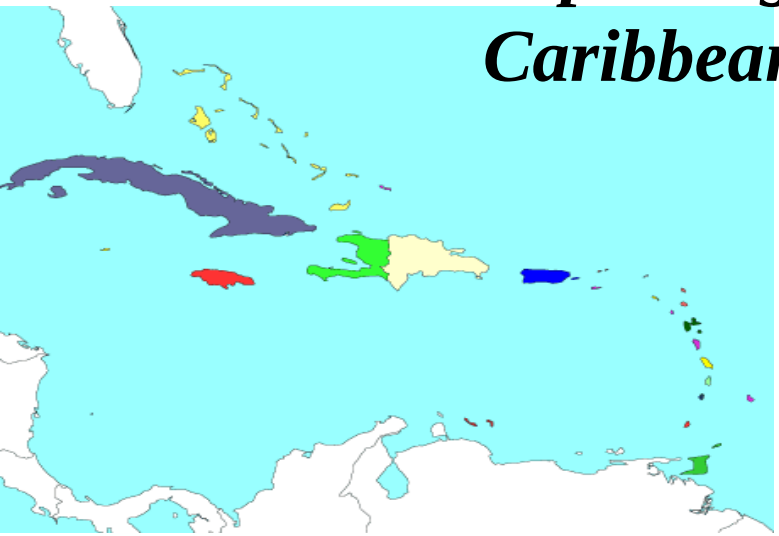
McGill- Macdonald Campus

4 O' Clock Seminar

Nov. 17, 2011

Centennial Centre

A "farm to fork" systems approach to improving food and nutrition security in the Caribbean



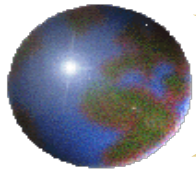
Leroy E. Phillip

Department of Animal Science

Funding: IDRC – CIDA

CARICOM Food Security Project

- One of three CIFSRF Food Security Research Initiatives within the McGill Institute for Global Food Security
- 42 mo $5M project funded through IDRC-CIDA
- Target region: CARICOM (Caribbean Community and Common Market)
- Applicant Organizations: McGill and UWI
- 13 Partner organizations; 4 CARICOM countries
- Website: www.mcgill.ca/globalfoodsecurity/research-initiatives/caricom-project



OUTLINE

- CARICOM Background
- CARICOM Project
  - The Concept
  - Research approach and interventions
  - Expected Outcomes
- Conclusions

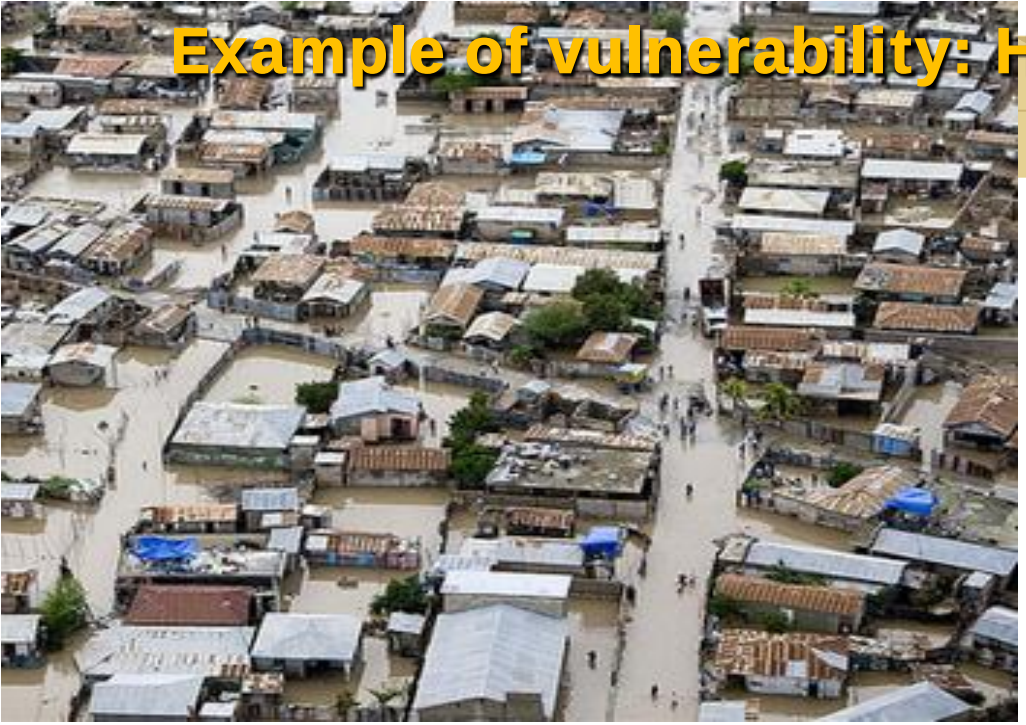
CARICOM BACKGROUND


Gulf of Mexico
Miami
Nassau
Bahamas
THE BAHAMAS
Havana
Tropic of Cancer
ATLANTIC OCEAN
Mérida
CUBA
Santa Clara
Campeche
Holguín
Las Tunas
Guantánamo
Santiago
MEXICO
Cap-Haïtien
Haiti
Jamaica
Belize
Villahermosa
HAITI
Kingston
Santo Domingo
San Juan
St. John's
Basseterre
San Pedro Sula
La Ceiba
Basse-Terre
Puerto Lempira
Dominica
Roseau
HONDURAS
Fort-de-France
St. Lucia
Tegucigalpa
San Salvador
Castries
Bridgetown
Barbados
Caribbean Sea
Grenada
St. George's
Managua
Riohacha
Barranquilla
Maracaibo
Caracas
Port-of-Spain
T&T
Puntarenas
Cartagena
Maturín
San José
Barquisimeto
Valencia
Mérida
Barinas
San Fernando de Apure
PANAMA
David
Cúcuta
Guyana
Las Tablas
Bucaramanga
Georgetown
VENEZUELA
GUIANA
Medellín
Paramaribo
Tunja
GUYANA
Cayenne
SURINAME
Ibagué
Bogotá
Boa Vista
PACIFIC OCEAN
Cali
COLOMBIA
RORAIMA
AMAPÁ
Pasto
SELVAS
Macapá
95°
25°
20°
15°
10°
5°

Socioeconomic data for CARICOM countries

Country	Area (sq Km)	Pop. in 2010 ('000)	GDP/ cap (2010); $ US	Public debt, (% GDP; 2003)
Antigua & Barbuda	440	88	11,442	139
Barbados	430	273	11,718	84
Belize	22,810	345	4,153	100
Dominica	750	68	5,649	122
Grenada	340	104	6,009	113
Guyana	196,850	754	2,945	179
Jamaica	10,830	2,702	5,179	142
St. Kitts & Nevis	260	52	10,038	171
St. Lucia	610	174	5,356	69
St. Vincent & Grenadines	390	109	5,137	73
Trinidad & Tobago	5,130	1,342	15,206	54

