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The Centennial Legacy
Celebration of Agriculture

AT THE UWI STA

FACULTY OF FOOD AND AGRICULTURE

CENTENNIAL LEGACY CONFERENCE REPORT

2021

Prepared by
Tharā Gabriel

ACKNOWLEDGEMENTS

The University of the West Indies Faculty of Food and Agriculture would like to extend special thanks to all sponsors, members of the planning committee, presenters, contributors, organizers and participants, whose tireless work and support, made this Centennial Legacy Conference possible.

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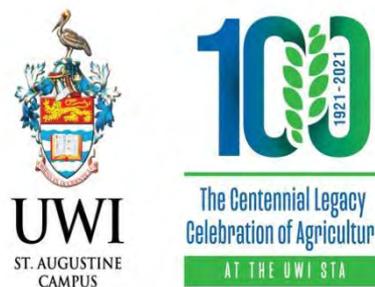
LIST OF ACRONYMS

AI	Artificial Intelligence
AIV	Avian Influenza
CABI	Centre for Agriculture and Biosciences International
CARICOM	Caribbean Community
CEO	Chief Executive Officer
CFO	Chief Financial Officer
COP	Conference of the Parties
CoPs	Communities of Practice
CSA	Climate Smart Agriculture
EMA	Environmental Management Agency
EU	European Union
FAIRR	Farming Adaptation and Artificial Intelligence for Resilience
FAO	Food and Agriculture Organization of the United Nations
FFA	Faculty of Food and Agriculture
GPS	Global Positioning System
GWP-C	Global Water Partnership Caribbean
ICT	Information and Communications Technology
ICTA	Imperial College of Tropical Agriculture
IPIFF	International Platform of Insects for Food and Feed
NACIA	North American Coalition for Insect Agriculture
NCD	Non-Communicable Disease
NPC	Nominal Protection Coefficient
NTAW	Neo-Tropical Animal Wildlife
OSTASP	The Open School of Tropical Animal Science and Production
PSU	Poultry Surveillance Unit
SDG	Sustainable Development Goal
SIDS	Small Island Developing States
SWEs	Seaweeds
UN	United Nations
UNDP	United Nations Development Programme
USA	United States of America
USVI	United States Virgin Islands
UWI	The University of the West Indies

OVERVIEW

Title

Celebrating a Hundred Years of Agricultural Research and Innovation: Perspectives on Tropical Food and Agriculture Systems



Objectives:

1. To showcase contemporary food and agricultural research and innovations relevant to Caribbean SIDS
2. To collate and share scientific data and research experience that can inform future research, development and decision making in Caribbean agriculture, food systems and related sectors
3. To identify, strengthen and promote collaboration and networking among regional, global scientists and stakeholders
4. To facilitate knowledge sharing amongst stakeholders
5. To enhance effectiveness of academic research towards decision making and policy development



Convener: The University of the West Indies, Faculty of Food and Agriculture (UWI, FFA)

Sponsors

1. The Food and Agriculture Organization of the United Nations (FAO)
2. Global Water Partnership Caribbean (GWP-C)
3. Caribbean WaterNet/CapNet UNDP

Type of Session: Virtual Conference

Technical Host: Marketing and Communications Unit, UWI

Date – Time

1. Wednesday 10th November 2021 – 9:00am to 2:30pm
2. Thursday 11th November 2021 – 8:30am to 1:45pm

Chairpersons

- Day 1 – Dr Ronald Roopnarine
- Day 2 – Dr Gaius Eudoxie

Keynote Speakers

Dr Renata Clarke - Sub-regional Coordinator for the Caribbean, FAO

Dr Shakuntala Haraksingh-Thilsted – Global Lead for Nutrition and Public Health, WorldFish

Speakers

Dr Mark Wuddivira – Dean, FFA

Mr Bruce Lauckner – Editor-in-Chief, Tropical Agriculture

Session Moderators and Presenters

Day 1

FAO Session – Innovation in Agriculture: Insect Production as Animal Feed

Moderators

- Discussion - Mr Reuben Robertson | FAO Representative, Trinidad and Tobago and Suriname
- Q&A - Mr Shaun Baugh | Programme Manager, Agriculture and Agro-Industrial Development, CARICOM Secretariat; Principal Director, Economic Planning and Policy, The ministry of Industry, Commerce, Agriculture and Fisheries, Jamaica

Presenters

- Mr Damian Malins and Dr Maureen Wakefield | Fera Science Ltd.
- Mr Tom Van Ravensberg and Mr Koen Volkers | RavenFeed
- Ms Wendy Lu McGill | Interim Director, NACIA
- Mr Constantin Muraru | Communication and Research Manager, IPIFF

Thematic Presentation – Innovative Agriculture for Sustainable Food and Nutrition Security 1

Moderator - Professor Duraisamy Saravanakumar | Head, Dept. of Food Production, FFA, UWI

Presenters

- Mr Michael Gloster
- Mr Rakesh Bhukal
- Dr Albertha Joseph
- Mr Romano Macfarlane

Thematic Presentation - Enhancing Life and Livelihoods in Agriculture

Moderator – Dr Oral Daley | Lecturer, Crop Science, FFA, UWI

Presenters

- Mr Nkosi Felix
- Dr Arlette Saint Ville

Thematic Presentation – Innovative Agriculture for Sustainable Food and Nutrition Security 2

Moderator – Dr Lystra Fletcher-Paul | Lecturer, Biometrics, FFA, UWI

Presenters

- Mr Romano Macfarlane
- Dr Omar Ali

Day 2

Thematic Presentation – Disaster Risk Management and Climate Resilient Agriculture

Moderator – Dr Gabriel Thongs | Lecturer, Natural Hazards, Urban Planning & GIS Modelling, FFA, UWI

Presenters

- Ms Gabriela Sewdhan
- Mr Brandon Murphy
- Ms Megan Donovan

Thematic Presentation – Data, Information and Communication 1

Moderator – Dr Arlette Saint Ville | Lecturer, Dept. of Geography, FFA, UWI

Presenters

- Mr Travis Paul
- Mr Jeet Ramjattan
- Professor Gary Wayne Garcia
- Ms Roshni Sita Ramsingh

Thematic Presentation – Data, Information and Communication 2

Moderator – Dr Selby Nichols | Deputy Dean, Graduate Studies & Research, FFA, UWI

Presenters

- Prof Wayne Ganpat
- Mr Andre John
- Dr Jeanelle Joseph
- Ms Stacey-Marie Syne

Rapporteur: Ms Tharā Gabriel

No. of Participants: 300

EXECUTIVE SUMMARY

The University the West Indies Centennial Legacy Celebration of Agriculture at the St. Augustine Campus was epitomized by the Faculty of Food and Agriculture's Virtual Conference entitled "*Celebrating a Hundred Years of Agricultural Innovation: Perspectives on Tropical Food and **Agriculture Systems***". This Conference was specifically geared toward highlighting areas which have impacted and shaped the Agri-Food Systems and related sectors in the Caribbean and the world. This was accomplished by facilitating 26 presentations under 4 thematic areas as follows:

- Innovative Agriculture for Sustainable Food Security
- Disaster Risk Management and Climate Resilient Agriculture
- Data, Information and Communication Technology
- Enhancing Life and Livelihoods in Agriculture

The Conference attracted a total of 300 registrants from the Caribbean, USA, Canada, South America and Europe, including stakeholders from state agencies, the private sector, community-based organizations, non-governmental organizations, academic institutions, regional and international organizations, as well as agricultural students, practitioners and researchers. Participants numbered at 160 persons on Day 1 and remained at approximately 100 for the duration of the conference.

As the convenor of the Conference, joint chairs were elected from within the FFA; namely Dr Ronald Roopnarine, (Lecturer in Disaster Risk Resilience/ Network Manager of Caribbean WaterNet) and Dr Gaius Eudoxie (Lecturer in Soil Science and Deputy Dean of Outreach). Opening remarks were brought by Dr Mark Wuddivira, Dean, FFA. The keynote speakers on Days 1 and 2, respectively, were Dr Renata Clarke, Sub-Regional Coordinator for the Caribbean, FAO; and Dr Shakuntala Haraksingh-Thilsted, Global Lead for Nutrition and Public Health, WorldFish. Session moderators were chosen from the FAO, FFA and CARICOM Secretariat. Graphic Recorders were sponsored by GWP-C, and Conference Rapporteur, by Caribbean WaterNet. The full profiles of keynote speakers, FAO presenters, chairs and moderators, and the Conference agenda are available on the conference website at <https://sta.uwi.edu/ffa/ffa-conferences>.

PROCEEDINGS | DAY 1

Welcome – Dr Ronald Roopnarine

Dr Ronald Roopnarine welcomed all participants to the inaugural virtual conference noting its unique and unprecedented nature necessitated by the on-going COVID-19 pandemic, while observing the benefits of a virtual forum as a more comprehensive and inclusive process. Highlighting the increased vulnerabilities of global populations, especially the challenges of Small Island Developing States (SIDS), he emphasized the need to develop effective, sustainable resilience particularly within the agricultural sector.



The Conference celebrated the culmination of 100 years of excellence in teaching, learning, research and innovation, from the establishment of the Imperial College of Tropical Agriculture (ICTA) in 1921, to the modern FFA and by extension, the esteemed institution, the UWI St. Augustine Campus. Building on the achievement of the last century, the conference showcased a wide range of research activities from regional and international researchers. Dr Roopnarine urged participants to use these advancements as a launchpad for increased future engagement, innovation and productivity within the field.

Opening Remarks – Dr Mark Wuddivira

Dean of the FFA, Dr Mark Wuddivira brought opening remarks expressing his excitement and confidence that the Conference would “yield rewarding outcomes and establish enduring relationships and collaborations”. He marked 2021 as an important milestone in a history of excellence and agri-environmental legacy. The FFA has had a major impact on societal transformation through capacity and community building within the field of agriculture. As a highly ranked foundational institution for myriad global scientists, researchers, educators, innovators, entrepreneurs, leaders, and a Nobel

Prize winner, the Faculty is positioned to continue its distinguished work well into the future.

