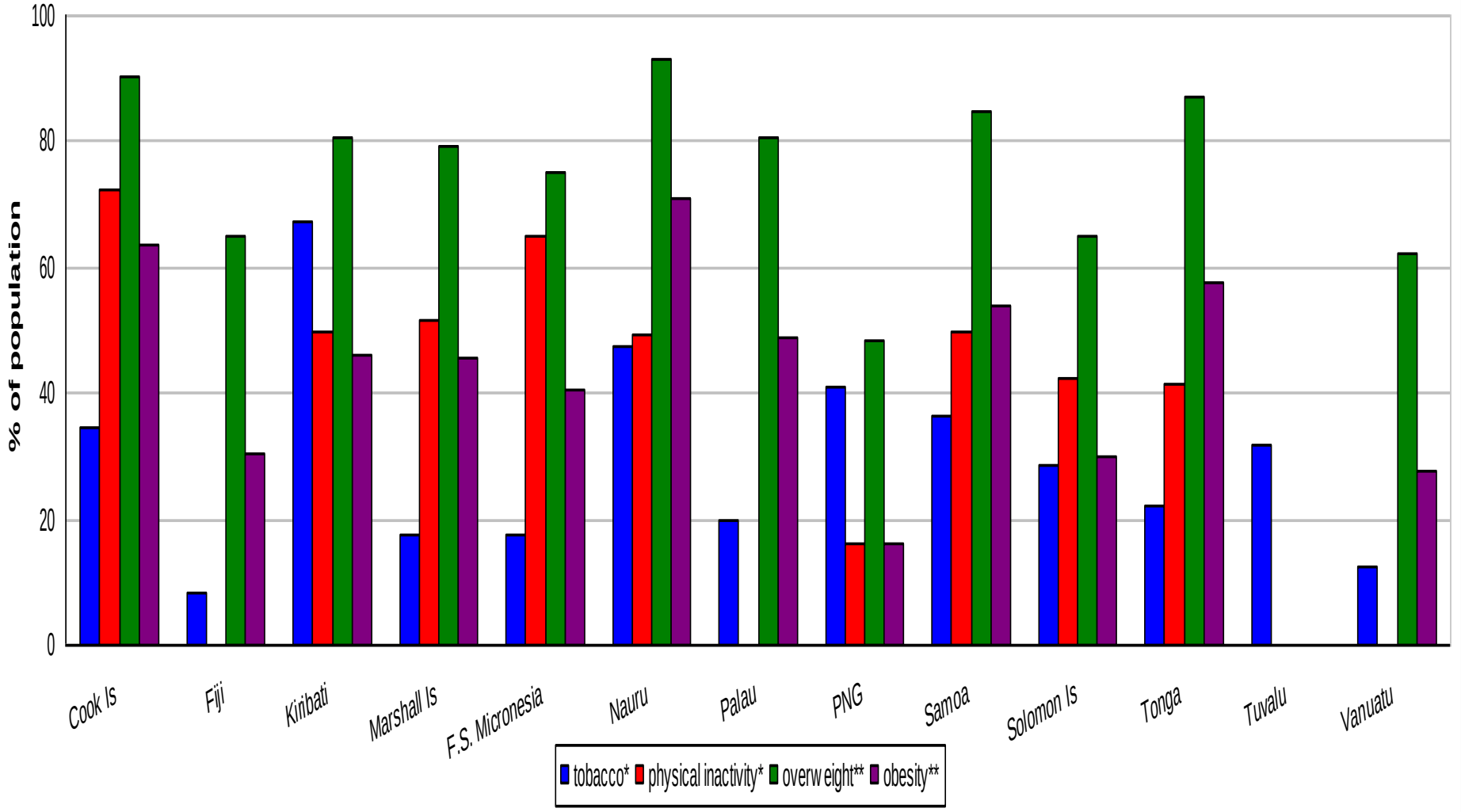
Utilisation Issues

Age-standardized prevalence of diabetes* in adults aged 25+ years by WHO Region and for PIC, 2008