Example of vulnerability: Hurricane / Earthquake damage

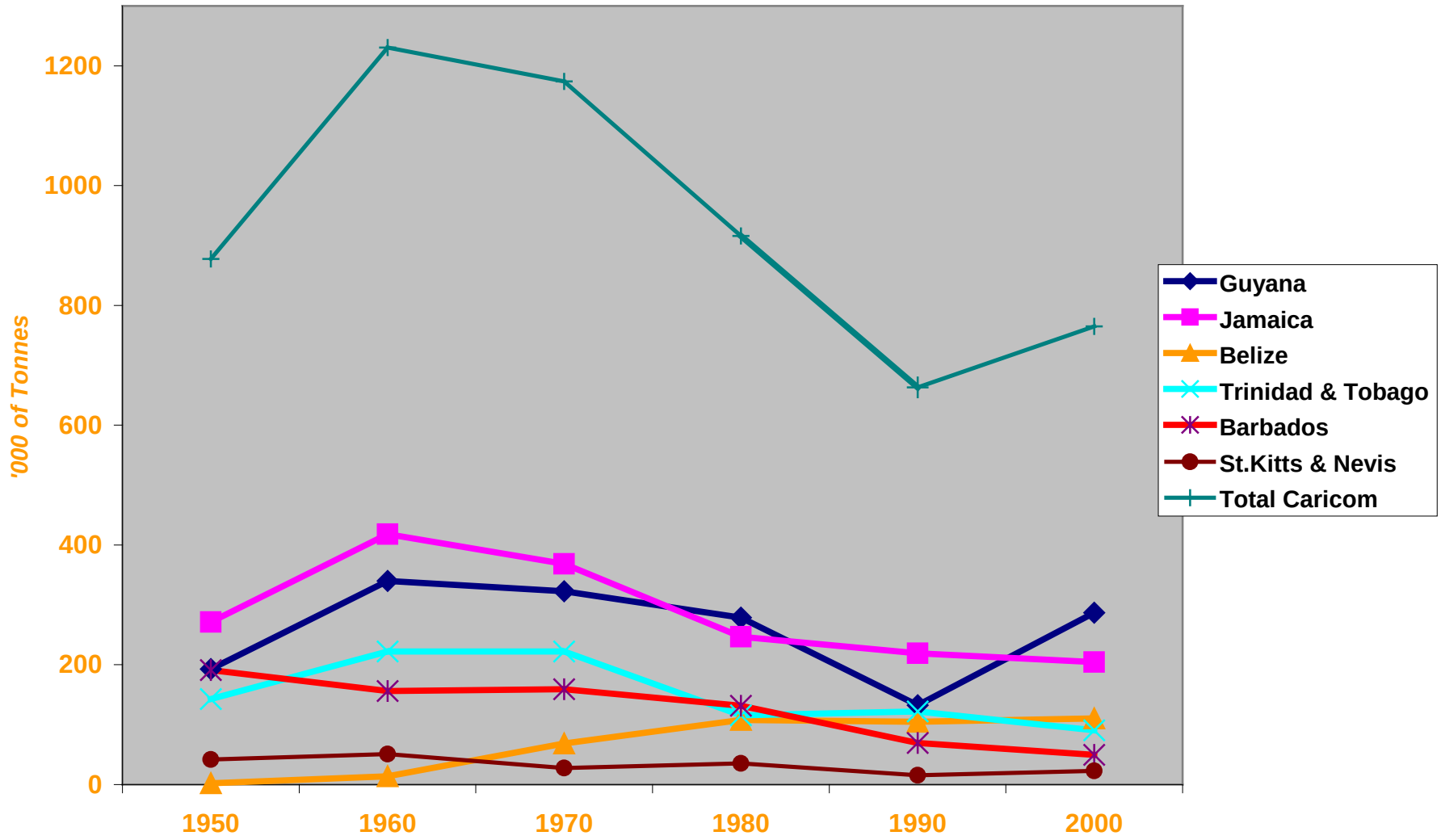


Vulnerabilities of CARICOM region

- Small size; limited domestic market
- Limited natural resources;
- Frequent natural disasters- hurricanes/floods
- Historic dependence on “plantation agriculture”
- High labour costs
- Heavy reliance on tourism - limited economic diversification
- Brain drain- limited human capacity for R&D
- “Causality” of globalization

Former Sugar Cane lands in St. Kitts

50 yr Trends in Sugar Production in CARICOM Countries

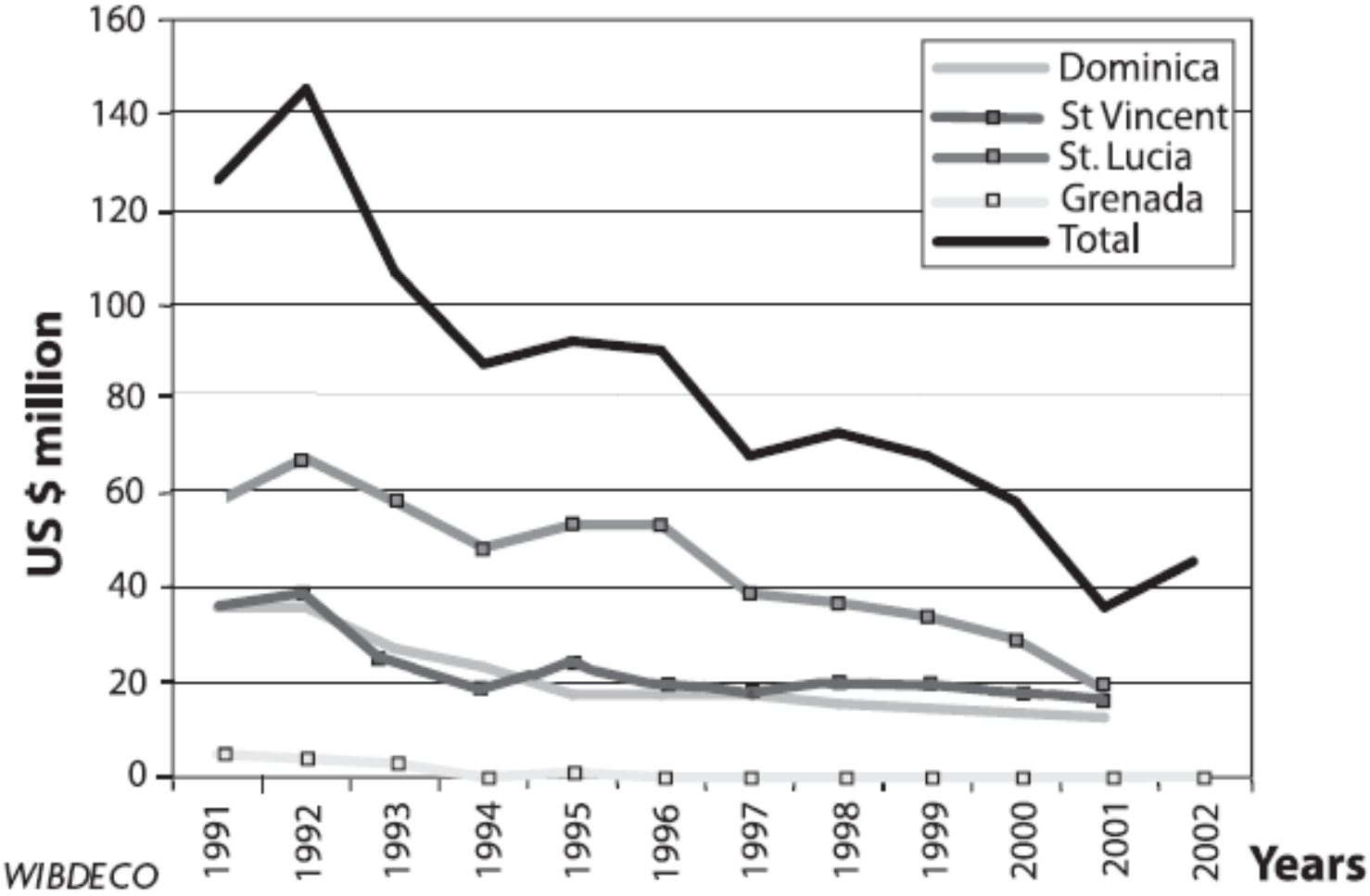


Declining sugar production over the 50 years

Maintaining Bananas in St. Lucia

Impact of "Banana War" on the Windward Islands

Figure 5. Export values for bananas fob, 1991-2002, $US million



Source : WIBDECO

Relative Costs of banana production

Average 1999 f.o.b. Price of a sample of supplier (US$ per tonne)	
Ecuador	235
Belize	419
Jamaica	558
Dominica	547
St. Vincent	500
St. Lucia	498

