NIGER DELTA UNIVERSITY

Wilberforce Island, Bayelsa State, Nigeria

3rd NIGER DELTA UNIVERSITY PUBLIC LECTURE

Title:

Enhancing Sustainable Agriculture and Food Security through Human Capital Development, Research, and Innovation in Climate Sensitive Environments

By

Prof. Mark Wuddivira

Professor of Agri-Environmental Soil Physics

Dean, Faculty of Food and Agriculture

University of the West Indies (UWI), St. Augustine

NIGER DELTA UNIVERSITY

Wilberforce Island, Bayelsa State, Nigeria

Motto

Creativity, Excellence, Service

Vision

To be a centre of excellence defined by well articulated programme that will produce creative and innovative minds

Mission

To strive to maintain an international reputation for high quality scholarship, research and academic excellence for the promotion of thesocio-cultural and economic well-being of mankind

Enhancing Sustainable Agriculture and Food Security through Human Capital Development, Research, and Innovation in Climate Sensitive Environments

Faculty of Food and Agriculture
Department of Food Production

Professor Mark Wuddivira, PhD
Dean, Faculty of Food & Agriculture, UWI

NIGER DELTA UNIVERSITY ANTHEM
(THE BRIGHTEST STAR)

Like the brightest star we are, to lead the way
To good education that is all our due,
The dream of our fathers like the seed has grown;
Niger Delta University if here to stay.

Let us build on this noble foundation
And with love, let our dedication increase,
To rise and uphold this noble vision
Ev'ry passing moment let our zeal never decrease.

In all that we do, let us bring to mind
Our duty as staff and students of N.D.U
Ev'rywhere to promote peace towards mankind.
Creativity, Excellence and Service

CHORUS
Rejoice, great people old and new, rejoice
For the good fruit through us is shown;
Be glad in our worthy contribution
To the growth of humanity (x2)

Protocol

About Myself

- Ph.D. Soil Science (UWI)
- B.Sc. & M.Sc. (ABU)
- Professor of Agri-Environmental Soil Physics
- Dean, Faculty of Food & Agriculture.

Family

ABOUT THE CARIBBEAN

About The University of the West Indies

- A pivotal force in Caribbean development
- Globally respected with nearly 50,000 students
- One of only two regional universities in the world
- **Five campuses**:
  - Mona in Jamaica
  - St. Augustine in Trinidad and Tobago
  - Cave Hill in Barbados
  - Five Islands in Antigua and Barbuda
  - Global Campus
- Offers over 1000 certificates, diplomas, UG &PG degree options.
- Caribbean's leading university,
- Possesses the largest pool of Caribbean intellect and expertise
- Consistently ranked among the top universities globally by THE

- The only Caribbean-based university ranked by THE.
- In the top 25 of *Latin America and the Caribbean*
- the top 100 global *Golden Age* universities

My Research Agenda:

Soil physical and hydrological management and the sustainable use of humid tropical ecosystems under intense rainfall and the impact of deleterious land use practices.

https://scholar.google.com/citations?view_op=list_works&hl=en&hl=en&user=GNQjoBQAAAAJ&sortby=pubdate

- Soil structural stability and erodibility
- Slaking sensitivity of soil aggregates
- Soil water repellency and Hydrological processes
- Time and cost-efficient procedures for fundamental soil physical properties.
- Mathematical models for the estimation of soil texture and other fundamental soil properties
- Geophysical soil sensing using the EMI technique for the assessment of soil spatiotemporal variability.

RESEARCH AGENDA:

Soil physical and hydrological management and the sustainable use of humid tropical ecosystems under intense rainfall and the impact of deleterious land use practices