Dr Wuddivira declared the Conference officially open, with an aim to “share scientific data and research experience to inform future research, development and decision making in Caribbean agriculture, food systems and related sectors; facilitate knowledge sharing among stakeholders; and enhance the effectiveness of academic research towards decision making, and policy development”.

Keynote Address – Dr Renata Clarke

Dr Renata Clarke's keynote address hearkened back to the recent UN Food Systems Summit and its overall determination that there is a need for more investment in research with a focus on developing new ideas, tools, approaches and solutions. These needs were compounded by a host of adverse statistics relating to the increasing global number of persons to feed, the lack of access to healthy diets, the need to increase food production and the high occurrence of greenhouse gas production attributed to the agricultural sector. Dr Clarke in her capacity as FAO Sub-Regional Coordinator for the Caribbean, stressed the need for a 'new agriculture paradigm' noting that innovation in agriculture was especially necessary in the Caribbean region. The importance of the youth perspective and a shift to community interest over self-interest were highlighted with regard to development and changing the way of thinking, planning and delivering on collective goals and objectives.



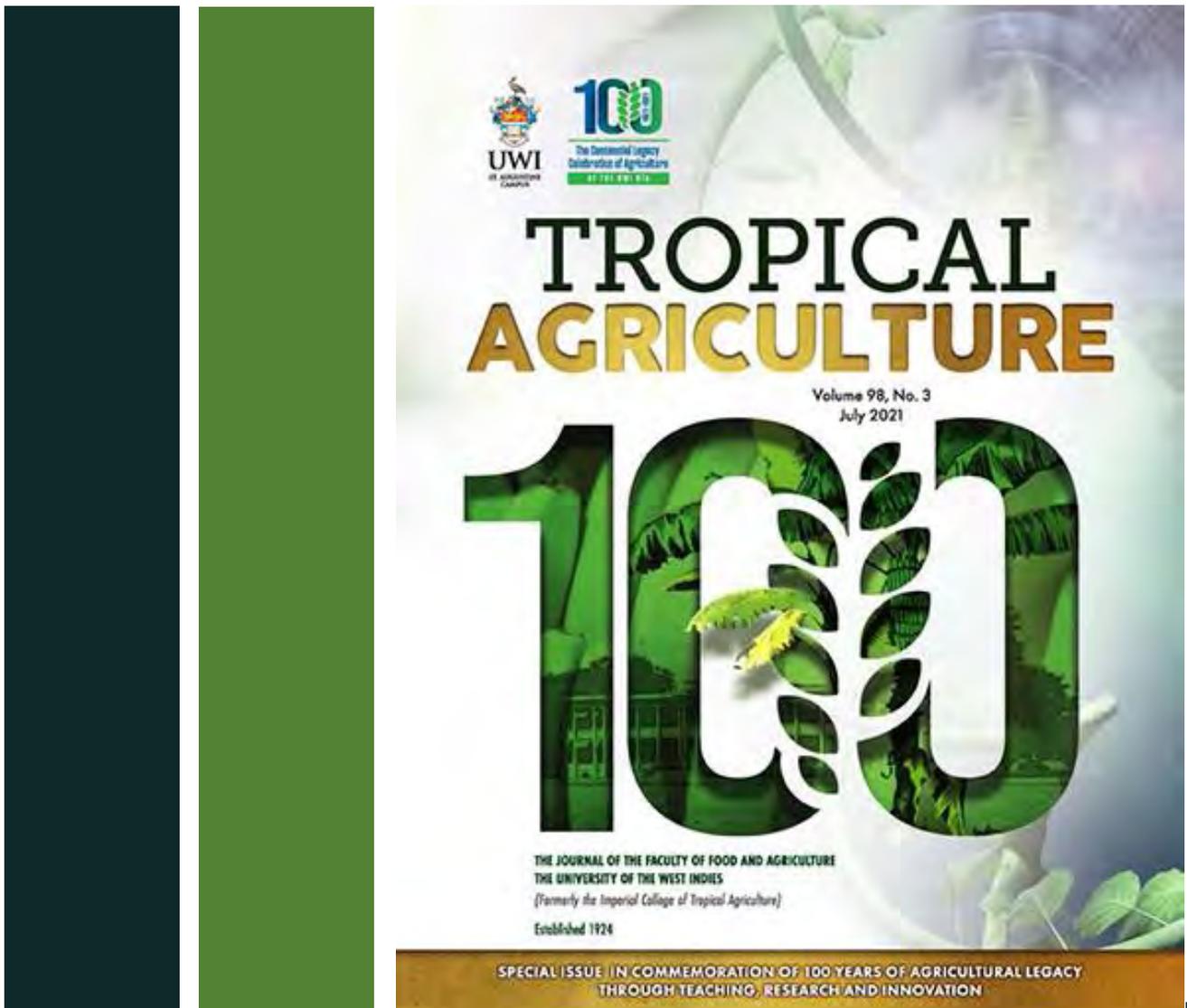
One of the major regional issues identified was the challenges faced by smallholder farmers and the resulting implications of their limited access to financing for investment, technology, extension services, insurance, and their impoverished status and ageing populations. This issue, in combination with increased water scarcity, land degradation and extreme weather, results in significant production loss and by extension a high dependency on imports within the sector. This presents further challenges for achieving regional food security as it hinders innovation and advancement, is directly affected by supply chain disruptions, and drives up the cost of a healthy diet in a region where it is already the highest in the world.

Dr Clarke called attention to the UWI's role in fostering regional leaders in agriculture, ensuring stakeholder interconnectivity in agricultural research to maintain relevance and effectiveness, and creating a culture of public awareness, understanding and collaboration, in achieving the goals and targets of regional institutions. Outlining the benefits of digitalization in agriculture, she also revealed the state of the digital divide and low technological accessibility within the region. In addition to a shift to decentralized and environmentally friendly agricultural practices, special consideration should not only be given to the benefits of innovation, but also all associated risks to ensure good governance. Dr Clarke concluded by saying "there is no doubt that transforming our food system here in the Caribbean is a social, environmental and economic imperative...we need to get off the sidelines and actively participate in determining the rules that govern our food systems".

Remarks – Mr Bruce Lauckner

As Editor-in-Chief, Mr Lauckner gave a brief historical overview of the Tropical Agriculture Journal from its founding in 1924 to the present, noting that the centennial anniversary of the Journal will be celebrated in 2024. As of 2021, the Journal is now open access with all 98 volumes currently available online; however only Volume 98 can be read by all. Volumes 1-97 still require payment to gain access to individual articles.

The third issue of 2021 was a special issue comprising a selection of the best papers from the last 98 years. He stressed that this issue uniquely showed a timeline of the progress in research and how agricultural practices have evolved. Mr Lauckner then called on all conference participants to submit papers for consideration and peer review, for a special issue carded for 2022 featuring papers from the centennial conference.



CELEBRATING 100 YEARS OF AGRICULTURAL RESEARCH AND INNOVATION

10-11 NOVEMBER 2021

OPENING CEREMONY



Dr. Ronald Roopnarine



Dr. Mark Wuddivira



Dr. Renata Clarke

THIS YEAR WE CELEBRATE TEACHING, LEARNING and INNOVATION!



COVID-19 EXPOSED VULNERABILITIES

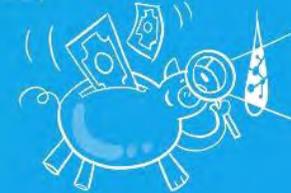
IDENTIFY, STRENGTHEN and PROMOTE COLLABORATION among ALL STAKEHOLDERS!



FOCUS on WHAT WE HAVE to DO NOW, and NOT on WHAT we HAVE DONE in the PAST



We NEED MORE INVESTMENT in RESEARCH!



"SUBMIT your PAPERS to the SPECIAL ISSUE of PAPERS here" (Mr. Bruce Lauckner)



ESTABLISH RELATIONSHIPS & COLLABORATIONS



EFFECTIVE GOVERNANCE of INNOVATION - THINK about RISKS!



We are CELEBRATING 100 YEARS of EXCELLENCE and COLLABORATION



Make the NEXT 100 YEARS MEMORABLE!



TO INFINITY and BEYOND!



We NEED to UNLEASH our POTENTIAL

WE NEED to PUSH LIKE CRAZIES!

TRANSFORM the WAY we have been THINKING

"THE WORLD NEEDS MORE THINKERS!" (Umberto ECO)



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FAO SESSION
INNOVATION IN AGRICULTURE

The joint moderators for this session on Insect Production as Animal Feed were Mr Reuben Robertson, FAO Representative, Trinidad and Tobago and Suriname; and Mr. Shaun Baugh, Programme Manager, Agriculture and Agro-Industrial Development, CARICOM Secretariat.

The session overview was conducted by Ms Daniela Battaglia, Livestock Production Officer, FAO. Her address was followed by thematic presentations from 6 panellists: Mr Damian Malins, Venturing Projects Director, and Dr Maureen Wakefield, Research Entomologist, Fera Science Ltd; Mr Tom van Ravensberg (CEO) and Mr Koen Volkers (CFO), Co-Founders of RavenFeed; Ms Wendy Lu McGill, Interim Executive Director, North American Coalition for Insect Agriculture (NACIA); and Mr Constantin Muraru, Communication and Research Manager, International Platform of Insects for Food and Feed.



The session was opened by Mr. Reuben Robertson who welcomed participants on behalf of FAO and drew reference to prominent research and statistics that amplified the importance of new feed solutions within the agricultural sector. He identified the nexus among the increasing demand for meat and fish products, the need to increase production and productivity of animal feed protein sources, and the resulting inimical consequences for food prices and the environment. One such alternative promoted by FAO which currently bears a high cost, but also a multiplicity of benefits and viable opportunities, is insect protein.