Sources: FAO Year Book and Windward Island Banana Development Company (WEBDECO)

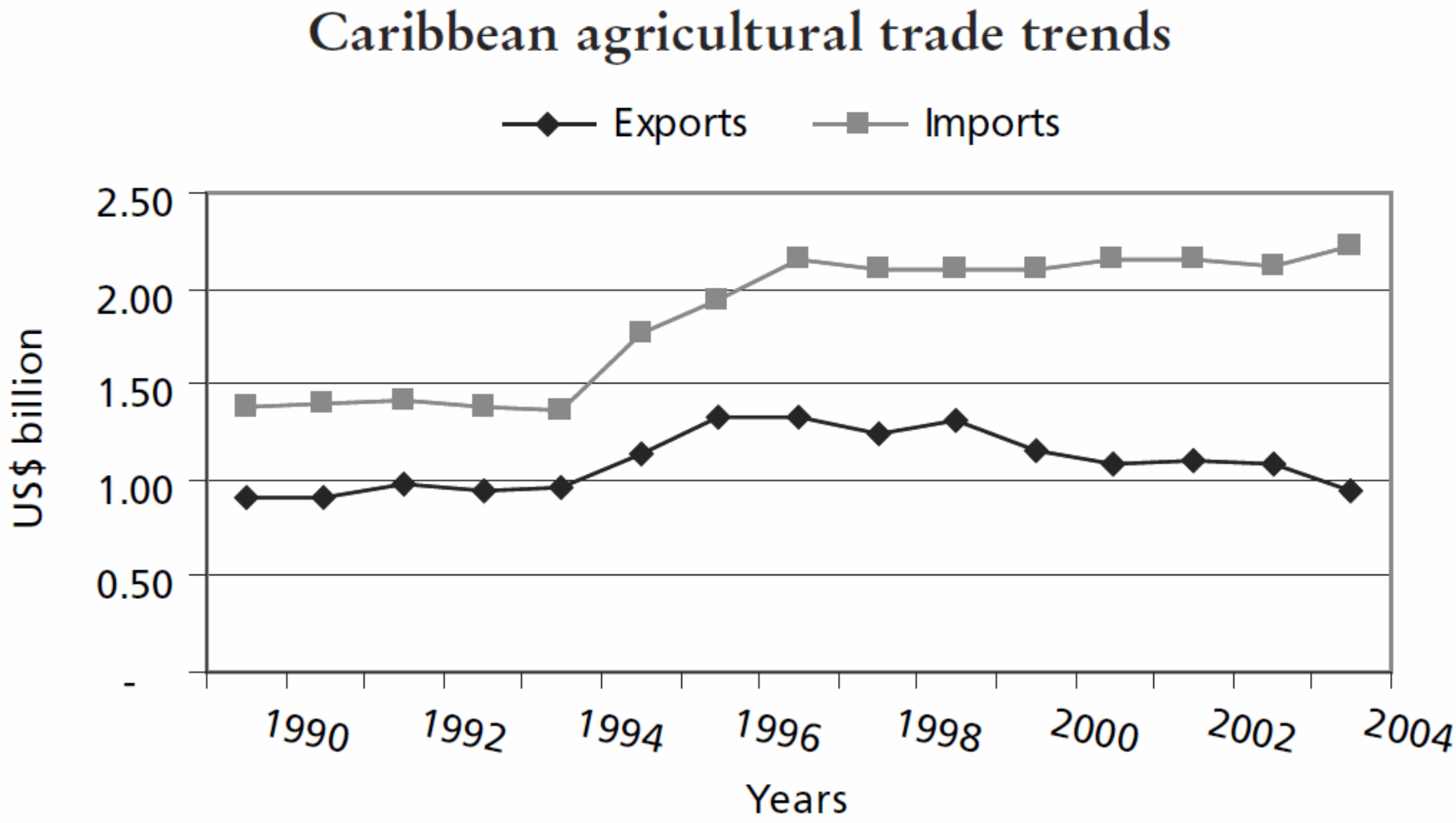
Changes in Agriculture value added (% of GDP) in CARICOM countries

Country	1981	1990	2000	2008
Antigua & Barbuda	7	4	4	3
Barbados	7	7	4	3
Belize	26	20	17	12
Dominica	32	25	18	18
Grenada	25	13	7	5
Guyana	22	38	31	21
Jamaica	-	-	7	6
St. Kitts & Nevis	11	6	3	3
St. Lucia	13	15	7	5
St. Vincent & Grenadines	16	21	11	7
Trinidad & Tobago	-	3	1	0

http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?display=default

Caribbean Agricultural Trade Balance

(1990- 2004)



Source: FAOSTAT, 2006

J.R. Deep Ford Crescenzo dell'Aquila and Piero Conforti ***FAO, 2007***

Food Availability in the Caribbean

Table II.1: CARIFORUM Food Availability (Calories/Grams), Selected Periods.

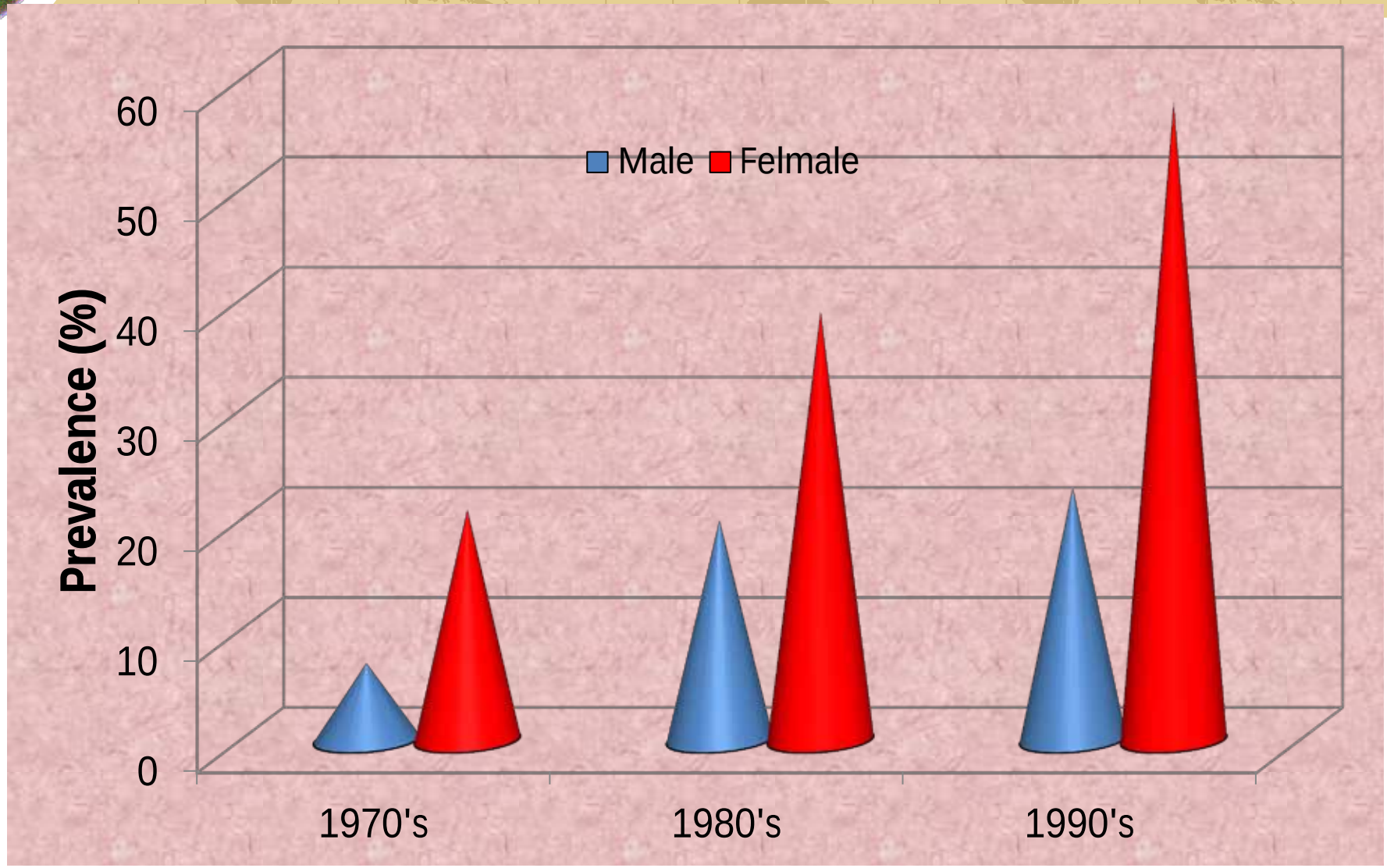
Food Availability	Availability[1] (Calories/caput/day)		RPG[2]	2000-02 Surplus (+) or Deficit (-) relative to RPG (%)
	1991-03	2000-02		
Total Food Calories	2,933	3,071	2,250	36(+)
Carbohydrates	1,766	1,825	1,238	47(+)
Protein	313	336	225	49(+)
Fats/Oils	746	802	450	78(+)
Fruits/Vegetables	215	238	337	29(-)
Sweeteners	393	424	180	136(+)
Staples[3]	967	974	1012	4(-)