*Defined as raised fasting glucose ≥ 126 mg/dl or on medication

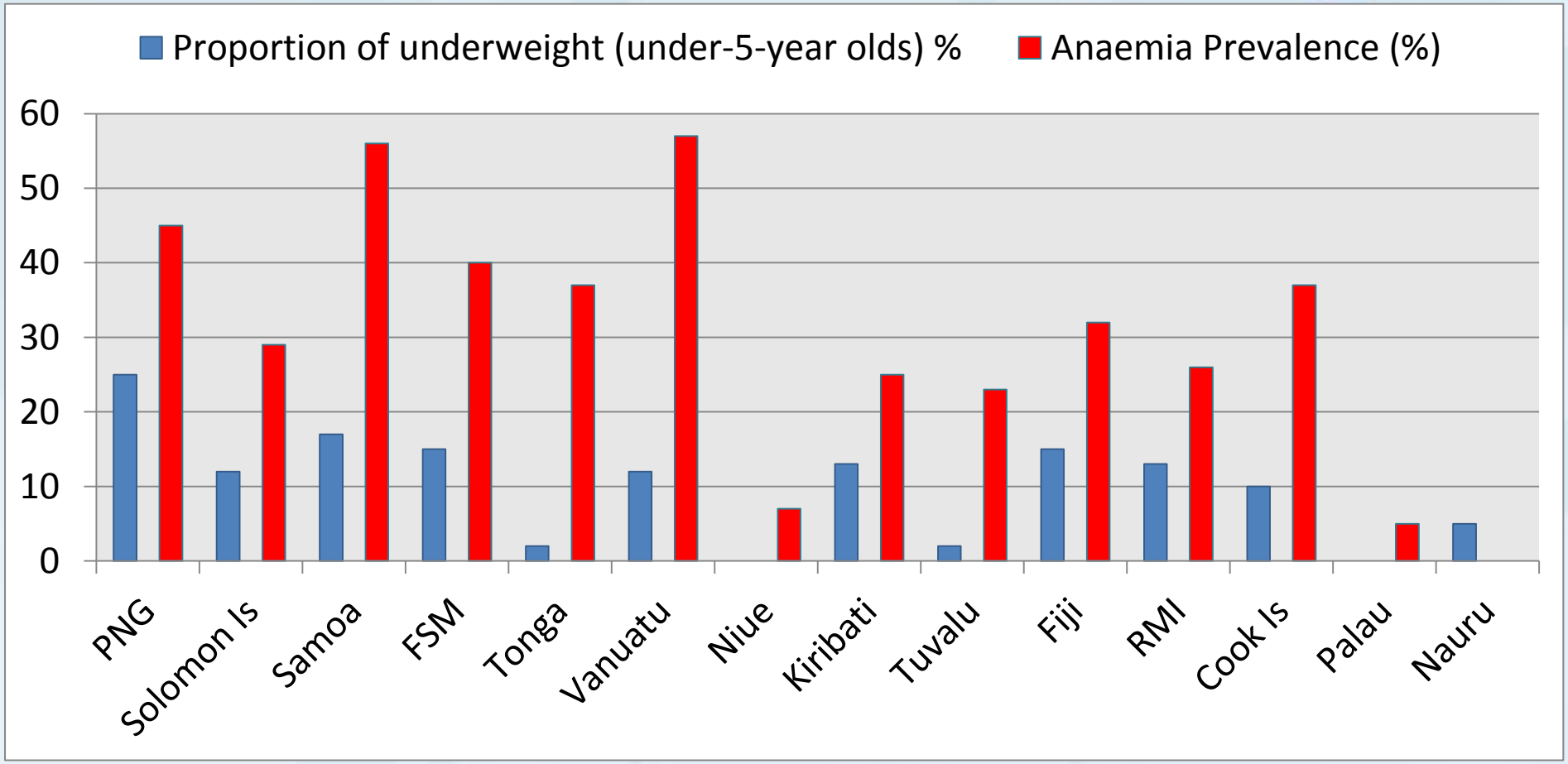
Prevalence of key NCD risk factors in Pacific Island Countries, 2008



*Defined as 15+ years

** Defined as 20+ years

Underweight/Anaemia

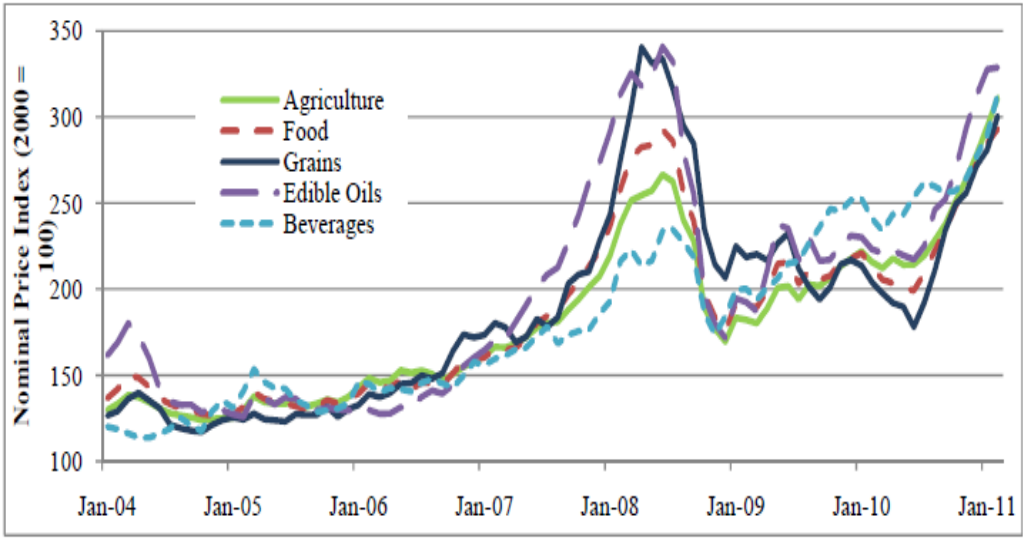


Food Stability Issues

Food and Oil Prices

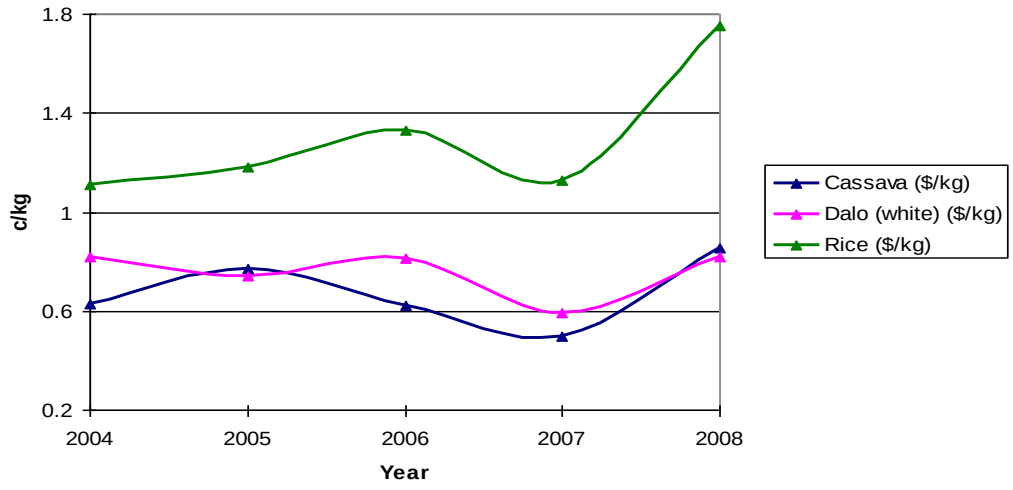
- Food and oil price will continue to increase
- Two third of PICTs are net food importers