In her introductory address Ms Daniela Battaglia gave **“An Overview of the Technology and its Global Relevance”**. She began by highlighting the correlation between sustainable livestock production and circular agriculture, and the Sustainable Development Goals (SDGs) and objectives of the 2030 agenda. Livestock production is extremely important in achieving SDGs such as the eradication of hunger, poverty and climate crisis alleviation, with added cultural and social benefits. She posited that population growth, urbanization, poor lifestyle and eating habits, and depleting resources with increasing demand are all drivers of the need for sustainably produced animal feed.



While there exists major concerns such as high production costs, biological and chemical safety issues, animal and public health and welfare and legislative barriers, there are a number of benefits to the utilization of insects. The “six-legged livestock” are recognized as a potential solution. They present low food safety risks and provide increased nutritional, functional and environmental benefits, while

boasting a high protein content. Ms Battaglia further added that the low requirements of land, water and other resources throughout the process, alleviates the loss of biodiversity while supporting animal and human health. Statistics from Japan, South Korea and the European Union show that the use of insects to recycle and reuse food and other agricultural co-products, significantly reduces wastage and pollution.

Ms Battaglia ended by encouraging widespread collaboration among all associated stakeholders to boost awareness, engagement, research and development of safe and sustainable technologies and products. She stressed the need for internationally agreed standards and a strong legal foundation while reiterating FAO's commitment to facilitating knowledge sharing and capacity building to promote the development and adoption of insects as an alternative feed source.



Panellists from Fera Science Ltd. gave a presentation on “Opportunities and Challenges for Growth of Insect Production **(for Investors and Governments)**”. Mr Damian Malins explored the duality of research and business in rearing insects as animal feed. He stressed the need to change the way we produce and consume food, noting that there is not only sustainable value, but also commercial

value to be gained from the creation of economic opportunities. Fera Science Ltd has been engaged in the global industrialization of insect proteins in Europe, Asia, South America, USA and the Caribbean. They have also created an industrial bioreactor prototype facility; this facility can be scaled up or down to meet the specific needs of each region where entrepreneurs and researchers are adopting and adapting to offset dependencies within their respective feed sectors. Mr Malins introduced the use of the Black Soldier Fly as a prime example of an insect for feed production. Its versatility as a “biologically perfected engine” provides multiple applications for its use such as a source of bioplastics, sustainable organic, manure and fertilizer, as well as ongoing research into the use of larvae oils and chitin in the insect's exoskeleton.

Mr Malins went on to discuss the ease of commercialization from concept to pilot demonstrator as a seven-step journey which could be modified and contextualized to specified needs, but should also meet clearly defined international and national standards.



Dr Maureen Wakefield continued with insights into emerging research areas in insect production as animal feed. This included the areas of quality and safety, nutritional needs of insects as it relates to substrates, the development of new products, as well as entomology relating to insect processing and engineering. Dr Wakefield ended by stating that there are numerous research and collaborative opportunities available and invited the FFA researchers and all participants to take full advantage of these opportunities.



RavenFeed co-founders Tom Van Ravensberg and Koen Volkers gave a presentation entitled ***“Why we have engaged in insect rearing; why and how we are promoting modular approaches to the production on insects as a feed ingredient”***. Describing the collective current global challenges, they noted that more than one-third of food produced is being thrown away via means of incineration or composting which causes a loss in valuable energy and nutrition. Taking advantage of the “enormous opportunities insects offer as missing links in a food chain”, RavenFeed has developed a technical solution called Smart Edge which is essentially an insect factory in a container that can be deployed anywhere. This compact system includes patented breeding boxes and advanced climate and communication technology, and automated processes which provide efficient modular-based farming.

They gave an overview of its implications for use, the benefits of shortened supply chains and a sustainable, circular and safe operation which increases farmers' self-sufficiency and independence. These modules also offer great capacity yields as they are able to convert 20 tonnes of biological waste into more than 6 tons of larvae every month, with manure as an additional by-product. Prototypes are currently undergoing extensive testing in Belgium and the Netherlands. RavenFeed continues to improve their technology with input from their wide network of experts and advisors. As supply chain experts themselves, they continue to seek collaboration in creating sustainable and accessible technology which contributes to a circular industry and ultimately the realization of the SDGs.

Interim Executive Director of the North American Coalition for Insect Agriculture (NACIA), Ms Wendy Lu McGill, focused on “*Current trends in insect production as animal feed ingredient in NA and current issues (technical and political)*”. This presentation discussed the use of insects not only as animal feed and pet feed, but also the existence of a thriving market for insect ingredients within the US. There also exists a soil health market for insect manure being used in regenerative agricultural practices.



The two main species currently being used are the Black Soldier Fly and Mealworms, These insects are generally reared in climate-controlled indoor facilities governed by pest management best-practices and safety and biological controls. Ms. McGill stressed that end-use should be given special consideration throughout the process as it would be a determining factor in the choice of substrates used in insect rearing.

In the US there is a growing market for insect ingredients in both pet food and treats for dogs, cats and backyard chickens. Insect ingredients are also being utilized in the poultry, aquaculture and pig-rearing sectors. Although these ingredients have a high price parity with traditional ingredients, pricing and scale remain important factors influencing market entry.

Ms McGill concluded by stating that NACIA is currently engaged in research into insects as food for ruminants such as cattle, goat and sheep and how their probiotic effects decrease the need for antibiotics in animal agriculture. This research is also available in the Journal for Insects as Food and Feed accessible online.



Mr Constantin Muraru continued with a similar presentation on market trends within Europe in his presentation on “*Current trends in insect production as animal feed ingredient in Europe and current issues (technical and political)*”. Market trends and forecasts within the European Union (EU) show several developments such as an increase in food waste throughout Europe, but also an increase in production and the high growth potential within the sector. New insects have been approved for technical applications, and there has also been an increase in the quantities of substrates available. Insect agriculture has proven to be an extremely dynamic sector as can be seen in the recently launched International Platform of Insects for Food and Feed (IPIFF) document shown on the next page.

An overview of the European market of insects as feed



01 | Insect farming is a growing industry in Europe

The production of insects for animal feed¹ and pet food is growing rapidly across the world. In the European Union (EU), innovative businesses - newly established or previously active in biocontrol activities or the production of feed for niche markets² - diversified their operations by targeting the pet food market. Gradually, following the EU authorisation of insect processed animal proteins (PAPs) in aquaculture feed (i.e. July 2017), the aquafeed market became the main animal feed market for the producers of insects as feed.

In light of the recent discussions on the authorisation of insect PAPs for poultry and pig nutrition (April 2021), this factsheet presents an overview of the current status of the market for insects as feed and its forecasted growth by 2030. Concurrently, this document includes a couple of scenarios, which take into account recent projections published by reputable entities in the field of economic and modelling research³ - as well as a recently conducted survey which included the majority of the insects as feed operators active in Europe⁴.

Facts & figures



IPIFF insect as feed operators presently employ about **1 000 FTEs** and are active in more than 20 countries. The sector may generate **25 000 jobs** by 2030.



More than **1 billion euros** have been invested in this sector since its establishment - this figure is expected to reach **3 billion euros** until 2025.



The total turnover of insect feed operators is expected to exceed **2 billion euros** per year by the end of the decade.

The regulatory framework will facilitate the development of the insects as feed sector

With several thousand tonnes of insect PAPs produced in 2020, the production of insects for feed is expected to increase rapidly in the coming years. Building on the total investment raised by the mid-2020s, the sector may reach a total turnover of circa 2 billion euros/year by the end of the decade⁵. This growth will materialise following the construction of new facilities (1 - logistical considerations). Subsequently, the production capacity of the sector may also be increased thanks to new legislative developments (2 - regulatory context), as well as consumer readiness (3 - awareness raising).

1. In this document, 'animal feed' refers to feed for food-producing animals (i.e. aquaculture, poultry and bovine species).
 2. Such as zoo and circus animals, reptiles, wild birds, etc.
 3. No Longer Drawing, Insect Protein: So Close to Home in the 2020s - Pipersbank, 2021; EU Agricultural Outlook Report 2020-2030 - European Commission, 2020.
 4. In addition to the IPIFF feed operators active in Europe, four non-European IPIFF members contributed to this questionnaire. While the latter category represents insect economic interest in the EU market, most of their products are presently targeting the international market (i.e. non-EU/EEA countries).
 5. According to a report of Metabolic Research, the net worth of the insect sector may reach 9 billion USD by 2030.

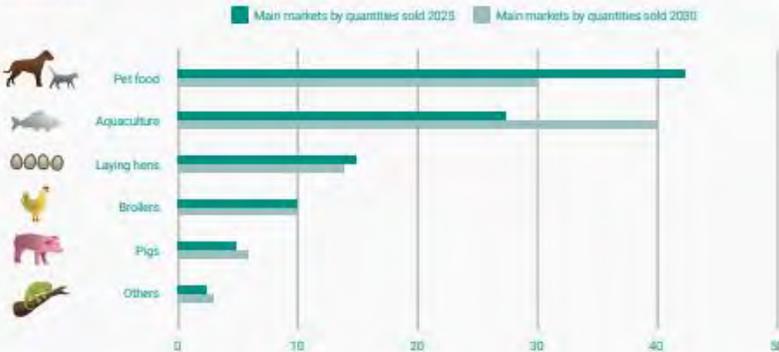
02 | Key economic figures

A. Main markets targeted by insect Feed Business Operators (FBOs)

The market of insects as feed is dynamic and depends on a series of factors. Among these, the regulatory context played an important role in the European Union. Notably, following the authorisation of insect PAPs in aquaculture, the aquafeed market became the main target for FBOs. According to IPIFF members, the authorisation of insect PAPs in poultry and pig feed will offer new opportunities - starting with the incorporation of such ingredient into the diet of such animals, the subsequent use of insects in organically farmed chicken and pigs, implicitly strengthening partnerships between insect and animal farms.