[1]Calories/caput/day; [2]Recommended Population Goal; [3]Staples=Cereals + Starchy Roots

Source: FAOSTAT. www.fao.org. August 2006.

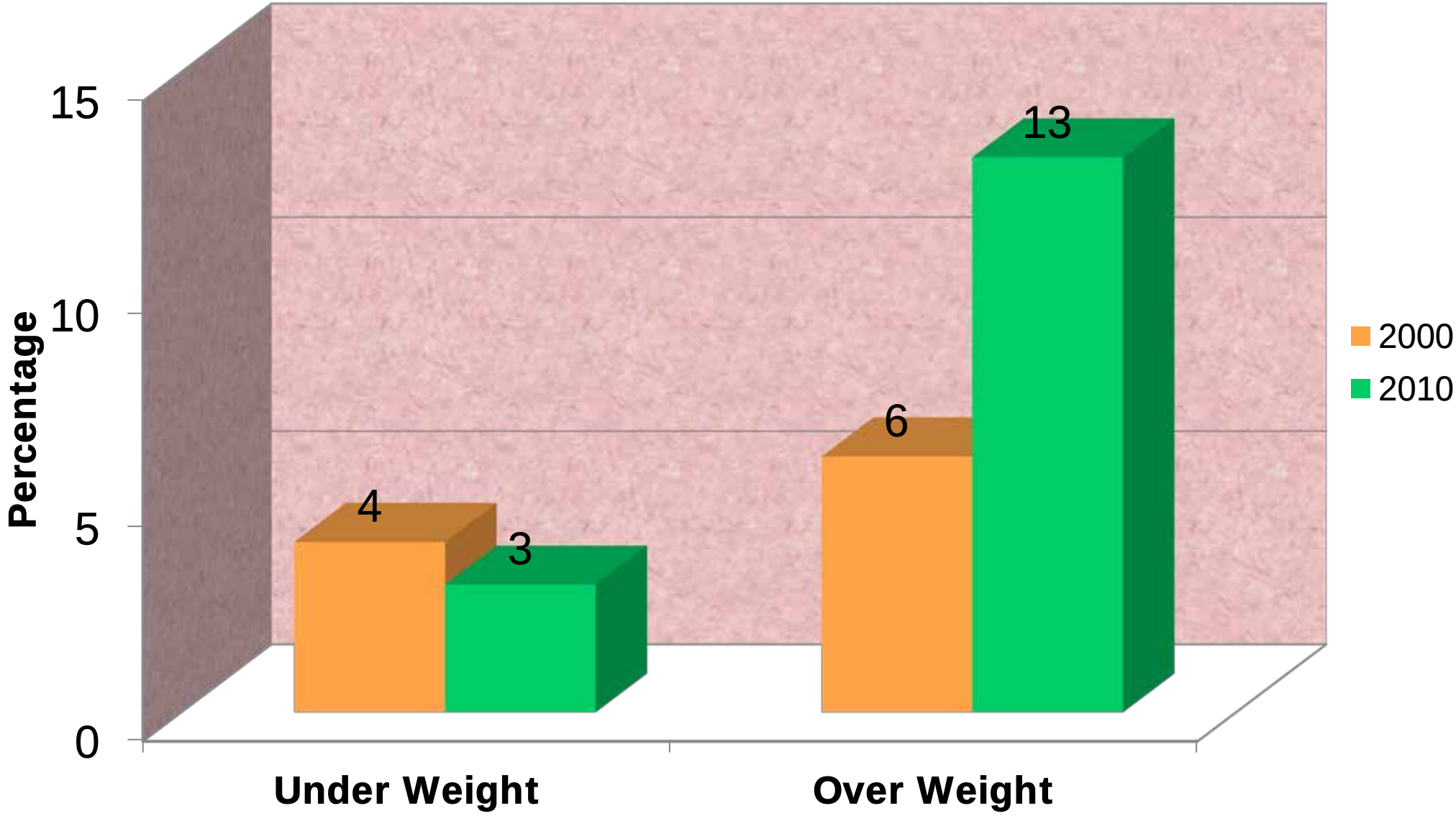
FAO-Caricom Food security Project Report 2007

Obesity Trends in CARICOM



Adapted from CFNI

Change in Childhood (0-5) Underweight and Overweight in CARICOM during the decade



Challenges to CARICOM Food & Nutrition Security

- Under-performing agricultural sector
- Underused sugar lands (e.g. St. Kitts-Nevis)
- Limited crop diversification
- Limitations in water resources – droughts and floods
- Land degradation
- Food Market imperfections (lack of year-round supply)
- High levels of food imports and food prices
- Poor dietary choices- limited vegetables and fruits
- Rising prevalence of CNCD's

The PROJECT

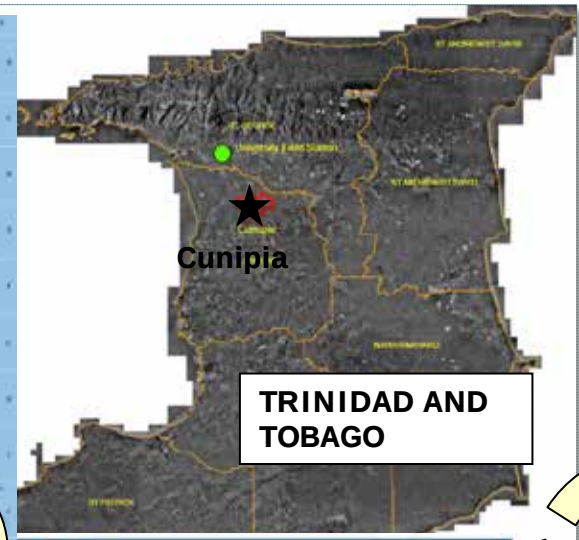
“Improving the nutrition and health of CARICOM populations through sustainable agricultural technologies that increase food availability and diversity of food choices”

Motivations behind the Project

- **"High-level CARICOM Heads of Government Reports" :**
- CARICOM is under-performing in domestic food production and food security;
- Outdated/inefficient agriculture, health & food safety systems;
- Inefficient land/water resource management systems;
- Inefficient market structures and small farmer incentives;
- Inadequate research & development;
- Rising food imports, dietary shifts to energy dense foods;
- Rising rates of obesity and diet related chronic diseases