Figure 1: Food commodity price spikes since 2004

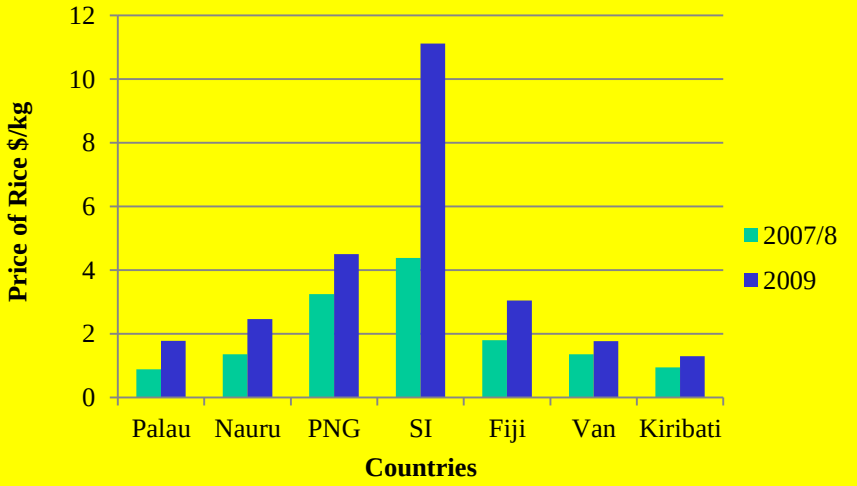


Source: World Bank.

Fig 1: A comparison of Suva cassava, dalo and rice prices



Effect of the Global Crisis on Price of Rice



Food Stability Issues - Climate Change Impacts

THREATS	PROJECTED CLIMATE CHANGES	CONSEQUENCES
Sea Level Rise	0.19 – approx. 4.00m by 2100	- Salt water inundation in atoll Communities - Coastal Erosion in both atoll and high islands
Surface Air Temperature	1.0 – 4.17^{0}C (N. Pacific) 0.99 – 3.110C (S. Pacific)	- Plant and animal stress - Soil moisture deficiencies - Changes in soil quality
Ocean Acidification	Increase carbon dioxide absorption	- pH drop from 0.3 – 0.4 - Coral growth
Rainfall Increases or decreases	From -2.75% to +25.8% in N. Pacific From -14% to +14.6% in S. Pacific	- Floods - Soil erosion - Ground water pollution - Water shortage on Agriculture
Cyclone	More intensification	- High winds and peak rainfall

Source: FAO, 2010; ADB, 2011, IPCC AR5

Sea Level Rise

- Loss of agricultural land
- Damage to atoll and coastal volcanic island crops

CC Threat to Fisheries

- Acidification may also threaten the structures of sensitive ecosystems (coral bleaching) upon which some fish
- Coral Bleaching will result in less fish habitat, less fish
- Changes in temperature and seasons could affect the timing of reproduction and migration.

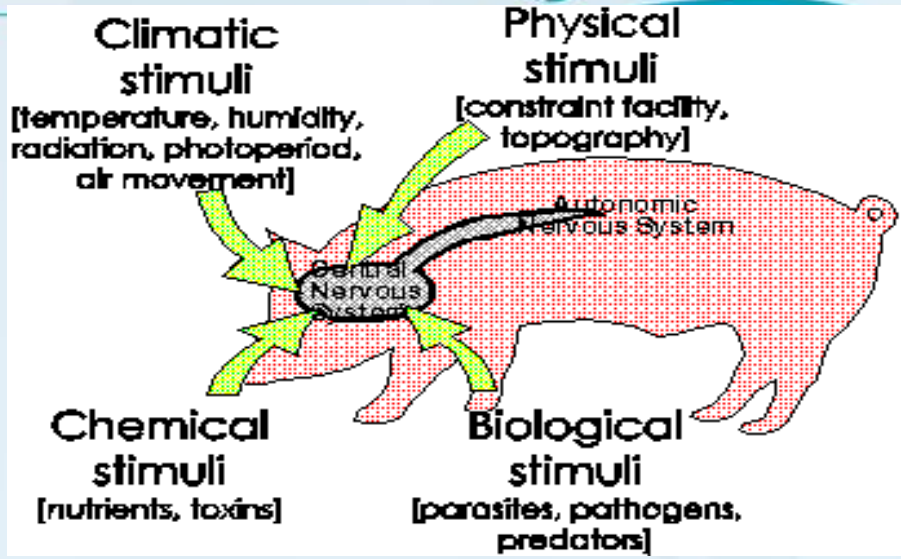
CC Threat to Biodiversity and GR

- Both marine and terrestrial plants and animals
- Genetic resources loss
- Reduced access to planting materials

CC Threat to Livestock

CC and Climate Variability and Extremes (Drought, Rainfall, Temperature, Sea level rise, Cyclones etc.):

- **Heat/cold stress – affect all performance** (Stress = reduce AFI = reduced growth, Immune system = susceptible to disease, increased mortality)
- **Pasture/feeds -** Affects quality, toxicity and storage
- **Current disease exacerbated, new disease, emerging/re-emergence**



Animal Species	TCZ(degrees centigrade)
Young cattle	20 - 25
Mature cattle	5 - 25
Sheep (fleeced)	5 - 24
Sheep (shorn)	7 - 29
Adult pigs	10 - 24
Piglets (newborn)	35 - 39
Horses	10 - 24