SILENT SOIL SUFFERING: THE RELENTLESS POWER OF DISRUPTIVE PRESSURES

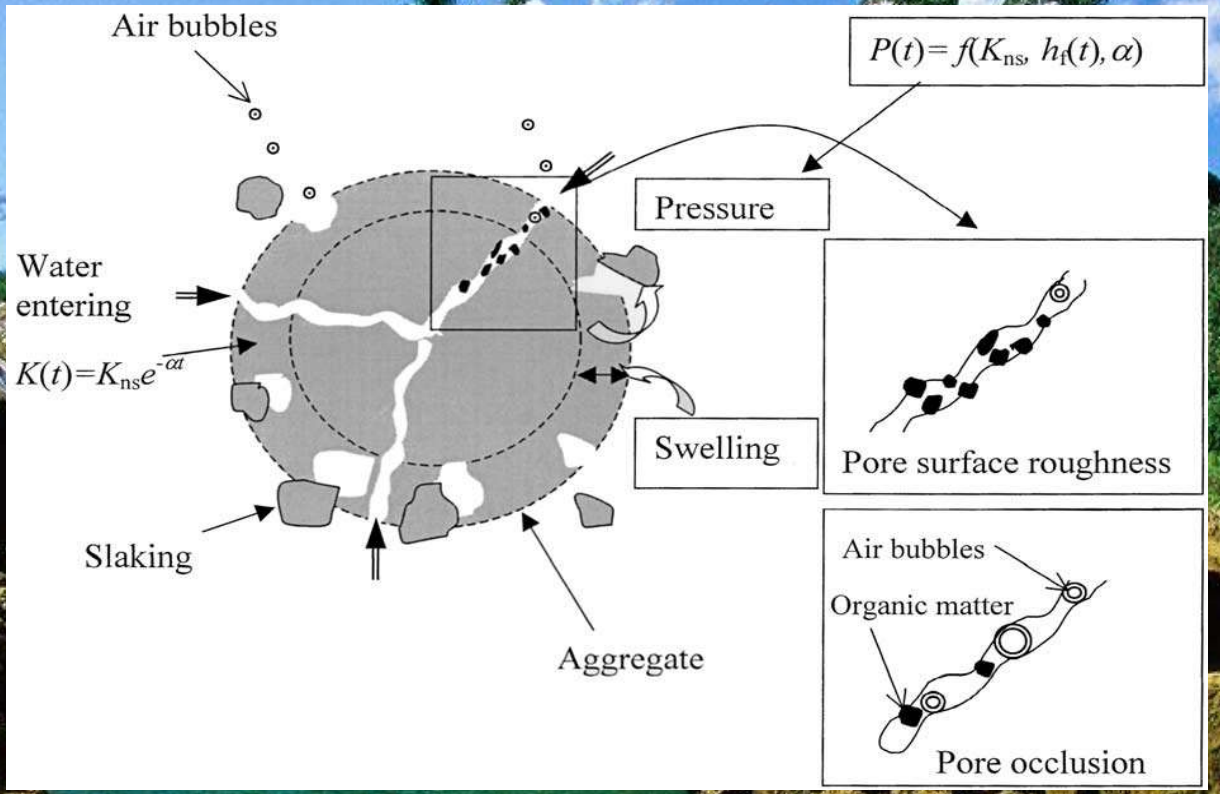
EXPOSURE OF SOIL SURFACE

- **Deforestation and deleterious land practices**

- **Intense Energetic Rainfall and Rapid Wetting**

Understanding Slaking Pressures

Conceptual model

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SOIL SLAKING
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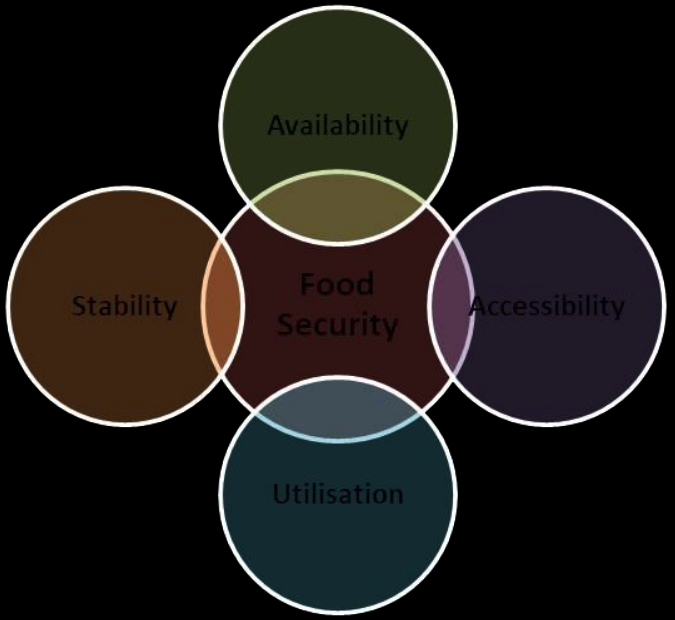
3