Hemispheric and Regional collaboration

ST. KITTS AND NEVIS



TRINIDAD AND TOBAGO

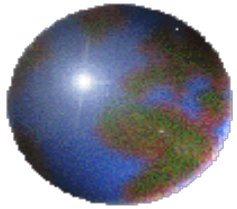
CANADA

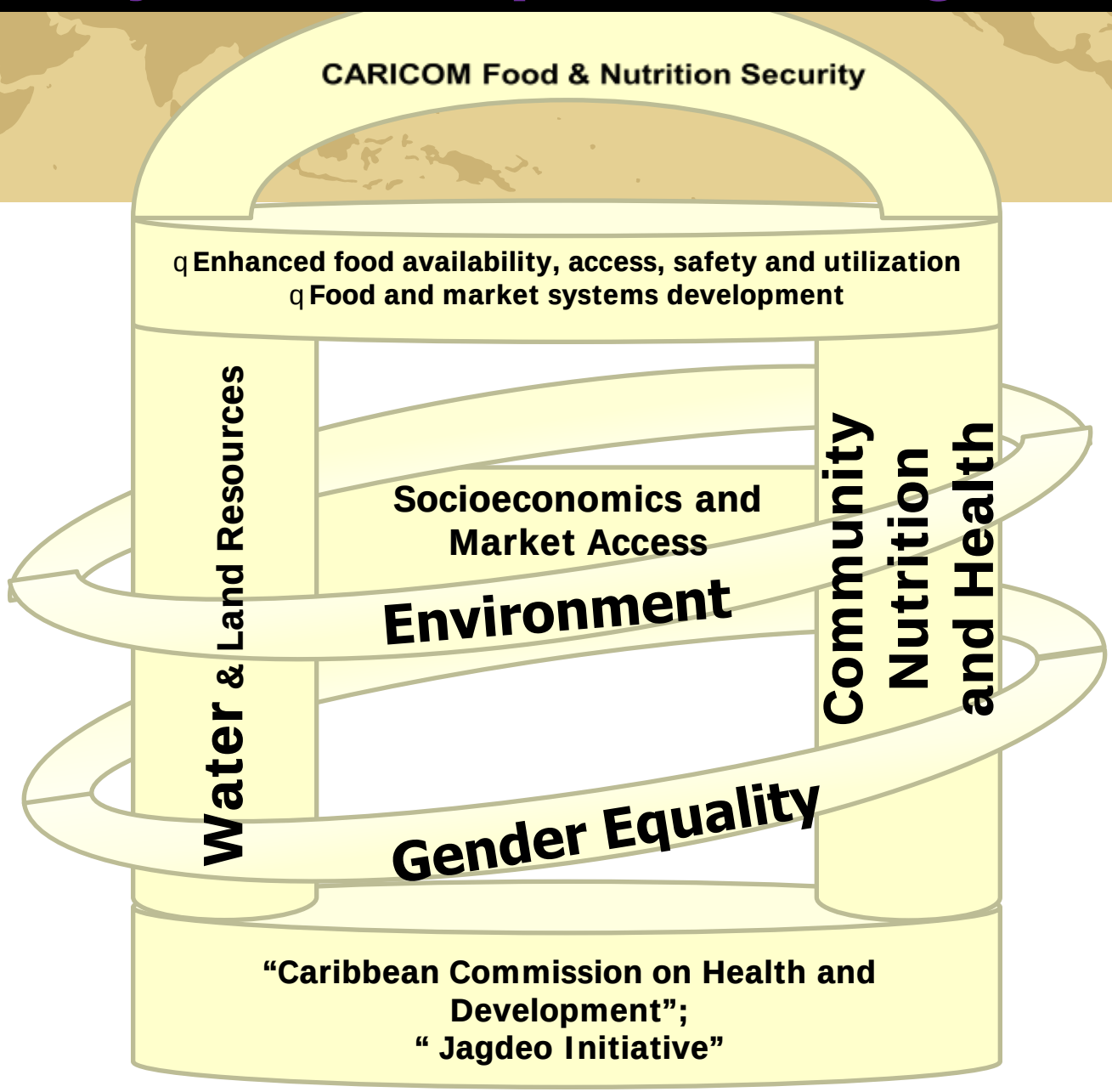
PERU

Project Challenges

- Obesity and overweight: **Major CARICOM health problems**
  - Obesity is no longer considered a 'Western society issue'.
  - Nearly 80% of deaths related to CNCD's occur in low & middle-income countries *(Public Health Nutrition:14(12), 2268–2269, 2011).*
  - Estimated CARICOM cost of obesity and co-morbidities~ US$1 billion/yr
- Accelerate agricultural diversification towards nutritious food crops
- Identify constraints to functioning markets and technology adoption
- Understand and influence consumer food choices
- Increase consumption of vegetables, fruits, pulses.

Project Concept and Integration





Novelty of the Project

- Multidisciplinary approach combining social, health, agricultural sciences;
- Incorporates ideas from the emerging field of *behavioural economics* to understand food choices;
- Takes a **farm-to-fork** "systems approach" linking agriculture to human health.

Project GROUP

- Multidisciplinary group of 14 researchers
- 2 Project PI's (UWI, I. Granderson; McGill, L. Phillip)
  - 11 Graduate students
  - 2 Research Associates
  - Gender consultant
  - Institutional CARICOM partners

Project Researchers

McGill:

- Animal Science- L. Phillip ; S. Borucki
- Bioresource Engineering- C. Madramootoo; M. Ngadi
- Economics – S. Laszlo; J. Engle-Warnick
- Dietetics & Human Nutrition- K. Gray-Donald; K. Koski
- Food Science & Agricultural Chemistry- I. Alli
- Natural Resource Sciences- G. Hickey

UWI:

- Agricultural Economics & Extension- I. Granderson; C. Pemberton
- Food Production- N. Badrie; R. Brathwaite