What do we know about Pacific Staple Crops

Thresholds for selected crops

Crop	Thresholds		Vulnerability to extreme events				Likelihood of CC breaching threshold – not current (not up to date but may still be relevant
	Temp	Water	Intense storms	Inundation	Sea level rise	CO^2 increase	
Banana (C3)	Growth stops <10C and >38C; opt temp for growth = 21C	2500mm required pa; drought tolerant varieties exist	Easily destroyed by cyclones	Vulnerable to poor drainage; yield & quality affected	Some varieties more tolerant of salinity; perform better on atolls	Elevated CO^2 increased total yield and fruit wt	Extreme temp may exceed tolerance; impact on yield possible with fluctuating rainfall & temp
Breadfruit (C3)	Opt temp for growth between 21C and 32C	Opt rainfall between 1500 & 3000mm but still get yield at 1000mm;	Large trees susceptible but quick regeneration	Prefer deep, drained soils but some varieties thrive in damp conditions	Not known but atoll varieties could have some tolerance	Not known	Temp may have impact – already seeing changes in fruiting patterns
Taro (Colocasia) – C3	Preferred range = 25-35C, with 30C optimum	Optimum growth when rainfall exceeds 2,500mm	Would depend on stage of growth; young plants likely to survive,	Will tolerate soil prone to water-logging or which is saturated for long periods	Not tolerant	CSIRO & USP study in progress	

Crop	Thresholds		Vulnerability to extreme events				Likelihood of CC breaching threshold – not current (not up to date but may still be relevant
	Temp	Water	Intense storms	Inundation	Sea level rise	CO^2 increase	
Cassava (C3)		Ideal sprouting temp = 17C to 37C; growth inhibited @<15C; Opt temp for growth = 25C to 29C but will tolerate 12C to 40C	Yields can be reduced by prolonged dry periods but drought tolerance seen in regions with dry periods of 4-6 months; problems with increased cyanogens with drought	Can be damaged with very intense storms	Periods of inundation will reduce tuber quality; root rot if soil constantly wet	Susceptible to sea water intrusion but areas of cassava production unlikely to be affected	The impact of increased carbon dioxide concentrations (eCO_2) is shown to have a detrimental impact on cassava production through reduced tuber size, decrease, plant protein content and increase in the concentration of cyanide in both leaves and tubers.
Yam (C3)		Sprouting occurs between 25-30C; delayed <15C & >35C; Most spp require 25-30C for normal development & vegetative growth is severely affected by <20C	High yields & commercial prod require 1500mm; but yams can grow with 500-700mm of rainfall. Are tolerant of dry conditions but yield affected if moisture stress occurs during 1^{st} 2 phases of growth	Susceptibility depends on staking system	Not very tolerant of water-logging	No evidence in the literature of salt tolerance however some observations suggest that D esculenta could be more tolerant than other species	Nothing found in the literature

Crop	Thresholds		Vulnerability to extreme events				Likelihood of CC breaching threshold - not current (not up to date but may still be relevant
	Temp	Water	Intense storms	Inundation	Sea level rise	CO^2 increase	
Swamp taro (C3)	Opt range = 23C-31C but easily tolerates 35-38C	Water-loving; long-term drought conditions would be damaging; 2011 Tuvalu drought indicated some genotype tolerance. Upper & lower limits of rainfall not relevant as sp must grow in marshy or swampy land	Unlikely to be affected but would depend on stage of growth	Tolerant of water-logging	Study in Tuvalu (2007) gave tolerance range of <=1,000 µs/cm to >= 3,000 µs/cm where there is crop decline and failure	Not known	Not known
Sweet potato (C3)	Opt temp above 24C; temp <10C will retard growth	Rainfall required is site-specific. Will not tolerate dry conditions at planting	Not susceptible to winds	Fail to produce roots in water-logged soils	Some varieties are more tolerant of salinity than others	USP Study Ongoing -	USP Study Ongoing -
Taro (Colocasia) – C3	Preferred range = 25-35C, with 30C optimum	Optimum growth when rainfall exceeds 2,500mm	Would depend on stage of growth;	Will tolerate soil prone to water-logging or which is saturated for long periods	Not tolerant	CSIRO study in progress	CSIRO study in progress