Such trends will also be stimulated by consumer choice (e.g. growing consumption of lower footprint animal-derived products, such as eggs, fish, chicken or pig), the growth of certain niche markets (e.g. free-range poultry, organic production value chains, etc.) The graph below indicates the expected growth of the main markets targeted by FBOs. In addition, this visual reflects a possible distribution of these markets by 2025 and 2030.

More specifically, by the middle of the decade, most of the demand for insect meal will lie in the pet food sector (circa 40-50% of the insect meal produced). Subsequently, the trend noticed after the authorisation of insect PAPs in aquaculture feed will continue - leading to a steady increase (reaching 25-35% in terms of share), stimulated by a growing demand for aquaculture products, such as carnivorous fish (e.g. trout, salmon). According to forecasts, the next relevant market for insects as feed operators in terms of quantities of insect meal sold will be the poultry (20-30%) and pig markets (5-15%) - that will see a rapid increase following the entry into force of the approval of insect PAPs this year.



By the end of the decade, new regulatory developments (e.g. authorisation of new substrates) are expected to play a key role in upscaling the production of insects and their derived ingredients - implicitly leading to a decrease in prices. However, the share of the different markets targeted by insect as feed operators presented in this visual may also depend on how the legislation will progress (e.g. which markets may open first - as mentioned in the section B **Production forecasts**). Such factors will make insect-derived products more attractive for certain markets: by 2030, the share of insect meal used in aquaculture is likely to surpass the pet food market (reaching 30-40% - in contrast to a slower increase of the pet food market, that will represent 30-35%). According to IPIFF members, the use of insect meal used in poultry and pig feed will increase gradually by 2030 - representing a similar market share to the one from 2025. While the poultry and pig markets are well established in the European Union, the quantities of insect-derived ingredients used in aquaculture also depends on how quickly EU fish-farming will be upscaled. This sector is expected to continue its rapid growth across the globe and the EU Commission indicated that its success may contribute to lowering the footprint of EU's food systems: 'Aquatic production should double and the use of feed from insects and algae should increase'⁶.

At the time when this document was drafted, it is worth noting that these forecasts reflect the current agri-food trends with respect to consumer demand (e.g. growing demand for lower-footprint meat products), relevant EU initiatives (e.g. Farm to Fork strategy, Organic Action Plan), as well as latest scientific and industrial developments (e.g. insect farming technologies, animal nutrition formulations).

⁶ Recipe for change: An agenda for a climate-smart and sustainable food system for a healthy Europe - European Commission, 2018.

Building on these developments, Mr Muraru indicated that the next steps should be stimulating investor interest, increasing the appetite in the field of alternative proteins, developing a robust regulatory framework to ensure certainty for investors. Cautioning that patience would be necessary as advancements evolved, he also stressed the need to provide guidance for small producers that detailed safety guidelines and good practices, which is also available on the IPIFF website. In conclusion, Mr Muraru noted that there are many factors determining how quickly the sector can and will be upscaled.

Subsequent to presentations, session Moderator Mr Robertson thanked the panellists for facilitating sensitization on the insect industry, value chains and opportunities for investment. He then shared a short summary of the presentations in a few key points as follows:

- Insect rearing is a viable option to develop an alternative protein source for feed.
- Current trends show an increase in both small and large scale commercialization within the private sector.
- There is a need for joint partnership between governments and the private sector.
- There are different types of substrates and species in, and approaches to insect rearing.
- Policies and sound legislative frameworks must be established to ensure standards, best practices and govern operations and use.
- Technical assistance and capacity building initiatives are needed to assist entrepreneurs in maximizing the insect value chain.

An extremely interactive question and answer session followed, moderated by Mr Shaun Baugh who encouraged participants to be innovative and provocative in their thinking. He noted that the Caribbean region is often described as the place where ideas come to die and to avoid this, there is a need for boldness and change in regional thought processes. He noted that conversation is key in building partnerships and opportunities for new businesses, promoting sustainability within a circular economy and improving food security. The highlights of this session are demonstrated in the graphic on the next page.



CELEBRATING 100 YEARS OF AGRICULTURAL RESEARCH AND INNOVATION

10-11 NOVEMBER 2021

FAO SESSION: INNOVATION IN AGRICULTURE

THE USE OF INSECTS AS ANIMAL FEED SOURCE

REMEMBER the IMPORTANCE of the LIVESTOCK CONTRIBUTION AROUND the WORLD

WE NEED MORE AWARENESS, ENGAGEMENT & RESEARCH in ALTERNATIVE USE of INSECTS as FOOD SOURCE

NEED of CONTINUOUS DIALOGUE with the EUROPEAN INSTITUTIONS

PRODUCTS MADE from BSFL:

- PROTEIN MEAL
- LARVAE OIL
- BIOFERTILIZERS
- CHITIN / CHITOSAN

SUSTAINABLE AGRICULTURE

LIVESTOCK GROWTH INCREASES the PRESSURE on CLIMATE CHANGE & SUSTAINABILITY

LIVESTOCK has a HIGH ENVIRONMENTAL IMPACT!

THERE is a BUSINESS OPPORTUNITY to CREATE VALUE!

THE INSECT PROTEIN is ONE of the KEY DRIVERS in the CREATION of NUTRITIOUS PRODUCTS

ATTRACT and CONVINCE INVESTORS in the ALTERNATIVE USES of INSECTS!

INVESTORS NEED CERTAINTY!

1/3 of the WORLD FOOD is WASTED ANNUALLY

BIO-PRODUCTS + WASTE = OPPORTUNITY

SILK WORMS APPROVED in EUROPE for FOOD PRODUCTION!

CHALLENGE: PRICE PARITY with other PRODUCTS

SETTING NEW INDUSTRY STANDARDS: BLACK SOLDIER FLY!

EXCELLENCE with COOPERATIVE ENTREPRENEURSHIP

DEFINE the NUTRITIOUS BENEFITS of EACH INSECT SOURCE

INSECTS are the MISSING LINK in our FOOD CHAIN

HAVE PATIENCE!

PET FOOD INDUSTRY - a GROWING MARKET for INSECT INGREDIENTS

PUSH the BOUNDARIES of WHAT can be DONE with INSECTS!

UWI ST. AUGUSTINE CAMPUS

100 The Centennial Legacy Celebration of Agriculture AT THE UWI ST. AUGUSTINE

FAO Food and Agriculture Organization of the United Nations

Global Water Partnership Caribbean

WaterNet

VISUALS BY IULIA ZOLOTCOV FOR VISUALITY @VISUALITYEU

CELEBRATING 100 YEARS OF AGRICULTURAL RESEARCH AND INNOVATION

10-11 NOVEMBER 2021

FAO SESSION: INNOVATION IN AGRICULTURE Q&A

USE SCIENTIFIC EVIDENCE!

IS IT SAFE for US as HUMANS?

YES IT IS!

NASA RECENTLY ADDED INSECT SOURCED MEALS to their FLIGHT MENU

USE SCIENTIFIC EVIDENCE!

FARMERS and FOOD MANUFACTURERS SHOULD RAISE AWARENESS and BE TRANSPARENT!

IMPROVE CONSUMER AWARENESS

ENGAGE with the LOCAL COMMUNITY

ENVIRONMENTAL BENEFITS!

NUTRITIOUS BENEFITS!

REGULATIONS EXIST to CREATE CONFIDENCE

INSECT FARMERS SHOULD ADAPT to the INCREASING MARKET NEEDS:

THE GREATER VALUE - THE GREATER ATTRACTION to the MARKET!

TAKE CARE of the ANIMAL HEALTH!

ENGAGE with the CELEBRITY CHEFS to RAISE AWARENESS

SHOP

UWI ST ALBERTINE CAMPUS

100 YEARS OF AGRICULTURAL RESEARCH AND INNOVATION

The Commercial Legacy Organization of Agriculture

Food and Agriculture Organization of the United Nations

Global Water Partnership Co-MoU

WaterNet

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INNOVATIVE AGRICULTURE FOR SUSTAINABLE FOOD AND NUTRITION SECURITY 1

Moderated by
Prof Duraisamy Saravanakumar



Mr Michael Gloster: Leaf Area Index and Light Interception response to Canopy Level and Canopy Orientation of Juvenile Breadfruit (*Artocarpus altilis* Forsberg) Cultivars in Trinidad

Mr Gloster's presentation gave an overview of breadfruit and its status as a staple and major food source in the Caribbean. It also has enormous potential for addressing food and nutrition security; however utilisation remains low despite increased market demands. The main reason for this low utilization was identified as the way in which the crops are grown. Owing to the tree height, its canopy often shades other crops and there is high incidence of fruit loss due to farmers' inability to harvest fruit from the upper canopy.

MATERIALS AND METHODS

- A trial was conducted on 26, 18 months old juvenile breadfruit trees in a pure stand at University Field Station, Valsayn, Trinidad,
- Two factors: Canopy level -(L1- below canopy, L2 - middle canopy, and L3 – upper canopy)
 - Cultivar: Four seedless ('Ma'afala' (M), 'Yellow' (Y), 'Jamaican Macca' (JM), and 'White' (W) and one seeded ('Breadnut (BB) *Artocarpus camansi*)
- A completely randomised experimental design, with 12 readings at each canopy level per tree was used.
- Vegetative data: tree height(TH), canopy height(CH), canopy depth(CD), average canopy width(ACW), branch cluster number (BCN), primary branch number(PBN), and total leaf number(TLN) were collected on each tree.
- Data on leaf area index (LAI), percentage light interception (LI%), average above PAR (AAPAR) and below canopy PAR (ABPAR) were measured with an AccuPAR/LAI Ceptometer (Model LP-80) at each canopy level per tree in a north, east, south, and west orientation.
- Analysis of variance (ANOVA) General linear model, Tukey's pairwise comparison and Pearson's Correlation were used.