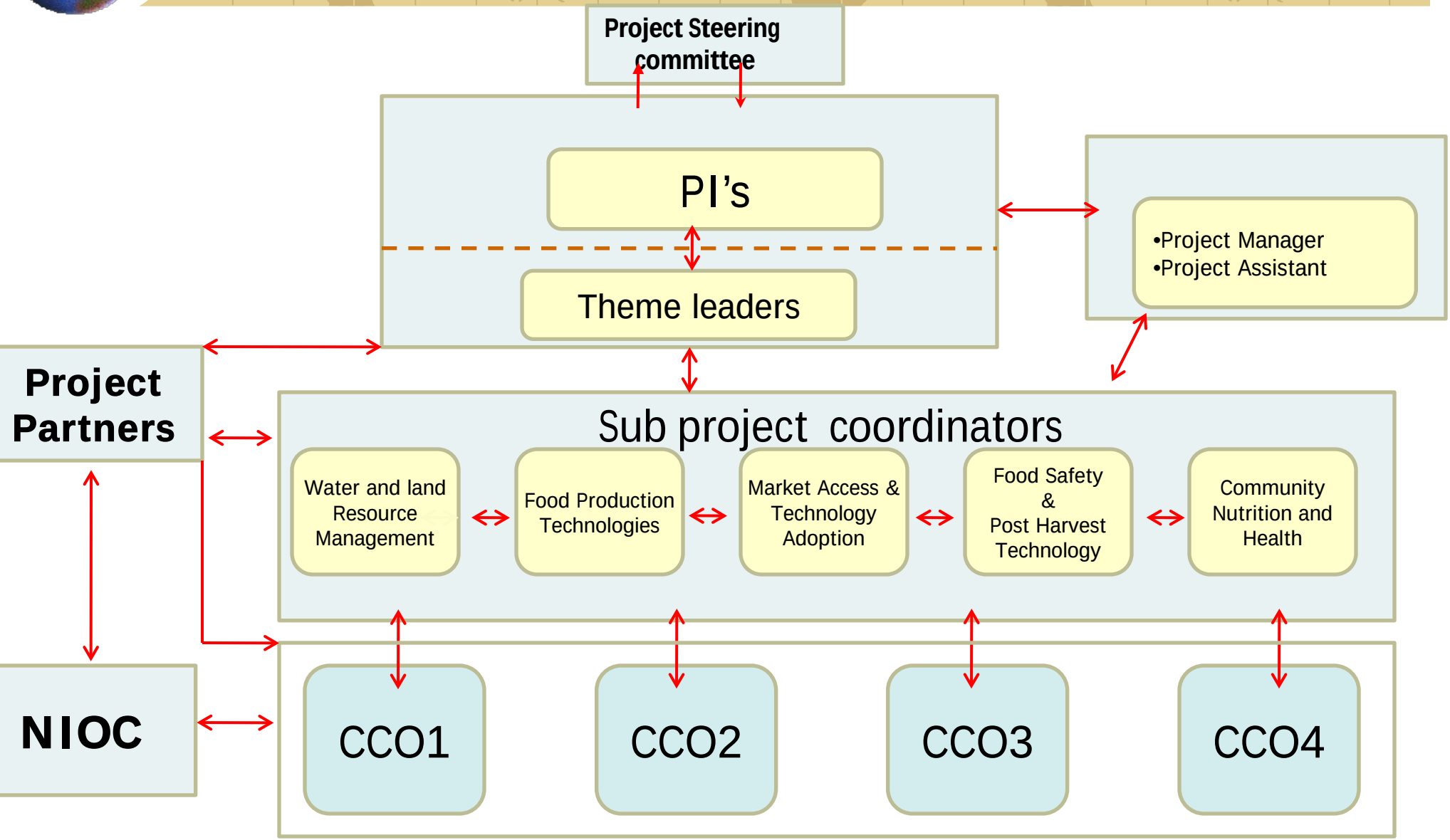
Institutional Partners

- Caribbean Agricultural Research and Development Institute (CARDI)
- Caribbean Food and Nutrition Institute (CFNI)
- Caribbean Environmental Health Institute (CEHI)
- University of Guyana
- Sir Arthur Lewis Community College (St. Lucia)
- University Trinidad and Tobago
- Trinidad and Tobago National Schools Dietary Services
- St. Kitts-Nevis Ministry of Health
- St. Kitts-Nevis Ministry of Education & Information

Institutional Partners

- St. Kitts-Nevis Ministry of Agriculture and Marine Resources
- Guyana Ministry of Agriculture (NAREI)
- St. Lucia Ministry of Agriculture, Forestry and Fisheries
- Group for the Analysis of Development (GRADE; Peru)

PROJECT COORDINATION STRUCTURE



Project Goals

- Improve nutrition outcome, especially among children leading to reduced prevalence of overweight and obesity
- Promote systems of agricultural diversification to enhance year round domestic production of vegetables and fruits
- Influence food and nutrition policy through science based integrated information
- Enhance CARICOM human resource capacity to solve problems of food and nutrition security

Major Research Questions

Markets , food choices, food quality / safety, and nutrition and health

- **How can access to markets be improved for food producers?**
- **What socio-economic, behavioural and institutional determinants affect farmers' ability to diversify and participate in local food markets?**
- **Can school nutrition interventions change food offerings and choices, and improve nutritional outcomes among school children and their caregivers?**
- **Can international standards be adapted to enhance farm-to-table food safety / quality, and reduce post-harvest losses?**

Major Research Questions

Water and Land Resource Management

Drip Irrigation & Soil conservation

- **Can we develop and test innovative water conservation and modern irrigation practices to conserve water and reduce agrochemical contamination of soil and water?**

- **Can we implement irrigation scheduling techniques to enhance water use efficiency?**

- **Can we introduce land management and cropping systems to conserve soil resources?**

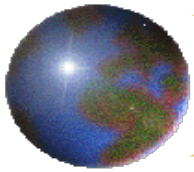
Major Research Questions

Water and Land Resource Management

Agricultural diversification

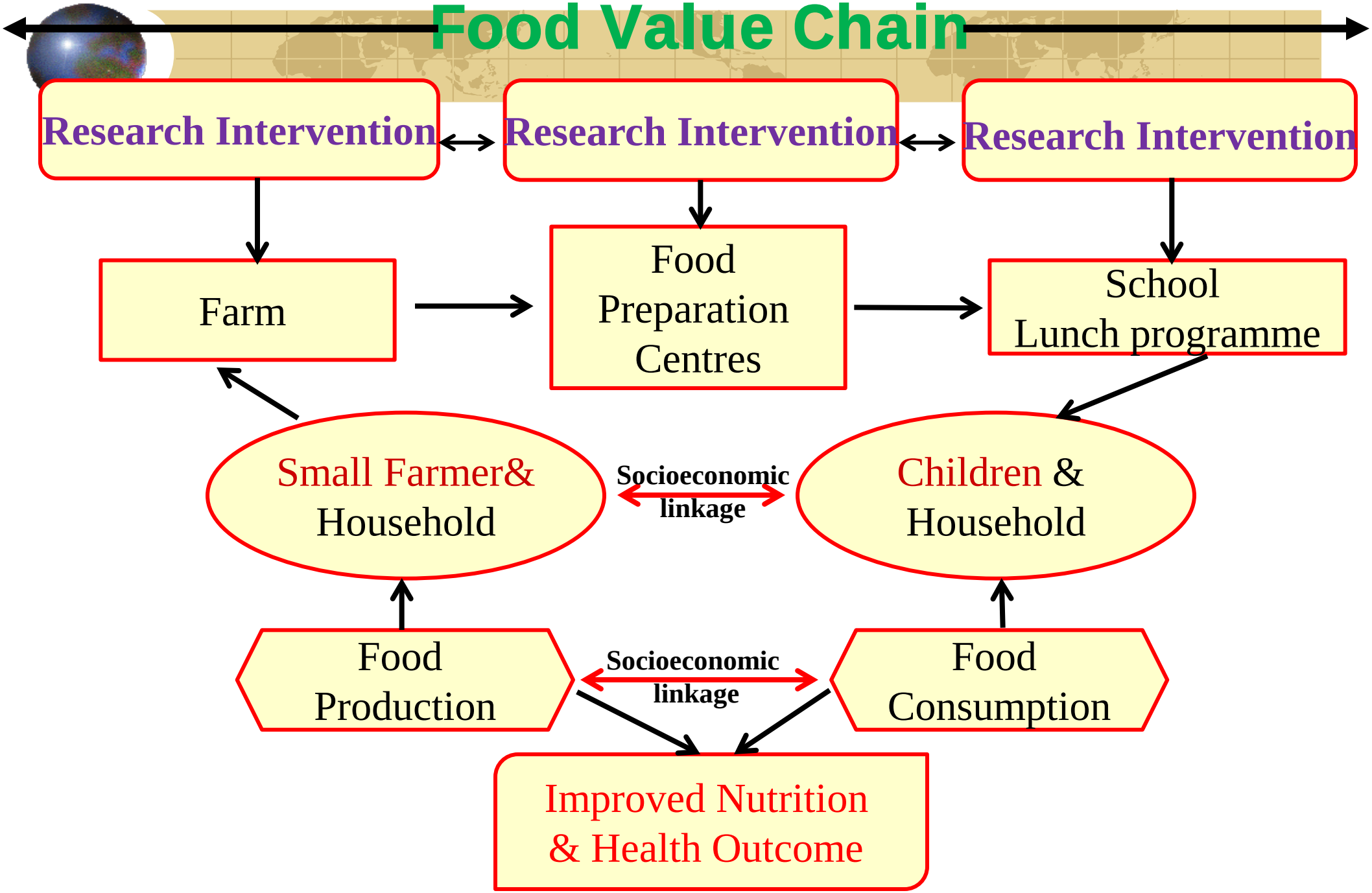
- **What are the design criteria for protected cropping structure and systems, taking into account the climate of CARICOM countries and acceptance by women farmers?**