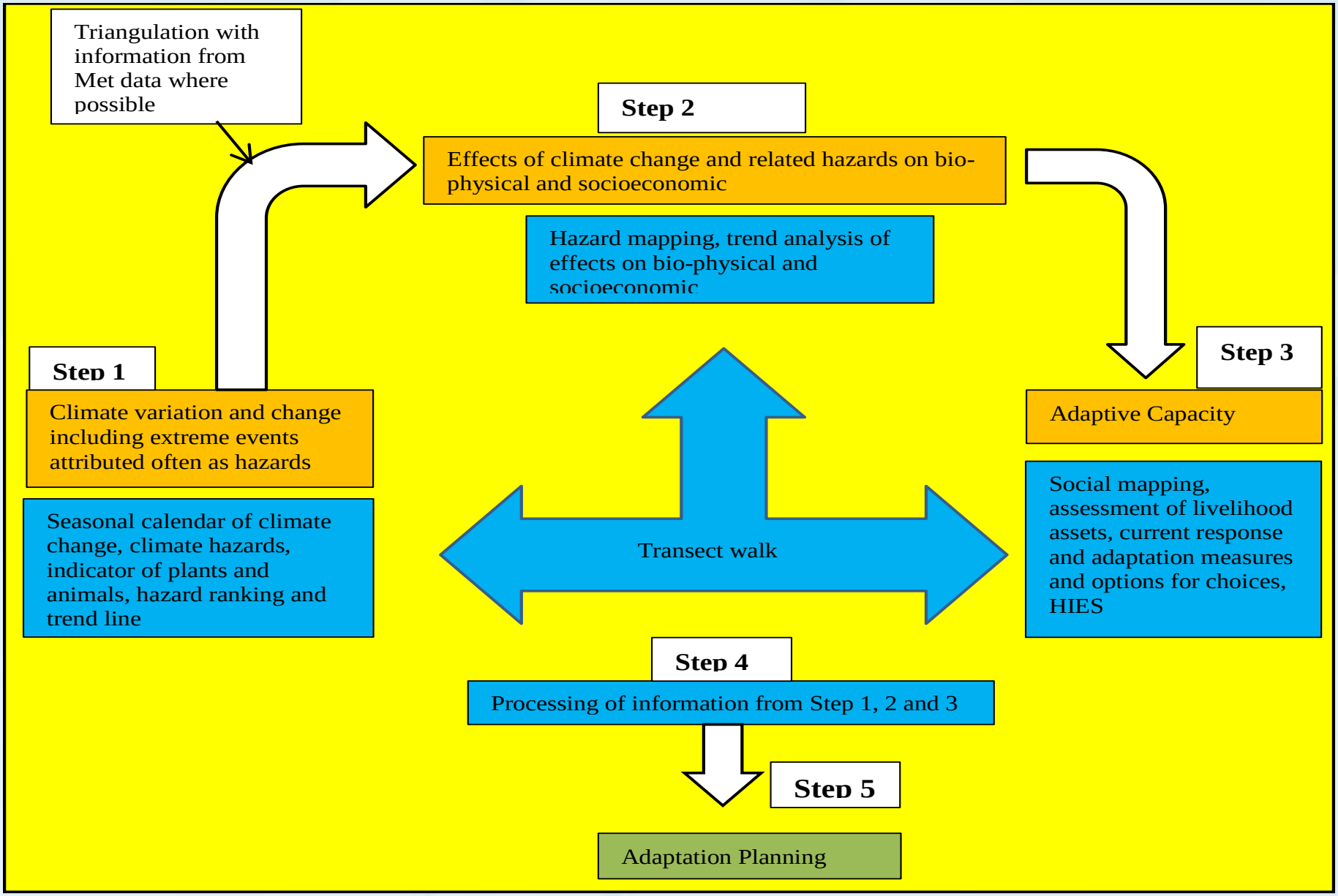
Crop	Thresholds		Vulnerability to extreme events				Likelihood of CC breaching threshold – not current (not up to date but may still be relevant
	Temp	Water	Intense storms	Inundation	Sea level rise	CO^2 increase	
Taro (Alocasia) – C3		Preferred range = 25-30C; 30C is optimum	Requires more than 1,700mm rainfall evenly throughout the year; cannot survive long period of drought	Unlikely to be affected but would depend on stage of growth	Not tolerant of water-logging	Not known but not grown in marshy/swampy conditions because of sensitivity to water-logging	Not known
Taro (Xanthosoma) – C3		Can be grown successfully at 24C;	Tolerant of drought; no opt range found but will grow with 1,000mm if evenly distributed and will cope with heavy precipitation if soil is well-drained	Would depend on stage of growth; young plants likely to survive, mature plants would be damaged though corms could be harvested	Sensitive to water-logging	Not known but not grown in marshy/swampy conditions because of sensitivity to water-logging	Not known

Regional Crop Model Studies

- Very little application using crop models to date
- APSIM Cassava model (Koronivia/USP) – PHD Research
- Crop Models by USP
- Assessing the ecological impacts of climate change on root crop production in high islands: A case study in Santa Isabel, Solomon Islands (Gareth Quitty, MSc)
- Vulnerability and Impacts of Climate Change on Food crops in Raised Atoll Communities: - A Case Study of Bellona Community in Solomon Islands (Joseph Maeke, MSc)
- Evaluate the Impacts of Climate Change and Climate Variability on Potato Production in Fiji (Moleen Nand, MSc)
- Simulating climatic impacts on growth and yield of Mana and Nadiri sugarcane varieties using DSSAT/APSIM (Natasha Verma, MSc)
- Application of the rice model (ORIZA) to assess the impacts of climate change and extreme events on rice production in Rewa Delta (MSc Jotika).
- Developing of sweet potato crop growth and carotenoid accumulation model (PhD)
- Validating taro model (PhD)

SPC LRD ASSESSMENT FRAMEWORK

V = EXS/A



Assessment of Exposure

Table 1b: Assessment of climate variables (Elements of Exposure 'E') of Tefisi.

Parameters	**Indicators**	**Perceived changes/remarks**	**Score index/remarks**
Temperature	• Numbers of hot days increased • Number of cold days decreased	High High	3.3 3
Precipitation	• Rainfall has become increasingly unpredictable	High	3.3
Plant and animal indicators	• Flowering and fruiting of some of the fruit trees like breadfruit and mango • Animal behaviour like chicken egg laying is changing • Yam season (pests and diseases)	High Medium - High	3.6 2.6 3
Climate induced disasters	• Drought • Hurricane	Medium - High Medium - High	2.6 2.6
	Average Exposure index	**High**	**3.2**

Assessment of Sensitivity

Table 2b: Sensitivity Assessment (elements of Sensitivity 'S') for Tefisi

Parameters	**Hazards**	**Indicators**	**Perceived changes/ remarks**	**Score index/ remarks**
Agriculture and food security	Hurricanes	Loss of productive lands	High	**3.6**
	Drought	Loss of crop production	Very High	**4**
	Outbreak of diseases	Production decline	High	**3**
Forest and biodiversity	Hurricane	Loss of forest cover	Med - High	**2.6** **2.3**
	Drought	Loss of bidiversity	Medium	
Infrastructure	Hurricanes	Trails and roads damaged	High	**3.6**
Water resources and energy	Hurricanes	Loss of quality fresh water	High	**4 3**
	Drought	Reduction of freshwater	High	**3**
Human health	Hurricanes	Emergence of waterborne diseases	Med - High	**2.8**
Average Sensitivity Score			**High**	**3.06**