Food Security



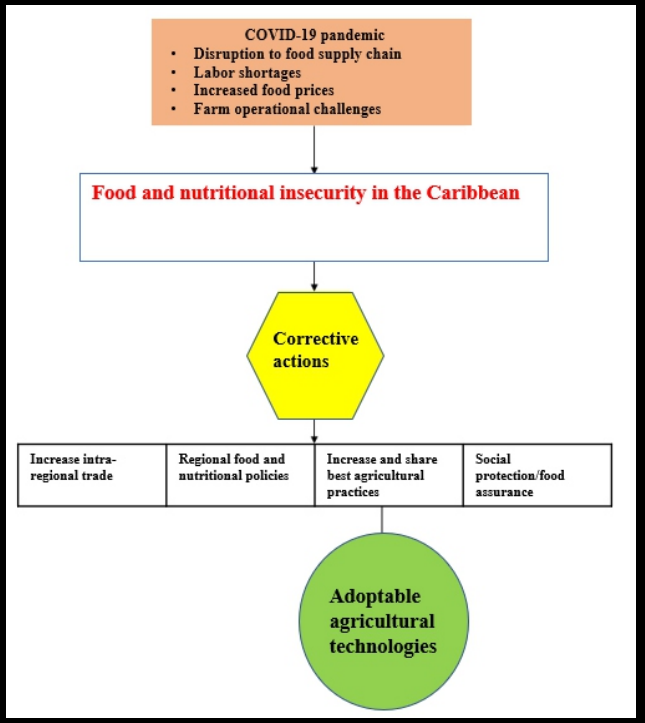
Definition:

- Food security is achieved when individuals have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and preferences for an active and healthy life.

Four Dimensions of Food Security:

- **Availability:** The supply of food through production, distribution, and exchange.
- **Accessibility:** The ability of individuals and households to obtain food economically and in appropriate quantities.
- **Utilization:** The nutritional quality and safety of the food consumed, including the preparation and dietary practices.
- **Stability:** Consistency in food availability, access, and usage over time, despite shocks

Food Security as National Security



- Food security has direct implications for national stability, economic resilience, and public health—making it an urgent national security priority.
- COVID-19's Wake-Up Call: The pandemic exposed how fragile global supply chains are, and how quickly food insecurity can escalate.
- Investing in food security safeguards our communities, strengthens economies, and reduces our vulnerability to global disruptions.

Food Security Dimensions and Link to National Security

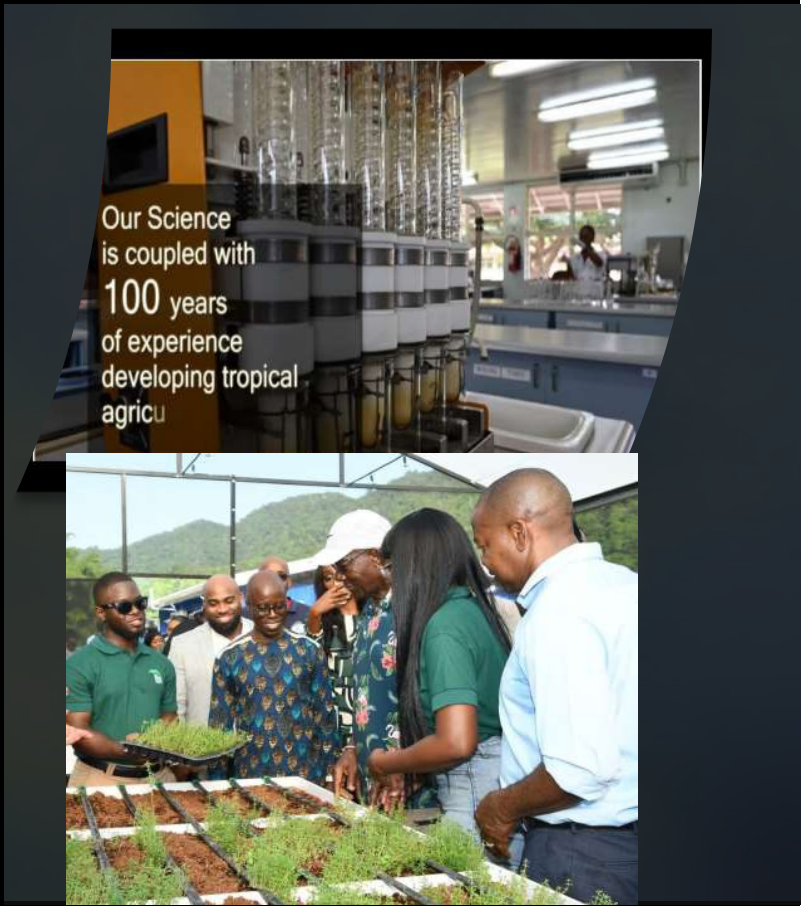
- Availability: Ensuring a reliable and steady food supply that is resilient against global shocks and climate threats.
- Accessibility: Addressing the cost and economic access to food—especially critical as inflation and income inequality have widened in the region.
- Utilization: Ensuring that food quality and nutritional value are high to reduce public health risks, especially non-communicable diseases (NCDs).
- Stability: Building buffers against unpredictable crises—whether economic, environmental, or geopolitical—that disrupt food availability and affordability.