- **Can small ruminant production be economically and environmentally sustained, using sorghum silage in a forage- based feeding system?**



RSEARCH INTERVENTIONS

Food Value Chain



Research Interventions & Activities

- ü Farmer Household and Consumer Household Surveys (Baseline, end point)

- ü Dietary modification of school lunches
- ü Nutrition education in schools and households
- ü Focus Groups and Food Choice experiments economics

- ü Technology adoption studies
- ü Control of post harvest losses and food safety / quality
- ü Drip Irrigation and Soil and water conservation
- ü Silage conservation and supplementation for small ruminants

Research Interventions

Project Themes	Research Activities	Guyana	Trinidad and Tobago	St. Lucia	St. Kitts and Nevis
		Black Bush Polder/ Parika	Cunipia	Marquis/ Black Bay	Stapleton/ Mansion
Community Nutrition & Health	Menu modification studies in school lunches	n/a	X	n/a	X
	Nutrition education	n/a	X	n/a	X
Socioeconomics and Market Access	Focus Groups	X	X	X	X
	Behavioral economics/food choice experiments	X (with farmers)	X (in schools)	n/a	n/a
	Post harvest & food safety	X	X	X	X
Water and land resources	Drip irrigation for food crops	X	X	X	X
	Protected agriculture	n/a	X	X	X
	Open field cropping systems	X	X	X	X
	Silage based ruminant production	n/a	n/a	n/a	X

http://www.mcgill.ca/globalfoodsecurity/research-initiatives/caricom-project/themes

Food Crops under study

	Guyana	Trinidad and Tobago	St. Lucia		St. Kitts and Nevis
	Black Bush/ Parika	Cunipia	Marquis/ Black Bay		Stapleton/ Mansion
	Field Crop/ Irrigation Studies	Protected Agriculture	Irrigation studies	Intercropping with banana	Field Crop/ Irrigation Studies
Tomato	X	X	X		X
Sweet pepper		X			
String beans	X	X	X		X
Melons	X	X	X		X
Eggplant	X		X		
Carrots					X
Sweet potato				X	X
Dasheen				X	
Papaya	X		X		X
Pineapple	X		X		X
Pumpkin	X				X

Socio Economic interventions

Guyana o PHS[1] o Focus groups o Experiments **St. Lucia** o PHS o Focus groups	**St. Kitts** o PHS o CHS[2] o Focus groups **Trinidad** o PHS o CHS o Experiments o Focus groups

[1] ***P****roducer* ***H****ousehold* ***S****urvey;* [2] ***C****onsumer* ***H****ousehold* ***S****urvey*

http://www.mcgill.ca/globalfoodsecurity/research-initiatives/caricom-project/themes/socioeconomics

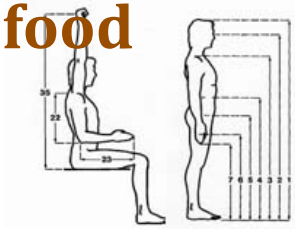
Socio Economic interventions

PHS and CHS Methodology

"Baseline" "endpoint" surveys of farmer (PHS) and consumer (CHS) households.

Structured nutrition and health questionnaire administered to 300- 400 consumers in rural communities

CHS focuses on socio-economic, demographic, and food expenditures data; 24-hour dietary recall; anthropometrics and biochemical profiles;



• CHS will support and evaluate the impact of the nutrition interventions in primary schools.

PHS Methodology

Structured questionnaire administered to 80 to 300 farmers and their households .

The PHS will focus on food production among small-holder farmers; 6 – 8 week survey period ;

The PHS will evaluate local food production systems, agricultural technology adoption, and access to markets

In both surveys, special attention is placed on the gender dimensions of food consumption and production.

Socio Economic interventions

Focus Groups Methodology

- Qualitative information will be gathered in relation to:
  a) agricultural technology and market structures;
  b) food consumption behaviour;
  c) gender issues and decision making.

- Focus groups will include all key stakeholders, especially farmers and women's groups.

- This technique complements the surveys and provides information to explain quantitative data collected from surveys .

Socio Economic interventions

Behavioural economics experiments

- To inform on the behavioral determinants of food consumption and technology adoption in food production.

- The experiments will be conducted with farmers in Guyana and Peru , and with care givers of children in Trinidad and Tobago.

Socio Economic interventions

Expected Outcomes

Develop a socioeconomic framework for :

a) **evaluating and understanding the impact of nutrition interventions among school children;**

b) **bridging the food consumption and food production components of the project;**

c) **assessing market constraints to production and consumption of safe and nutritious foods.**

Community Nutrition Interventions

Methodology

- 0ver 300 -400, 5-9 yr children in up to 8 primary schools
- Randomized to 4 nutrition interventions for nutritional assessment :
  - dietary intake patterns,
  - overweight , obesity, anemia, serum lipid profile.

- Menu modification of school lunches to include local farm produce and to improve diet quality , acceptability, and safety

- Nutrition education intervention of children and their caregivers

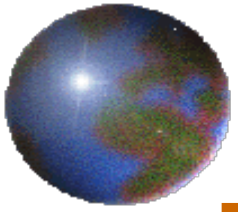
Community Nutrition Interventions

Expected Outcomes

- Reduced prevalence of overweight and obesity among school children and householders

- Changes in food choices- increased consumption of vegetables and fruits

- Successful aspects of the nutrition interventions transferred into public health policies



Food Production, Safety and Post harvest Quality

Water and Agricultural Interventions

METHODOLOGY

- **Drip irrigation systems will be installed and irrigation scheduling systems evaluated on test crops on farmer's plots under controlled conditions.**

- **Soil moisture sensors and agro-meteorological stations will be installed for key measurements .**

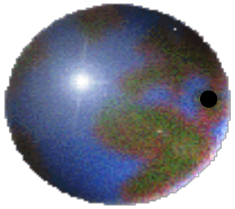
- **Data and samples will be collected:**
  - **a) agronomic practices, irrigation schedules, samples of soil and water,**
  - **b) rainfall, temperature, and evaporation**

Water Resources Management in Guyana

Rain water harvesting pond in St. Kitts Guyana

Water Resources Management

EXPECTED STUDY OUTCOME



The use of drip irrigation and fertigation as sustainable water savings technologies

- **Implemented of soil moisture sensing and irrigation scheduling techniques to enhance water use efficiency**

- **Training of farmers, extension officers, technicians, and students on advanced water and soil management systems**

Protected Agriculture & Crop Diversification

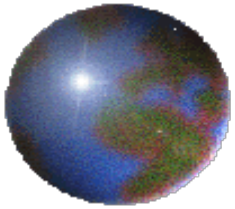
METHODOLOGY

Evaluation of designs, cultivation media, crop varieties and pest & disease management strategies for Eastern Caribbean conditions of high sustained temperature (>38C) and relative high humidity (>95%)

Protected Agriculture structures in St. Lucia

Protected Agriculture & Crop Diversification:

Expected Outcomes



- Appropriate structural designs for use under Caribbean conditions of temperature and high humidity

- Year-round availability of vegetables and fruits based on sustainable cropping systems for CARICOM.

Small ruminants

METHODOLOGY

- Conservation of mulato grass and forage sorghum as silage to increase availability and quality of forage during the dry season.

- Supplemental feeding of sorghum silage silages on “time to achieve market weight”

- Investigate “drum” silage technology on the quality of sorghum and mulato grass silage as appropriate for small holder farmers.