MCG

6

This sparked research into how different juvenile breadfruit cultivars respond and which factors may be adjusted to improve management and gain optimum efficiency from higher populations of shorter trees. These factors included cultivar selection, cropping systems, orchard management and tree population/plant arrangement, which had significant implications for light absorption, fruit production and overall productivity.

Mr Rakesh Bhukal: *Aquaponics an Innovative Solution to Food Security in SIDS: A Review of System Types and their Potential as Sustainable, Climate-smart Farming Techniques for the Caribbean*

Under the overarching theme of the need to improve both the quantity and quality of food production on a global scale, Mr Bhukal presented on Aquaponics as a sustainable solution for SIDS and Caribbean food security. There is currently a global decrease in world fisheries due to overfishing, pollution and climate change, while there is a simultaneous increase in demand.

Aquaponics, a combination of Aquaculture and Hydroponics, maximizes both the benefits and disadvantages of each type of system. While Aquaculture produces nutrient rich water that requires special and often costly disposal, Hydroponics requires that nutrient solutions be purchased for crops; therefore the symbiotic relationship in an Aquaponics system has been found to resolve inherent issues. This special relationship also allows for increased crop diversity.

Aquaponics is especially beneficial for Caribbean agriculture as the technology can be adapted for local conditions. As a soilless food production system utilising climate smart and resilient technology, it is not subject to climate issues.

Aquaponics Technology

- ❖ Satisfies the 3 pillars of CSA: food security, adaptation, and mitigation
- ❖ Excellent candidate for digital agriculture & AI applications

Advantages

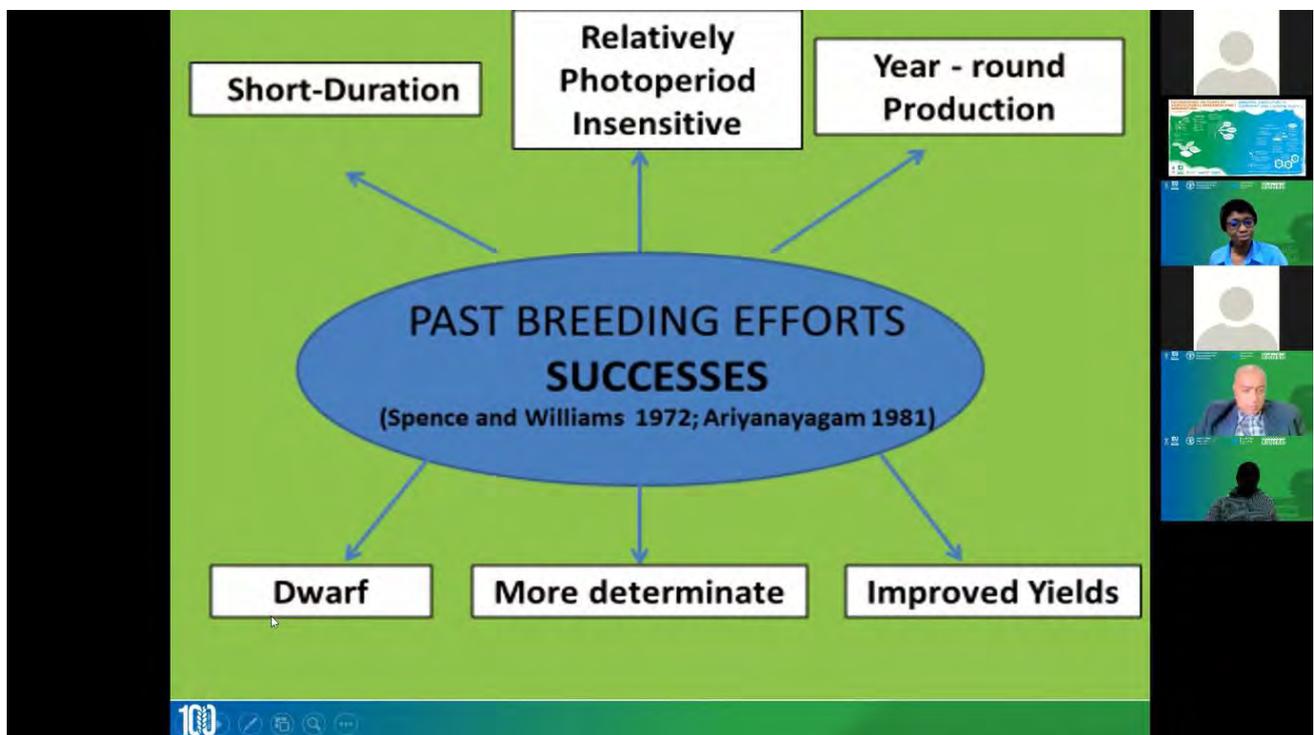
- Efficient
- Fast Growing
- Produces 2 crops instead of just one (Vegetables & “Fish”)
- Increasing demand for vegetables and fish for health reasons
- More crops in less space
 - *75% smaller footprint
- Less pests and weeds
- Less physical labor
 - *No weeding
- Less water than traditional farming (Precision farming)
- Produces significantly less waste than Aquaculture and Hydroponics



Dr Albertha Joseph Alexander: Relationship between Yield and Physical Quality Characteristics In Dwarf Vegetable Pigeon Peas

Pigeon peas is seen as a prominent, often seasonal vegetable in the Caribbean region. For this reason there were multiple Dwarf Pigeon pea breeding programmes which sought to provide a year-round supply of the crop. Dr Alexander's presentation explored past breeding efforts, the challenges which arose, and new research which aims to resolve these issues.

The main shortcomings of past efforts were related to unacceptable consumer quality traits as it related to seed size and number, and variable yields. There were however, significant benefits which set the foundation for continued research.



Dr Alexander's study found that seed size and number can be simultaneously improved without compromising yield in short duration pigeon pea, and proposed a new variety to replace the earlier bred varieties.

Mr Romano Macfarlane: **A Quantitative Analysis of Poultry Farms' Vulnerability to Avian Influenza in Trinidad, Republic of Trinidad and Tobago**

The poultry industry is one of the largest contributors to the Trinidad and Tobago economy; it is also seen as a major provider of employment nationally. An outbreak of Avian Influenza (AIV) would therefore be significantly devastating to the industry and by extension, the local economy. All aspects - conceptual (inherited situations), structural (farm structure) and operational (day-to-day management) biosecurity are therefore, integral to the success of the industry.

The objective of Mr Macfarlane's study was to determine the high risk areas and gaps in biosecurity within duck, layer and broiler farms throughout the country. This included the ability of poultry farms as it relates to Bio-exclusion (keeping pathogens out) and Biocontainment (keeping pathogens in). This study found that over 50% of farms in Trinidad were deemed vulnerable to AIV, especially in broiler farms geographically located in central and south areas. This raised the question of the overall vulnerability of the entire industry. Mr Macfarlane concluded with a series of recommendations to improve Biosecurity within the poultry industry.

Recommendations

1. Construction of poultry farms should be subject to necessary planning and approval as it relates to spatial selection and farm physical conformation.
2. Duck farms in particular should be monitored for diseases as the system of production provides opportunities for pathogens to be introduced and spread.
3. Farms located in Cluster 1* and Cluster 2* in particular should be monitored to maintain the best possible structural and operational biosecurity.
4. Quantitative vulnerability assessments should be adopted as a regular monitoring mechanism for poultry farms across Trinidad and high priority lists maintained for individual farms and geographic locations.



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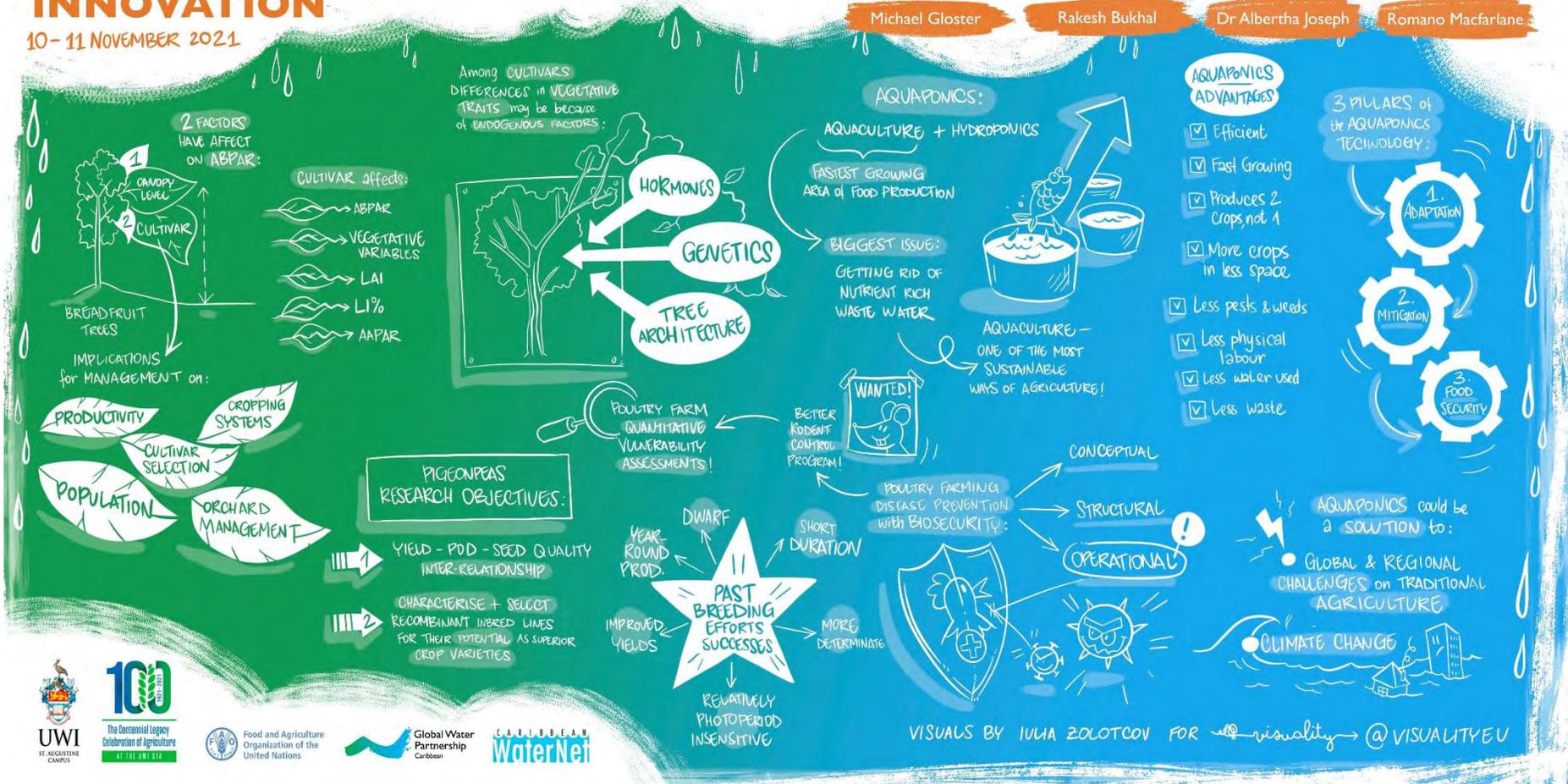
INNOVATIVE AGRICULTURE FOR SUSTAINABLE FOOD & NUTRITION SECURITY 1