Costs of Food Insecurity

- Economic Strain: High food import bills increase reliance on foreign currency reserves, destabilize budgets, and exacerbate trade imbalances.
- Public Health Costs: Food insecurity drives poor nutrition, leading to higher rates of NCDs, escalating healthcare costs, and lower workforce productivity.
- Social Stability Risks: Food scarcity or high prices can fuel social unrest, migration, and inequality, as food insecurity disproportionately impacts lower-income populations.
- Environmental Costs: Unsustainable agricultural practices and heavy import dependence increase carbon emissions, further endangering local ecosystems and resilience.

Food Security Situation

- 57% of the population is food insecure.
- Unsustainable food import bill due to overreliance on food imports.
- The 25 x 2025 initiative of the CARICOM Heads of Government.
- Unique challenges due to geographic and economic characteristics of Caribbean SIDS hampers food security.
- Limited resources.
- Presenting a robust partnership model aimed at leveraging scientific resources to enhance food security in the region.



Food Security Challenges

01

Limited Resource and Funding Allocation

- Limited STI, human, and institutional capacities to address food security.
- Insufficient funding and support for ST&I
- No dedicated STEM R&D funds.
- Lack of or obsolete research facilities for basic/impactful research.

02

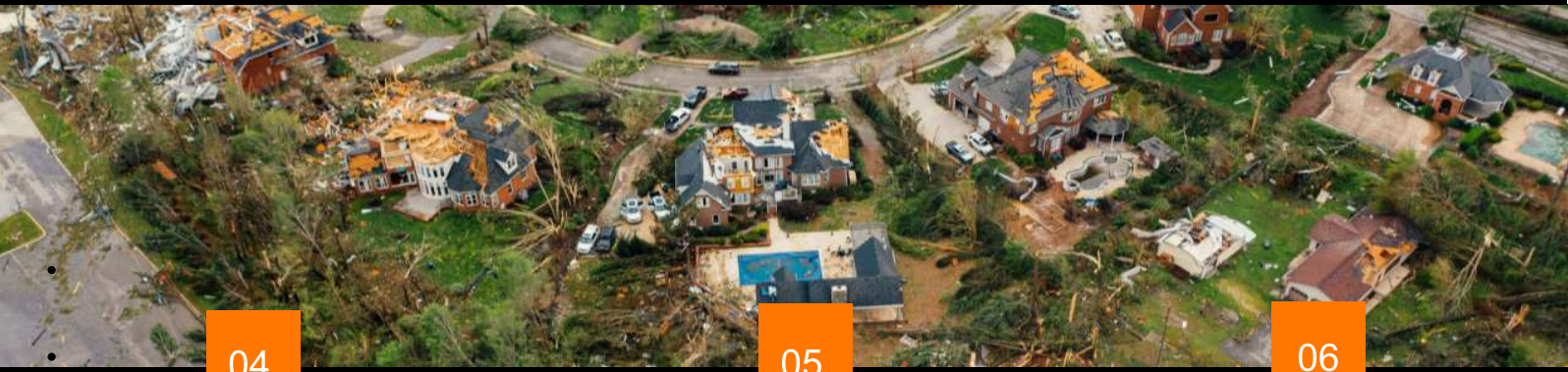
Geographic isolation

- Limited Arable Land & Soil Degradation
- Jamaica loses 9,722 ha/year (Ewing-Chow 2019)
- Scarce Water Resources
- Trinidad dry season precipitation reduced to 10-20% (Fraser 2021)
- Biodiversity loss
- 1,200 species threatened (Johnson 2020)

03

Human Resource Challenges

- Brain drain due to inadequate Compensation.
- Graduate research (the lifeblood of scientific research): hampered by a lack of equipment and funding leading to low enrolment in experimental STEM-based research programmes



04

Vulnerability to climate change, natural disasters and degradation.

Increased Frequency of Extreme Weather Events, e.g. storms, hurricanes, floods, and droughts.

Yearly storm damage: 17% of GDP (UNDP)

Rising sea levels and ocean acidification.

Soil Degradation and Land Scarcity - Compelled farmers to utilize wetlands, leading to flooding and loss of arable land.