Small ruminant Production

EXPECTED OUTCOMES

- **Improved productivity of small ruminant (sheep and goats).**
- **Increased quantity and quality of forage during the dry season for small ruminant production.**

Food safety and Quality

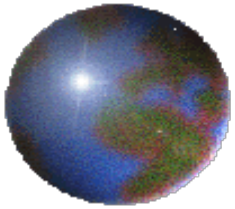
METHODOLOGY

- **Development of a FSQ criteria established by Codex Alimentarius**

- **Standards which will be used as tools for data collection and monitoring food production practices :**
  a) **At the farm level: pre and post harvest,**
  b) **School lunch program : at distribution of school meals**

Food safety and Quality

EXPECTED OUTCOME



- **Food safety and quality guidelines for pre and post harvest activities**

- **Quantify the improvement on FSQ by the adoption of international checklist and standards for food crops handling protocols**

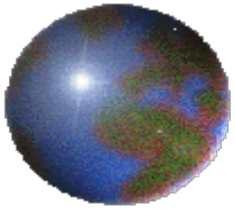
Postharvest Quality

METHODOLOGY

- **Direct measurement of the losses through the distribution network (data collection in farms, distribution market, & school lunch kitchen)**

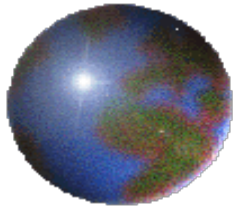
- **Assess impact of agronomic interventions on post harvest losses and crop quality**

Postharvest Quality



EXPECTED STUDY OUTCOME

- **Quantification of postharvest losses for study crops**
- **Characterization of produce "distribution chain" in each country**
- **Country –specific methodology for measuring postharvest losses**
- **Improved handling technology on postharvest losses**



Environmental Sustainability and Gender Equality

Hillside farming and Soil erosion in St. Lucia

Environmental Sustainability

METHODOLOGY

- Analyze environmental threats linked to soil and water resources management in the four countries.

- Evaluate the impact of the project interventions on soil and water quality

Environmental Sustainability

OUTCOMES

Delivery of reports not currently available in CARICOM:

- **Environmental Impacts in Agriculture**
- **Good Agricultural Practices (GAP) for Food Safety**
- **Drought Mitigation Plan**
- **Environmental Farm Plans (technical, economic and institutional framework for implementing such plans)**

Social and Gender Analysis - SAGA

Social and gender analysis will be integrated in the project to ensure gender equality in the action plans

- Monitoring and evaluation of gender indicators;

- Analysis of the gender roles in land and water conservation and management, land ownership and decision making

Social and Gender Analysis - SAGA

SAGA Expected Outcomes

- Defined specific gender roles in the food supply chain

- Empowerment actions strategies

- Documented experiences and findings from SAGA targeted to benefit women groups.

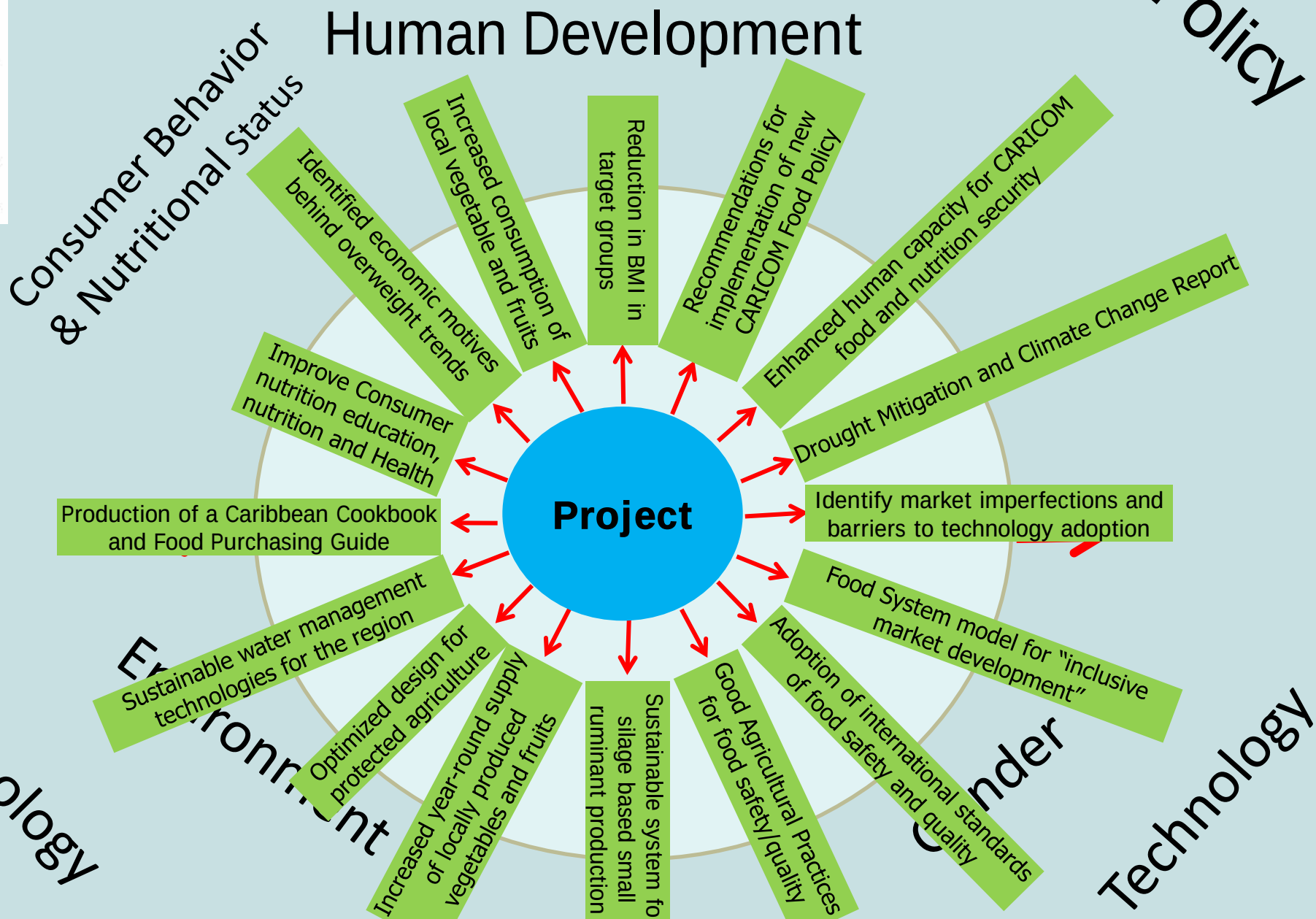
Knowledge Integration

- Examine and understand the existing relationships among government and regional institutional food security policies.

- Identification of critical information pathways to enhance adoption and application of technologies in the food security strategies of government.

- Integrate research knowledge to influence food security policy in CARICOM.

Expected Outcomes



Summary of Expected Project Impact

- Turn school children into consumers of fresh and healthy produce from small farmers;
- Change diet choices in school age children to reduce obesity
- Enhance market access for local small farmers to produce safe and nutritious produce
- Integrate research knowledge that would link agriculture and health, and change public food and nutrition policy.
- Enhance human capacity for R&D to improve CARICOM Food Security

Conclusions

- The project represents a major step in inter-institutional and regional collaboration within CARICOM to solve problems of CARICOM Food Security

- The project builds on strong and historic collaborations between McGill, UWI and regional institutions to enhance human resource development in CARICOM countries

- Extends to CARICOM, McGill's food security research collaborations in Peru, and strengthens South-South food security initiatives.

Acknowledgements

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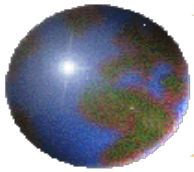
- Institutional Collaboration between McGill and the University of West Indies, (UWI) St. Augustine , Trinidad and Tobago

- Collaboration of CARICOM Partners and project team members is a cornerstone of the project

- The CARICOM Project is research Initiative within of the McGill Institute of Global Food Security



THANK YOU!