Assessment of Adaptive Capacity

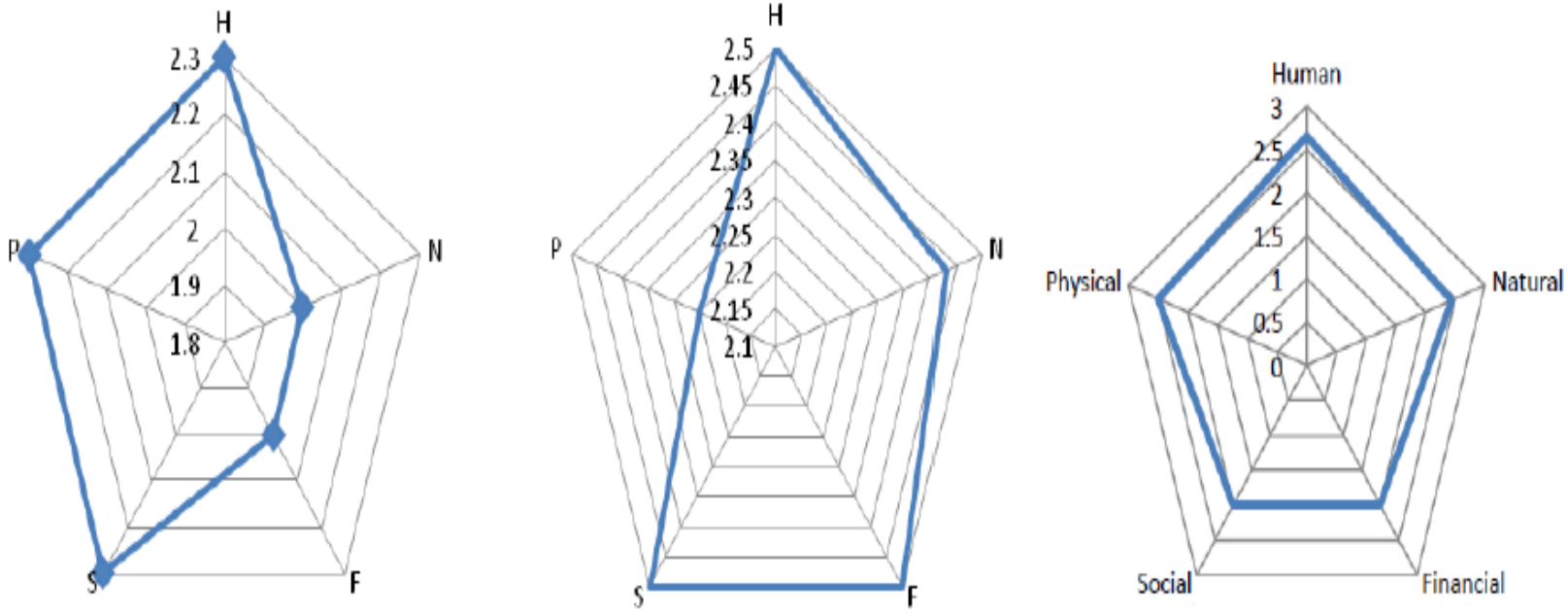
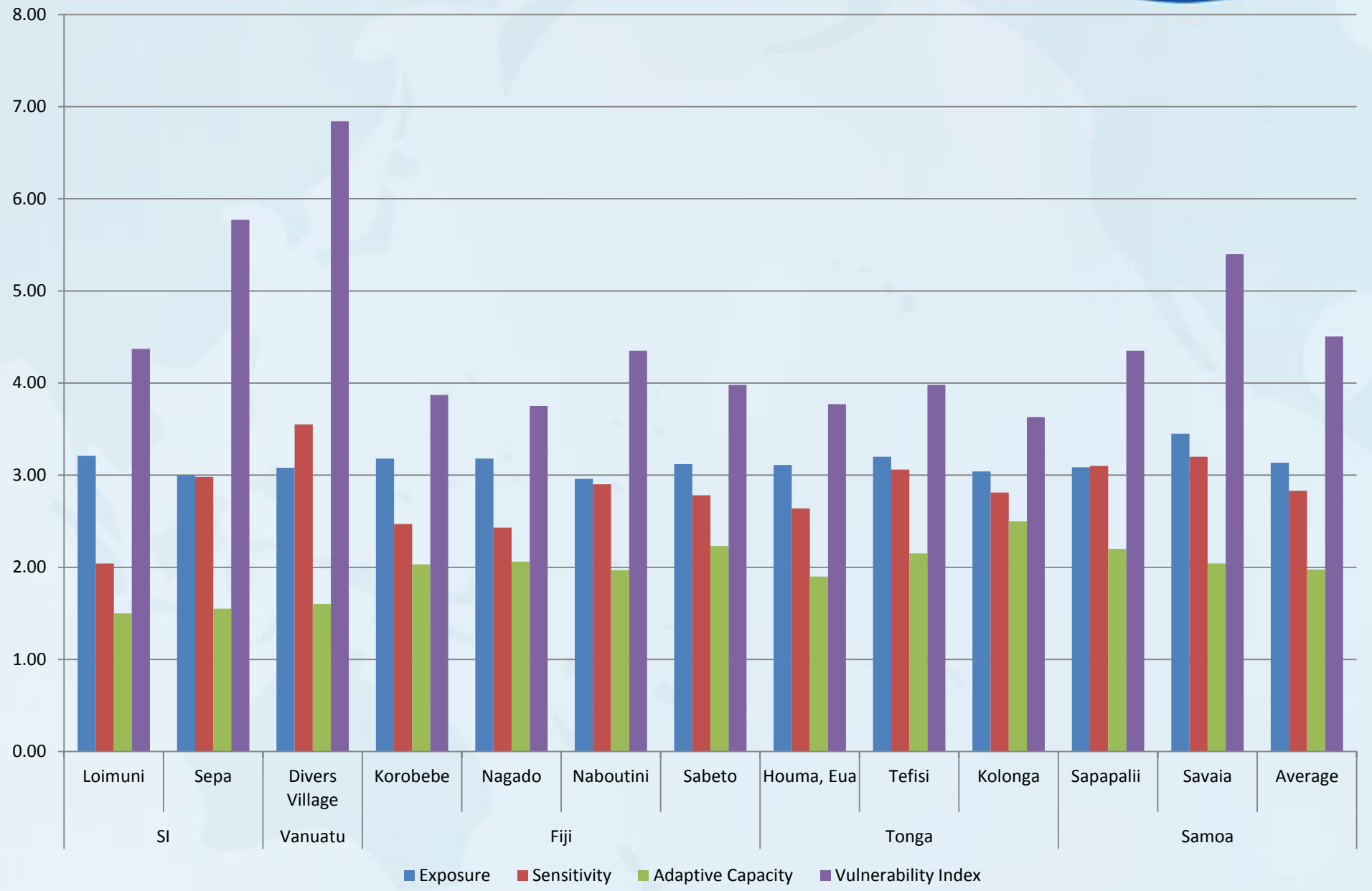