Jamaica loses 9,722 ha/year (Ewing-Chow 2019)

Scarce Water Resources

Trinidad dry season precipitation reduced to 10-20% (Fraser 2021)

Biodiversity loss: 1,200 species threatened (Johnson 2020)

Water Contamination - Pollution from oil companies leading to poor water quality impacting agriculture and health.

05

Economic dependency on imports, leading to food insecurity

- 57% of the population is food insecure
- Effect of climate change
- Limited arable land
- Overreliance on extra-regional imports with food import bills at a precarious level

06

Restricted Autonomy of Scientists and Innovators

- Limited potential for scientific and technological advancements.
- Constraints on study designs and research dissemination.

04

Social Challenges:

- Poverty - exacerbating food insecurity.
- Limited Production Capacity – Further impacted by a rapidly increasing population.
- Market Factors - High inflation and prices for essential food items, limiting access for low-income households.
- Climate mobility

05

Government Neglect

- Limited support for agricultural initiatives and food accessibility programmes.

Bridging the Gap: Multifunctional Role of the FFA

Food security challenges are multifaceted

- Climatic, environmental, economic, and social issues.
- Addressing these challenges requires leveraging of knowledge, expertise, and innovative approaches

The FFA at UWI plays a central role in research, education, and outreach efforts along the food value chain, to improve food safety standards in the region.

Our Mandate & Mission

Mandate:

The University of the West Indies (UWI) has tasked us with providing training and capacity building in agriculture and related disciplines across the Caribbean.

Mission:

Our mission is to deliver high-quality education, training, and research aimed at the sustained improvement of the region's food and nutrition security. We are also dedicated to promoting the sustainable use and development of agri-environmental systems.

Our Pedigree

Historical Legacy:

With a rich history dating back to 1921, the Institute of Caribbean Tropical Agriculture (ICTA) has been a cornerstone in teaching and research in tropical agriculture, both within the British Empire and globally.

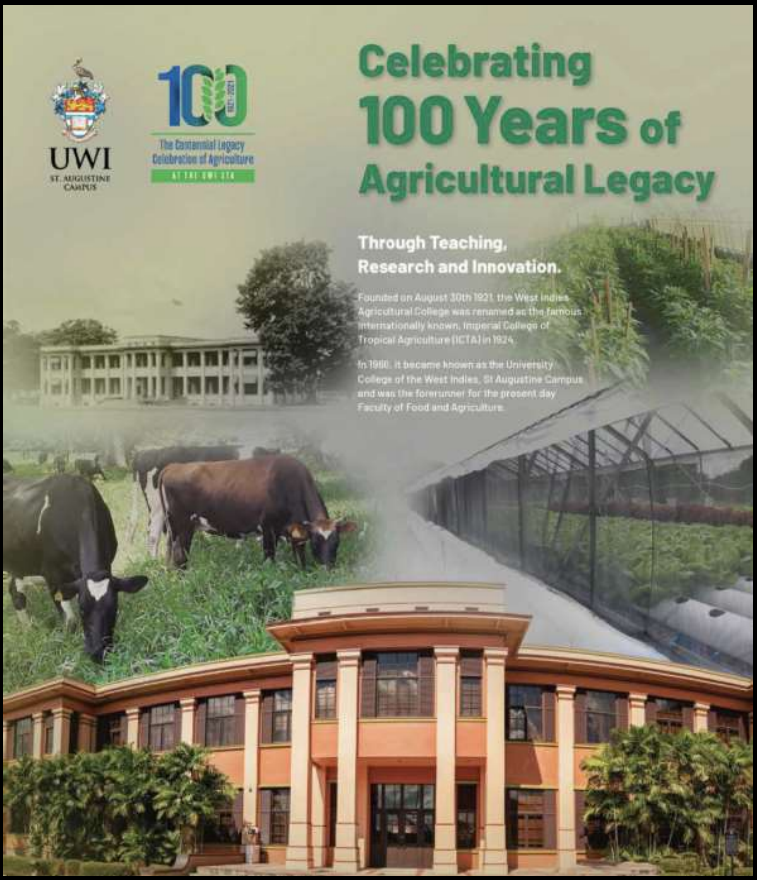
Century of Excellence:

Over the past 100+ years, we have consistently excelled in teaching, research, and outreach in the field of tropical agriculture.

Tractor ploughing land for experimental plots at the University Farm, U.C.W.I., Faculty of Agriculture, St. Augustine

Our legacy and strength

- A symbol of regionalism.
- Holds an exclusive mandate to provide training and capacity building in agriculture and related disciplines in the Caribbean.
- Possesses an excellent pedigree in teaching, research, innovation, and outreach in tropical agriculture and the environment.
- Produces outstanding graduates, including great scientists, researchers, educators, innovators, entrepreneurs, and leaders such as Dr. Shakuntala Haraksingh Thilsted, World Food Prize Winner 2021.
- Maintains strong linkages between research, teaching, and learning in the agri-food-environment spectrum.
- Hosts a concentration of highly qualified staff within the agri-food-environment spectrum.
- The reputation and quality of our programmes are indisputable.