Michael Gloster

Rakesh Bukhal

Dr Albertha Joseph

Romano Macfarlane



INNOVATIVE AGRICULTURE FOR SUSTAINABLE FOOD & NUTRITION SECURITY 2

Moderated by
Dr Lystra Fletcher-Paul



Mr Romano Macfarlane: An evaluation of Pet Shops in Trinidad, Republic of Trinidad and Tobago for the Introduction of Highly Pathogenic Avian Influenza

Following on from his first presentation on AIV, Mr Macfarlane delved into pet shops in Trinidad and how they can be the source of very large outbreaks of disease. This is because they are geographically dispersed and have multiple consumers handling animals and potentially becoming exposed to zoonotic diseases.

The study sought to analyse the existing protocols for acquisition, storage, care and sale of animal specimens; review the process for safety and the prevention of the introduction, transmission and spread of AIV; and review the institutional framework within which pet shops operate. It also identified the gaps between international best practices and local practices.

The results highlighted issues such as supplier illegitimacy; contraventions of international and local wildlife laws; a lack of health and safety planning as it relates to the use of personal protective equipment, inoculation for animal-related diseases, no emergency plans; little to no staff training in animal husbandry; and animal welfare issues relating to disease tracing and records management. Mr Macfarlane concluded that local pet shops are highly susceptible to the introduction of AIV.

Conclusion



- **Pet shops are vulnerable** to introduction of Avian Influenza
- **Best practices for acquisition and sale of animal specimens were not carried out by pet shops in Trinidad.**
- **It was found to be easy for diseases pathogens to be introduced, transmitted and spread of in pet shops.**
- **Lack of legislation and codes of practices for pet shops leaves the pet trade industry without clear guidelines and dedicated institutional oversight.**

Mr Romano Macfarlane: The Ability of the Poultry Surveillance Unit (PSU), Animal Production and Health Division, Ministry of Agriculture, Land and Fisheries to Achieve Early Detection of Avian Influenza Introduction into Trinidad

The final presentation relating to AIV dealt with the surveillance capacity of the arm of government responsible for early detection. Several issues were identified from the onset noting lack of surveillance as a major issue. Factors influencing this included lack of funding, external testing facilities with delayed results, incomprehensive surveillance and reporting due to organizational and staffing challenges and lack of technical capacity.

Introduction

Animal surveillance system

Components	Objectives	Resources
1. Data collection,	1. Free of disease	1. Human
2. Data analysis,	2. Early detection	2. Financial factors
3. Dissemination and	3. Measuring disease level	3. Logistical factors
4. Response	4. Discovering new cases.	4. Technical factors
		5. Stakeholders



100

In order to treat with these challenges and meet the requirements of a proper animal surveillance system in keeping with international obligations, Mr Macfarlane highlighted the need for data mining and statisticians, early warning systems, digital surveillance, cluster analyses and environmental modelling.

Concluding his presentation he underscored the need for legislative collaboration to combat the inevitable delay of early detection of AIV in Trinidad. The PSU should be made a stand-alone agency to improve flexibility to solve issues in a timely manner, and granted authority to enter into pet shops and large integrated farms for comprehensive surveillance.

Dr Omar Ali: Phytostimulatory Effects of Trinidadian Seaweeds in Tomato and Sweet Pepper

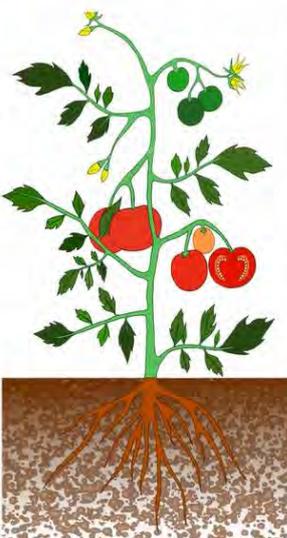
Dr Omar Ali presented on seaweeds (SWEs), an under-utilized bio-resource, as potential bio-stimulants in agriculture. This is especially applicable in the Caribbean region when considering the recent upsurge of sargassum affecting the tourism industry. It can also alleviate the overuse of toxic chemical pesticides in the agricultural sector.

This research was recognized and awarded the Environmental Management Agency (EMA) Green Leaf Award for Environmentally-Friendly Crop Production Methods.

The study found that SWEs are effective in promoting seedling vigour, increasing all plant growth parameters, increasing yield, and significantly reducing the incidence of disease when used in combination with a regular fungicide regime.

Dr Ali concluded that SWEs cause no direct effects when used as a bio-stimulant, but increase overall productivity when used with integrated treatments. They also provide a balanced trade-off between growth and defence. Further research is being done to determine additional uses and applications for SWEs.

Effects of SWE on plants



Plant physiology

- Starter effect for seedlings
- Increased chlorophyll content, photosynthetic rates & stomatal conductance
- Increased leaf numbers, plant height and vigour
- Higher flower numbers per plant
- Greater fruit set numbers per plant
- Prolonged flowering and bearing

Tolerance effects

- Priming effects for biotic (pests and microbial pathogens) and abiotic (salinity, drought, freeze) stress
- Improved resilience to transplantation shock

Microbial Restructuring

- Soil crumb structure & aeration improvements
- Increased α & β diversity in soil and root microbes
- *Rhizobium*, *Sphingomonas*, *Sphingobium* and *Brachyarthrobium* positively correlated with fruit yield
- *Mortierella* spp. positively correlated with fruit yield
- Increased enzymatic activity (hydrogenase, invertase, urease, proteinase, polyphenol oxidase & phosphatase)

Gene Regulation

- Increased synthesis of phytohormone genes (GA, IAA & CK)
- Modulation of defense signalling pathways (SA, JA & ET)
- Modulation of ABA mediated signalling
- Increased expression of flowering-related genes
- Increased expression of root transporter genes

Produce Quality

- Increased fruit weight and flesh thickness & firmness vibrant colour and higher mineral content
- Increased Vitamin C, TSS, total phenols, anthocyanins, total protein, fructose & sucrose
- Longer shelf life, minimized fruit browning post-harvest

Nutrient Acquisition

- Root structure alteration
- Efficient use of soil water
- Increase micro/macro mineral content in roots
- Rooting promotion in cuttings
- Increased nutrient use efficiency
- NPK uptake increase