Fig. 4 Adaptive capacity of Houma (left); Tefisi (middle); and Kolonga (right)

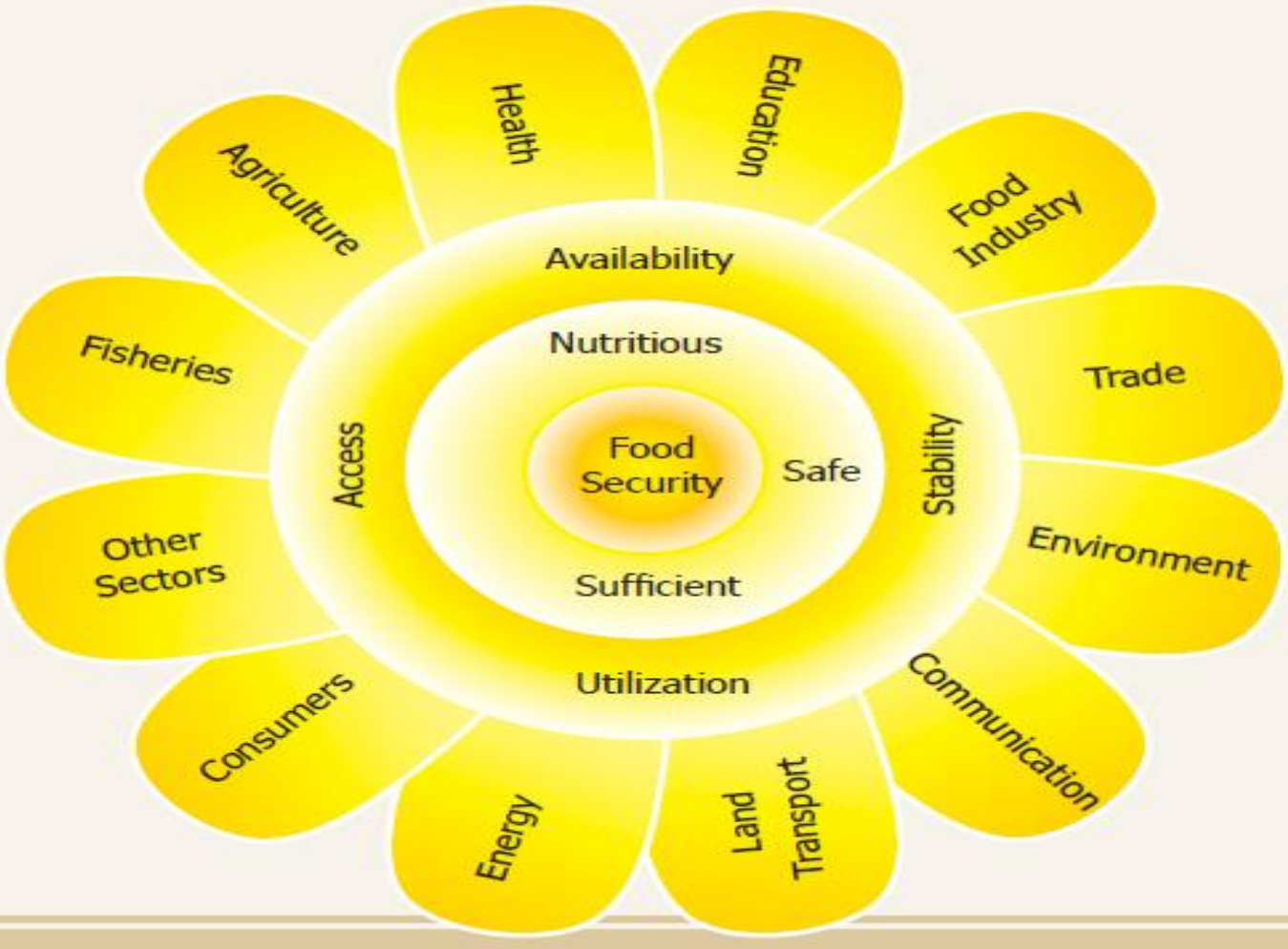
Aggregated Results



Adaptation pathways

Multi sectoral collaboration and partnership

Figure 1: Conceptual model of food security in the Pacific



Adaptation Pathways

Strengthening Policies

- Research and Extension
- Improving land access
- Tax reforms/incentives
- Youth employment – agriculture as a career
- Provide incentives for food production
- Resilient infrastructure