Our Departments

Our primary focus is producing highly qualified human resources essential for regional food and nutrition security in a safe and resilient environment.

Department of Agricultural Economics and Extension

Offering Programmes in Human Nutrition, Agri-Business, Consumer Sciences etc.

Department of Food Production

Offering programmes in Agriculture, Livestock Science, Soil Science and more

Department of Geography

Offering programmes in Geography and Environmental Studies

Our Facilities

- The University Field Station is the main vehicle through which field-based research and teaching is done.
- Our laboratories and greenhouses are equipped to demonstrate scientific, modern, and climate-smart agricultural, food safety, environmental management, and best practices.

How FFA advances Caribbean Food security?

- FFA's programmes are vital in shaping the future of food security in the Caribbean.
- Graduates from FFA are making meaningful contributions across various sectors, playing a crucial role in enhancing food security throughout the region.
- Collaboration with industry and governments amplifies the impact of their initiatives, fostering resilience and sustainability in food systems.

Programmes at the FFA

Certificate Programmes:	Diploma Programmes:	Undergraduate Degree Programmes:
• Agriculture • Environmental Geography • Human Ecology	• Institutional and Community Dietetics and Nutrition • Agriculture	• Agribusiness Management • Agriculture • Human Nutrition and Dietetics • Geography

Undergraduate Majors

- Agribusiness
- Agricultural Technology
- Entrepreneurship
- **Disaster Risk Resilience for Agriculture & Environment**
- Environmental and Natural Resource Management (ENRM)
- Foods and Food service Systems Management
- Geography

Undergraduate Minors

COMMUNICATION AND EXTENSION

ENTREPRENEURSHIP

ENVIRONMENTAL AND NATURAL RESOURCE MANAGEMENT (ENRM)

SPORTS NUTRITION

Postgraduate Diploma

AGRI-FOOD SAFETY AND QUALITY ASSURANCE

TROPICAL CROP PROTECTION

TROPICAL ANIMAL SCIENCE AND PRODUCTION

PESTICIDE TECHNOLOGY AND MANAGEMENT

CLIMATE RESILIENT AGRICULTURAL EXTENSION FOR COMMUNITY DEVELOPMENT

MSC

- Agricultural Economics
- Agri-Food Safety and Quality Assurance
- Marketing and Agribusiness
- Tropical Animal Science and Production
- Tropical Crop Protection
- Value Addition for Food and Nutrition Security
- Food Security

MPhil/PhD

- Agricultural Economics
- Human Ecology
- Agricultural Extension
- Geography
- Soil Science
- Crop Science
- Horticultural Science
- Livestock Science
- Tropical Earth and Environmental Science
- Cocoa science

Continuing Professional Education (CPEs)

- Hydroponics
- Small Gas Engine Repair
- Landscape Management
- Data Analysis (using SPSS)
- Broiler Rabbit Production and Management
- Aquaponics
- Nutrition Fundamentals
- Waste Management
- Advanced Hydroponics
- Home Gardening & Crop Protection
- CompostingPlant Quarantine
- Shade House Production and Management
- Aquaculture Production and Management

Research Themes

- Climate change, adaptation and resilience
- Agricultural value chain
- Environment and sustainability
- Biodiversity
- Soil, water and land
- Agricultural economics and trade
- Waste management and circularity

Climate Smart Agriculture

Vulnerability and risk

Assessment and monitoring

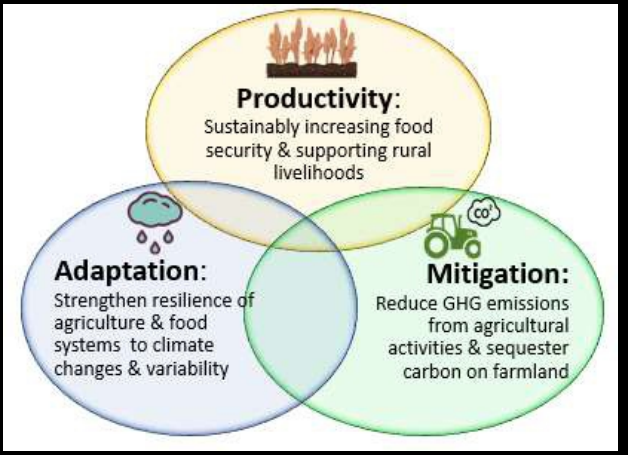
Mitigation

Adaptation and resilience

Protected systems

Improved efficiency systems

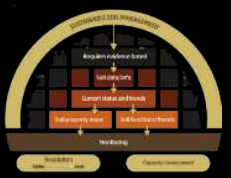
Crop and livestock breeding and management