Ali et al. 2021



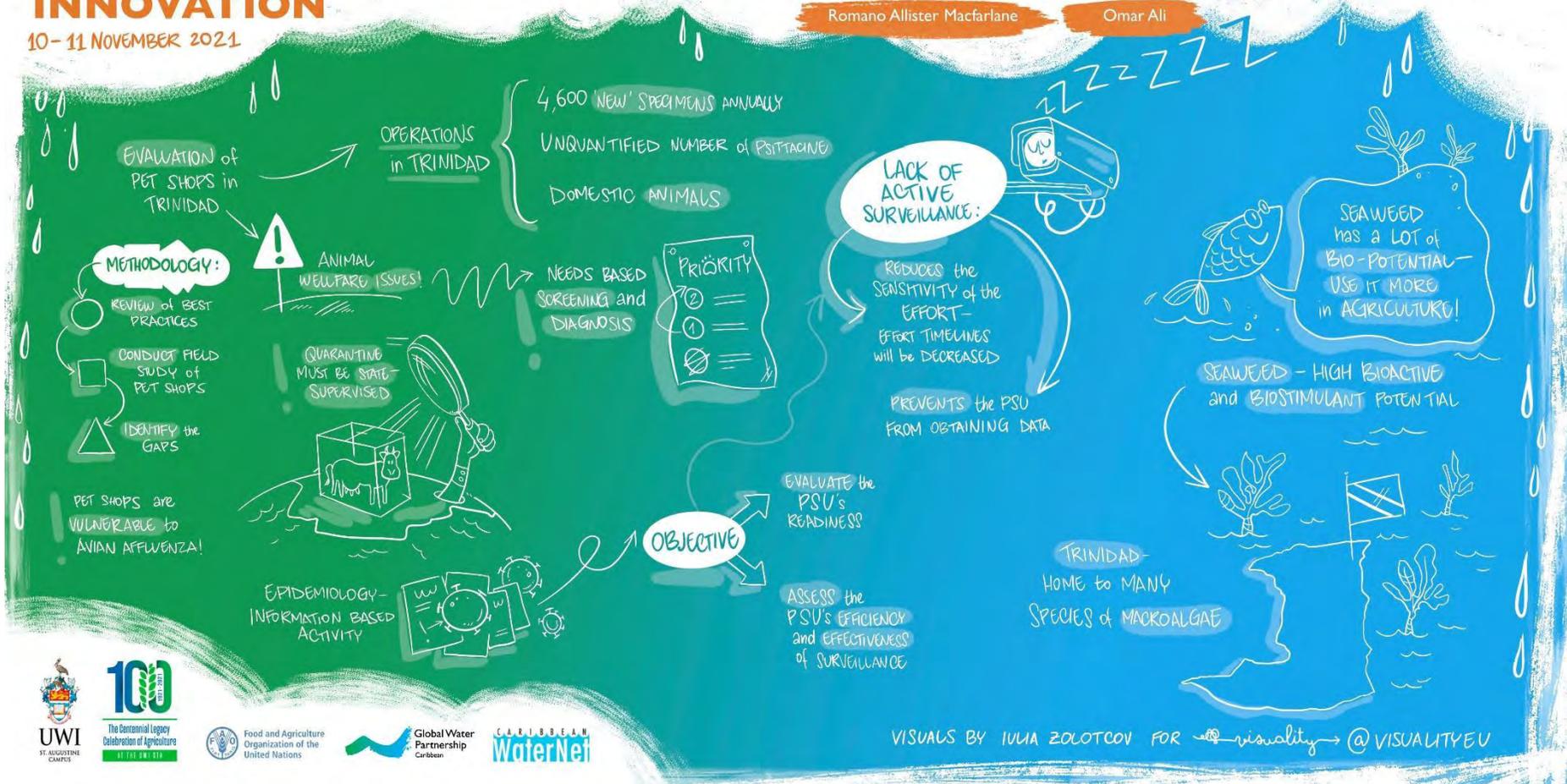
CELEBRATING 100 YEARS OF AGRICULTURAL RESEARCH AND INNOVATION

10-11 NOVEMBER 2021

INNOVATIVE AGRICULTURE FOR SUSTAINABLE FOOD & NUTRITION SECURITY 2

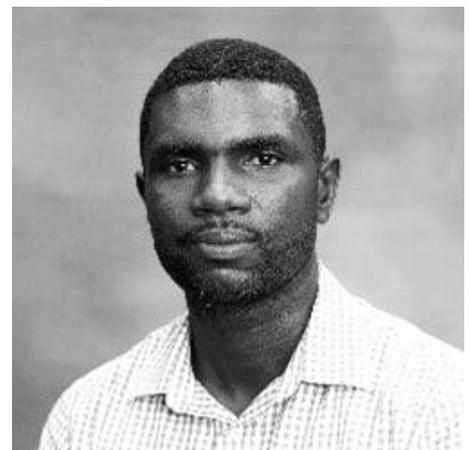
Romano Allister Macfarlane

Omar Ali



ENHANCING LIFE AND LIVELIHOODS IN AGRICULTURE

Moderated by
Dr Oral Daley



Mr Nkosi Felix: Competitive Analysis of Crops Cultivated in Plant Factories to Reduce Food Importation: Romaine Lettuce and Strawberries

Mr Nkosi Felix drew attention to the fact that the Caribbean region is plagued by the economic issue of rising import dependence, since more than half of Caribbean SIDS imported 80% of their food supply. This dependency is influenced by a variety of factors including regional crop production issues, increased burden on limited resources of land, water and capital, adverse effects of pests, diseases and unpredictable weather patterns. There is also an increase in the demand for non-native crops. The analysis conducted showed that Plant Factories are a viable option and potential solution to combat these challenges.

A competitive analysis of the production of two crops in two Caribbean countries (Antigua & Barbuda and the Bahamas) focused on energy consumption, the cost of production and the Nominal Protection Coefficient (NPC). This analysis revealed that by maximizing resource utilization and ensuring the efficient use of light, energy, water and temperature control, there are myriad benefits of plant factories in relation to regional food and nutrition security.

Conclusion

- Plant factory systems can be a **solution for food and nutrition security** in Trinidad and Tobago
 - Industry rates producer prices reduce: **TT\$7.75 (TT\$9.92)** and **TT\$31.20 (TT\$38.45)** for strawberries
 - **Greater bargaining power** along supply chain
- Further **competitiveness and resilience** through **Renewable Energy (RE)**



Dr Arlette Saint Ville: Photovoice Data Collection Method, Building Community-Based Nutrition Sensitive Value Chains and Healthy Moms in Nevis

The United Nations declared the years 2016 to 2025 as the Decade of Nutrition to elucidate the issues of under and over-nutrition. Under this theme Dr Arlette Saint Ville conducted research on building nutrition sensitive value chains within school-feeding programs, including all actors and activities from food production to consumption. The need to prioritize nutrition in value chains stemmed from regional statistics which reveal an ongoing pandemic of diet-related diseases and a consistent increase in obesity rates, especially in children. The data show that child overweight and obesity rates in 5-9 year olds are 2-3 times that of the world, and doubling every decade.

Dr Saint Ville's Photovoice project sought to identify actors and determine whether or not a more participatory approach can address concerns, influence messaging, and provide a forum for multi-stakeholder discussion on healthy eating within communities. The study found that among parents in the selected community, there was a lack of awareness of dietary quality (variety and diversity), moderation, balanced diets and cultural and historical influences.

What is Photovoice?

- A participatory action research method that fosters reflection and dialogue around unspoken and cultural practices.
- Employs photography and group dialogue to deepen community engagement
- Visual images and shared stories used as tools for advocacy and connect to decision-makers (Wang & Burris, 1994)



Concluding, she noted that there is a need to develop culturally sensitive messaging that could be used to communicate what healthy eating looks like, using a bottom-up, community-oriented approach with consideration for a gender-empowerment element. There should also be capacity building via training of community based nutrition advocates.

PROCEEDINGS | DAY 2

Day 2 began with a welcome from chair Dr Gaius Eudoxie followed by a summary of Day 1's proceedings by Dr Ronald Roopnarine. This was followed by the keynote address.

Keynote Address – Dr Shakuntala Haraksingh- Thilsted

Dr Thilsted's keynote address was set against the backdrop of COP 26 with a focus on the transformation of food systems in relation to land and water systems and current global narratives. The COVID-19 pandemic continues to expose the vulnerabilities of current food systems while increasing inequities and the displacement of vulnerable populations. An increase in poverty and global hunger has shown that there is a need for a more holistic food systems approach that includes all stakeholders.



A recurring message is being shared across all high-level platforms; there must be a drastic change in approaches, new coalitions to address crises, and a paradigm shift in focus to include food quality and safety, and nutrient composition.

Dr Thilsted identified 4 major challenges going forward: food and nutrition security, building climate resilience, enabling socio-economic equality and facilitating environmental protection and restoration. These challenges must be addressed with context-specific and culturally appropriate solutions.

2021-2030 has been identified as the UN Decade of Ocean Science for Sustainable Development. In keeping with this theme Dr Thilsted urged the UWI to strengthen engagements and as SIDS, drive research in ocean science and aquatic superfoods which offer multiple benefits and nutrients needed to combat the prevalent diet-related NCDs within the Caribbean region.

Dr Thilsted concluded with a resonating observation that we are only “9 harvests away from the SDG deadline”; this is an extremely short time to achieve identified goals. Therefore there must be increased collaboration both between universities, and within universities. Experts from various faculties and disciplines must come together to engage people and communities to create holistic and sustainable solutions for global food and nutrition security.

CELEBRATING 100 YEARS OF AGRICULTURAL RESEARCH AND INNOVATION

10-11 NOVEMBER 2021

OPENING CEREMONY



Dr. Gaius Eudoxie



Dr. Shakuntala Thilsted

PACKED DAY 2



LOOKING FORWARD TO YOUR INTERACTIONS TODAY!

A LOT OF ENGAGING DISCUSSIONS ON DAY 1!

PHOTOVOICE DATA COLLECTION! MORE RESEARCH!

AQUAPONICS

SEAWEED-BIOPOTENTIAL
INSECT FOOD!

WE NEED TO ADDRESS GLOBAL FOOD AND NUTRITION CRISIS!

DR. SHAKUNTALA THILSTED

FOCUS NOT ONLY ON FOOD PRODUCTION and QUANTITY BUT ALSO ON QUALITY and FOOD SAFETY

WE NEED TO USE THE POTENTIAL OF AQUATIC FOODS IN NUTRITION!



WE NEED TO USE SCIENTIFIC DATA, KNOWLEDGE and TECHNOLOGY!



PAST 2 YEARS HAVE SEEN A LOT OF CHANGES...

COVID-19 LEFT A LOT OF PEOPLE STARVING!