Policy Advocacy

- IFCP Example: Participatory awareness approach for advocacy to help increase the use of local food and healthy lifestyle

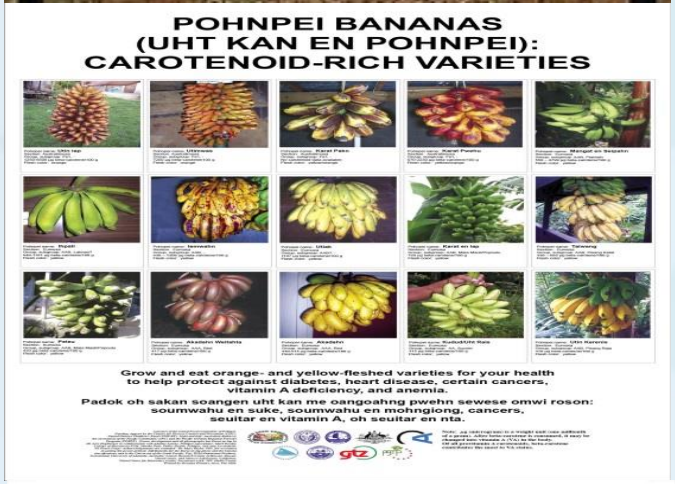
- Resulted:
  - Banning of junk foods at village levels
  - Paramount Chief Proclamation – Household Farming Scheme
  - Personal Commitments
  - School Vendors/School Lunch programme
  - Karat banana was proclaimed as the Pohnpei State Banana – Postal stamps, Telecards
  - Soft Drink Act for Pohnpei – increase taxation on soft drinks (encourage drinking local coconut and tax is diverted to support local food production)
  - Presidential Proclamation - Banning of junk foods in offices; only local food served at government organised functions; Government fitness programmes strengthened at National Level; FSM Food Security Policy Framework
  - Government funding support increased; Increased serving of local food in hotel/restaurants & local food vendors

Nutrition Education/Awareness

Awareness on the production, marketing and consumption of local food – “Go Local” Campaign in Pohnpei

Pohnpei Example:

- “Let's go Local” and “Go Yellow” Slogan
- Email Network, Facebook, Posters, Brochures, Go Local pens, pencils, t-shirts, stickers, newsletters, TV, Video, radio, songs
- Fun Walk/Run – with free t-shirts
- Planting Day – Roadsides and recreation areas
- School visits – student social clubs
- Workshops and Community engagement
- Recipes and Cooking Trainings – Community and Hotel/Restaurants



Nutrition Education/Awareness

- Diet Diversification (Home gardening, Raising backyard livestock, e.g. poultry)
- Cooking demonstrations
- Micronutrient Fortification (Sugar, flour, rice, margarine, edible oils, noodles, condiments i.e. soy, etc.)

Climate Resilient Agriculture

- Climate proofing agriculture (Climate smart agriculture):
  - adapting and building resilience to climate change (improving farming systems and practices, crop diversification, high yield crops, resilient crop varieties, soil biodiversity etc.);
  - reducing and/or removing greenhouse gas emissions (mitigation), where possible.
  - sustainably increasing agricultural productivity and incomes;
  - Traditional Knowledge

Livestock Adaptation Options

- Have an active surveillance and disease control/eradication program
- Develop Emergency Response Plans available
- Resilient facilities
- Proper feed/water sources/storage facilities, select resilient pasture species
- Identify/Choose resilient breeds/species (conserving indigenous genetic resources)

There's more though isn't there?

- Absolutely.
- Adaptation solutions we derive from baseline information and assessments of communities, sectors, and current science and climate projections
- Much has been achieved in the last few years, the science has finally become available at level of application that didn't exist before
- We're now more data and information savvy than before as a result in the meteorology area

Needs

- **DATA DATA DATA DATA + MORE DATA**

- Location specific data (rainfall, temperatures, SLR etc.)
- Sector and site specific data (GIS layers, health histories etc.)
- Good sectoral science and better climate science continues to be a need. We're now refining the resolution more from country level to district level, and future is household level
- SPC and PICTs will continue to need better refined projections data to help guide specific impacts on sectors
- SPC and PICTs will also need to have better science and research foci and outputs in sector work (e.g. genetic resources: root crop collections need to be tested to more specific temperatures vs broad ranges (think projected temp range of 1.5 to 2C range vs 1.5 to 4C, hence better crop modelling outputs also, to be selection of resilient crops for the projected climate scenario)

Foreseeable short to medium term future

- Resilience building to continue
  - PICTs will continue to face human resource capacity constraints and thus, continued capacity supplementation will continue also
    - Examples: Coastal zone fisheries management and monitoring work, climate change ready crops and genetic resources work etc.
    - Embedding regional support at national level is essential still
    - Donors must see this also and commit to long term support in these activities to ensure monitoring is a priority AND is carried out without break to collect long term data

Working towards an integrated approach at SPC

- Food security focus requires expert resources in
  - Climate change
  - Crop production and extension, soils
  - Genetic resources, crops and trees
  - Agroforestry
  - Plant health / Pests and diseases
  - Animal health and production
  - Biosafety/biosecurity
  - Markets access and enterprises development
- Pulling in additional sectors surrounding communities: Health, Statistics, Human Development, GIS, mapping, etc.

In summary

- Pacific Food Security is under threat (from CV, CC, + other issues)
- Background issues in agriculture sector currently impacting FS pillars
- Current development concerns for agriculture in many countries
- Food and nutrition increasing source of health issues for Pacific Islanders
- Climate change threatens all pillars at multiple levels in the region
- Smarter solutions e.g. climate smart agriculture, needed in way forward for Pacific (a good start here with SWoCK!).

- Investments, partnerships, supporting sectoral strengthening
- … and all your individual efforts on the ground, most of all!!!

Vinaka vakalevu