SOILCARE

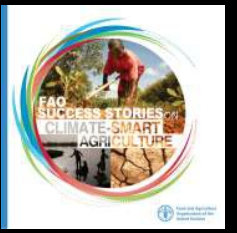
To Strengthen Caribbean SIDS with the necessary tools for adopting policies, measures and reforming legal and institutional frameworks to achieve Land Degradation Neutrality LDN and Climate Resilience

1. Soil Information Systems as a basis for Evidence-based Decision Making



2. Adressing **Land Degradation** through the Rehabilitation and Restoration of Degraded land/soils

3. Soil productivity restored through **climate smart agriculture**



4. Enhancement of **Food Systems** and Alternative Livelihoods

5. Knowledge management and Capacity Building

Innovation

- Plant biostimulants
- Biopesticides
- Biofertilizers
- Alternative and nontraditional foods and products
- Spatial analysis and precision agriculture
- Protected systems
- Social media, communication and extension
- Robotics and drones

Innovation

Development of Sustainable Agricultural Inputs

- Seed Bank
- Compost pellets
- Biopesticide

Biophyt 1.0

- A safe environmentally friendly Bio-pesticide as an alternative to highly hazardous pesticides currently being used.
- Foliar and root drench application to manage foliar and basal rot diseases caused by bacteria and fungi.
- Stimulates growth by solubilizing nutrients that are usually in a state unavailable to plants.

Innovative approaches to agriculture

A Latin American and Caribbean Leader in developing Intensive Production Models for Key Neo-tropical Animals

- Establishing an Insect Farming Hub at the UFS
- Using insect larvae as protein substitutes in animal feed to potentially cut down on the cost of feed.
- Organic waste to feed the insects and use insects as feed
- Protein-rich feed for fish, Poultry & other animals
- Environmental waste reduction & circular farming

Extension Services:

- Offering technical advice and support to farmers, food processors, and regulatory agencies.
- Helping implement food safety measures from farm to table.

Collaborative Efforts

Partnerships with Local Farmers:

- Providing education and training in Good Agricultural Practices (GAP) to enhance productivity and sustainability.
- Promoting organic farming methods to increase food availability and reduce dependence on chemical inputs.

Government and International Collaborations:

- Working with government agencies to strengthen food security policies and support for local farmers.
- Collaborating with international bodies like the FAO and CARICOM for regional food security frameworks and resource sharing.

Role of FFA in Policy Development

Influence on Policy:

- FFA's research contributes directly to shaping national and regional food safe policies.
- Expert advice provided to Caribbean governments on strengthening food safety regulations.

Capacity Building:

- Hosting workshops, conferences, and training sessions for regulatory authorities, extension officers, and food industry stakeholders.

Recommendations to Improve Food Security

Policy Integration and Prioritization

- Position Food Security as a Core National Security Priority:
  Elevate food security in state security strategies, alongside traditional defense and public safety initiatives.
- Expand Budgets for Food Resilience:
  Allocate resources within security budgets for food security initiatives, treating access to food as an essential public safeguard.

Regional Collaboration and Local Production Investments

- Enhance State-Wide Policies:
  Coordinate policies for food production and import strategies to stabilize supplies and reduce dependency on external sources.
- Strengthen Local Agriculture:
  Invest in resilient agricultural systems, supporting local farmers, climate-smart practices, and agro-processing industries.

Recommendations to Improve Food Security

Infrastructure and Emergency Response Capacity

- Build Strategic Food Reserves:
  Develop local food stockpiles or buffer reserves to mitigate future supply chain disruptions.
- Enhance Distribution Infrastructure:
  Strengthen food distribution channels, ensuring equitable access in vulnerable and remote areas during crises.

Climate Adaptation and Sustainability Initiatives

- Incentivize Climate-Resilient Agriculture:
  Fund sustainable farming practices that protect the environment and promote food security.
- Advance Technological Innovation:
  Encourage investment in agricultural technology, including digital platforms and crop insurance for local farmers.

Financial and Trade Mechanisms

- Create State Food Security Funds:
  Establish financial mechanisms to support food security programs, incorporating grants and low-interest loans for local production.
- Negotiate Fair Trade Agreements:
  Secure trade agreements that ensure affordable imports of essential food items while prioritizing local production.

Thank You!

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Faculty of Food and Agriculture UWI STA

sta.uwi.edu/ffa

PROFILE OF THE 3RD NDU PUBLIC LECTURER

Prof. Mark Wuddivira

Professor of Agri-Environmental Soil Physics

Dean, Faculty of Food and Agriculture

University of the West Indies (UWI), St. Augustine

CITATION OF PROF. MARK WUDDIVIRA

Professor Mark Wuddivira is the Dean of the Faculty of Food and Agriculture at The University of the West Indies (UWI), St. Augustine, and a Professor of Agri-Environmental Soil Physics. He also serves as the President and a Fellow of the Caribbean Academy of Sciences (CAS) and is a member of the International Science Council's (ISC) Small Island Developing States (SIDS) Liaison Committee.

An internationally recognized expert in agricultural and environmental sciences, Professor Wuddivira's research focuses on soil physical management and the sustainable use of humid tropical ecosystems. His work has been widely published in leading international journals, and he is frequently invited to deliver keynote speeches and expert presentations at high-level UN, ISC, Latin America, and Caribbean meetings. In addition to his ongoing academic contributions, he has also served as a Visiting Lecturer/Researcher at top international institutions, with his longest tenure being from May 2018 to May 2019 at the Faculty of Natural and Environmental Sciences, University of Koblenz-Landau, Germany.

Professor Wuddivira has played a pivotal role in advancing a comprehensive interdisciplinary research programme that integrates plant and soil science, driving innovation and research dissemination both regionally and internationally. In recognition of his significant contributions, he was awarded the Principal's Research Award as the Most Outstanding Faculty Researcher in 2023.

A leading figure in the academic and scientific communities, particularly in advancing science, technology, and innovation for sustainable development in SIDS, Professor Wuddivira champions the transformation of the agri-food system to ensure food security and resilient development for these vulnerable regions.

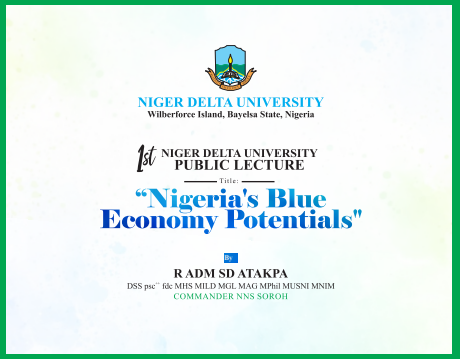
He holds a Ph.D. in Soil Science and a Graduate Certificate in University Teaching and Learning from UWI, as well as a BSc in Agriculture and an MSc in Soil Science from Ahmadu Bello University, Nigeria. He also earned an International Graduate Certification from the Hebrew University of Jerusalem, Israel.

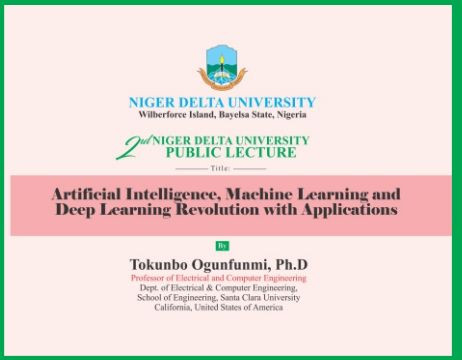
In addition to his academic and research roles, Professor Wuddivira chairs the Editorial Board of the journal Tropical Agriculture and is an Associate Editor of the Journal of Plant Nutrition and Soil Science (Wiley). He serves on various steering committees and advisory boards, including the Caribbean WaterNet/CAPNET UNDP, the Cocoa Research Centre at UWI, and the Caribbean Agricultural Research and Development Institute (CARDI). He is also a member of the Advisory Council for the Transformation of Agri-Food Systems (CATSA) at the Inter-American Institute for Cooperation on Agriculture (IICA) and chairs the Consortium of Universities in the Caribbean Communities involved in Agricultural Education and Research (CUCAER).

SERIES OF UNIVERSITY PUBLIC LECTURES

TITLE	PRESENTER	DATE
"Nigeria's Blue Economy Potentials"	**R ADM SD ATAKPA**	8th February, 2023
Artificial Intelligence, Machine Learning and Deep Learning Revolution with Applications	**Tokunbo Ogunfunmi, PhD**	8th November, 2023

SERIES OF UNIVERSITY PUBLIC LECTURES





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