PRIORITIES:

1 NUTRITION SECURITY



2 CLIMATE RESILIENCE



3 SOCIAL & ECONOMICAL EQUALITY



4 FACILITATION OF ENVIRONMENTAL PROTECTION and RESTORATION



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DISASTER RISK MANAGEMENT AND CLIMATE RESILIENT AGRICULTURE

Moderated by
Dr Gabrielle Thongs



Ms Gabriela Sewdhan: Building Climate Resilient Agriculture Using Smart Vegetation Maps and Landscape Level Data in Small Island Developing States

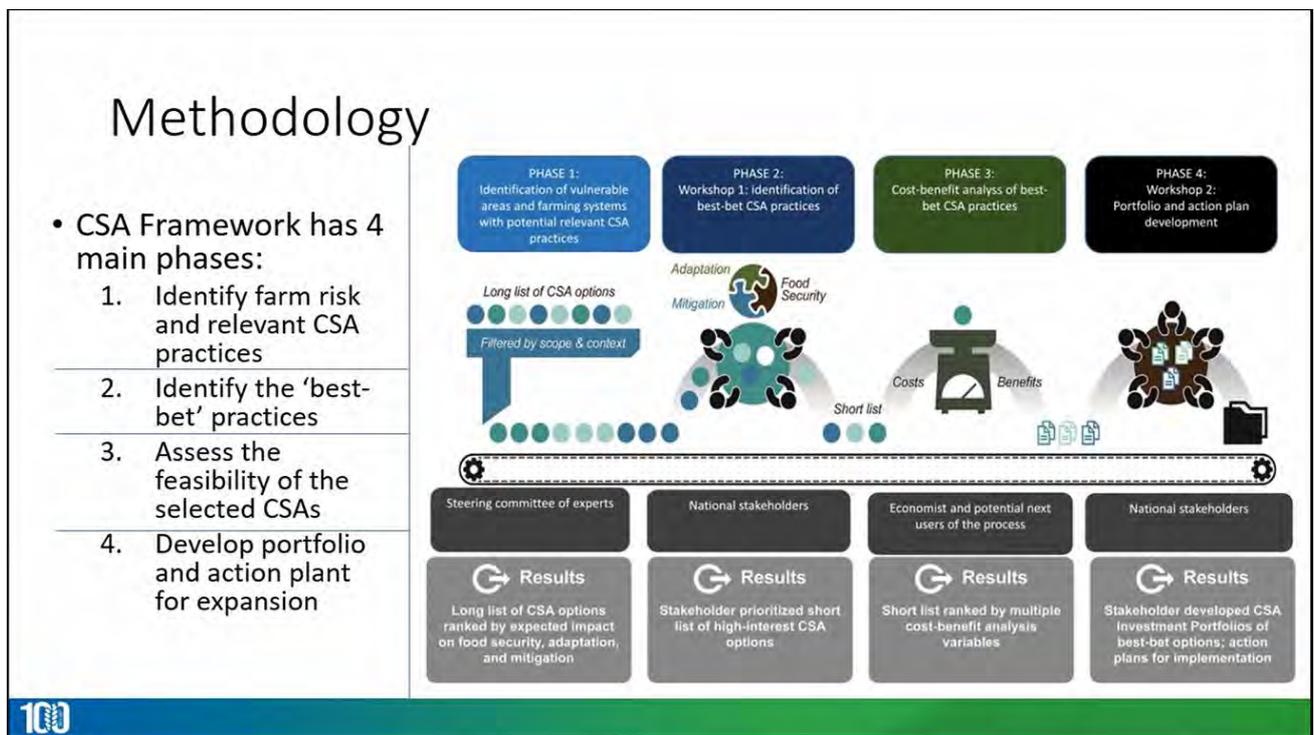
Ms Sewdhan began by identifying the various risks climate change poses for agriculture and indicated that machine learning and the use of artificial intelligence (AI) can positively contribute to resilience within the sector.

This research project was completed with a grant from National Geographic in collaboration with Microsoft to develop AI Farming Adaptation and Artificial Intelligence for Resilience (FAIR). This app provides real-time assessments of smallholder crops and soil health. It also serves as a detection, prediction, classification and monitoring tool to aid farmers and technical officers, optimizing efficiency in data collection and analysis, and contributing to improved overall farm management.



Mr Brandon Murphy: *Prioritizing Climate Smart Agriculture Practices in Trinidad: A Multistakeholder Approach*

The vulnerability of the agricultural sector is especially evident in SIDS as small scale farmers use production systems which are dependent on natural weather conditions. Climate Smart Agriculture (CSA) includes sustainable agricultural practices which consider context-specific solutions to reduce short term risks and increase long term resilience. Trinidad and Tobago is faced with multiple impacts and hazards relating to climate change including rising sea levels, increased flooding and unpredictability of weather conditions, hillside erosion and loss of coastal habitats.



Mr Murphy's research sought to identify local mainstream CSA practices and a framework that is replicable, flexible and applicable at various levels. The study gleaned an overview of farmer perception on climate proofing as it relates to soil health management, biodiversity management practices and water management. It was noted that the cost of implementation was a major factor in the adoption of CSA; farmers indicated preferences that CSA should be low-cost, have high climate-proofing capability, benefit the eco-system and provide some level of support or benefits from the government.

Ms Megan Donovan: Agricultural Water Resource Management in the U.S. Virgin Islands (USVI)

Ms Donovan's presentation covered water resource management in the USVI with a focus on the challenges farmers face in meeting irrigation needs. Research conducted showed that farmers were most concerned with the cost of irrigating (equipment purchase and repair, electricity/fuel and labour), a declining water supply (prolonged drought and unpredictable rainfall patterns), and water quality (damage to equipment, pollutants, and biological threats such as weeds and human pathogens).

Summative concerns



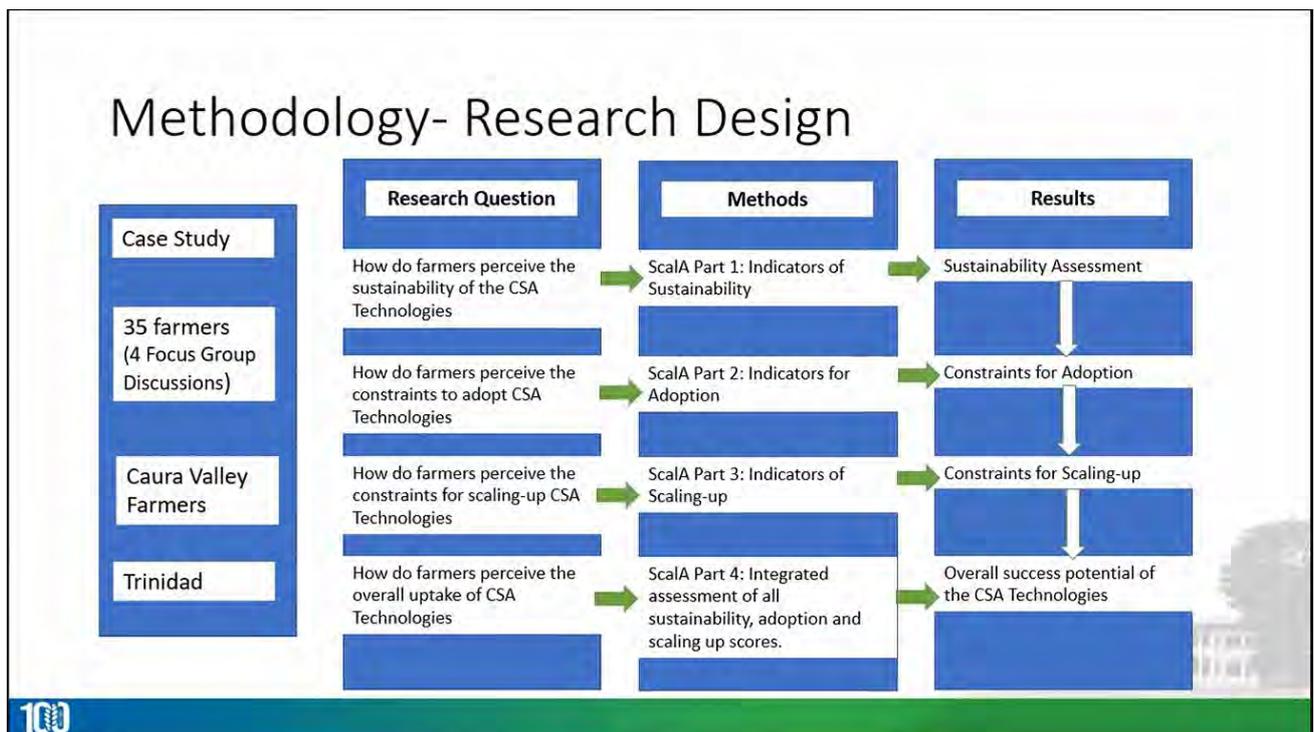
- **Water availability**
 - Declining water supply in the future
 - Cost of irrigating at the present time
 - Declining water supply at the present time
- **Water quality**
 - Biological threats coming onto farming operation
 - Sedimentation
 - Industrial pollutants coming onto farming operation
 - Clogging irrigation systems
 - Saltwater intrusion
 - Changes in the soil profile
- **Future irrigation research**
 - Increasing efficiency of irrigation
 - Development of farming practices to improve soil moisture retention



Ms Donovan concluded that there should be further surveys and sampling to ensure representativeness and inclusion of all regions. It was found that there are unique water resource needs within the USVI, and crops and concerns differed from those of farmers within the contiguous US, thus the USVI would benefit from tailored research and an entirely separate study.

Mr Brandon Murphy: Exploring Farmers Perception of CSA Technologies: A Case of Caura Farmers Trinidad

Mr Murphy's second presentation on CSA dealt with the perception of a specific subset of the farming community within Trinidad. Agriculture is indubitable responsible for high GHG emissions and CSA can offer mitigating solutions. However this study reveals farmers' perception on the sustainability and constraints of technologies used in CSA as it relates to efficient use of agriculture irrigation systems, integrated nutrient management and integrated pest management.



The overall farmer perception identified constraints such as a lack of funding and capital, limited access to credit and government subsidies, and limited technical knowledge and capacity. It was also noted that farmers must be able to see benefits before adopting CSA practices or scaling up. They must also have peer and community support.

Mr Murphy concluded that there is a need for public and private partnership to address issues relating to financing and capacity building in order to encourage and promote the adoption and scaling up of CSA practices in the local agricultural sector.

CELEBRATING 100 YEARS OF AGRICULTURAL RESEARCH AND INNOVATION

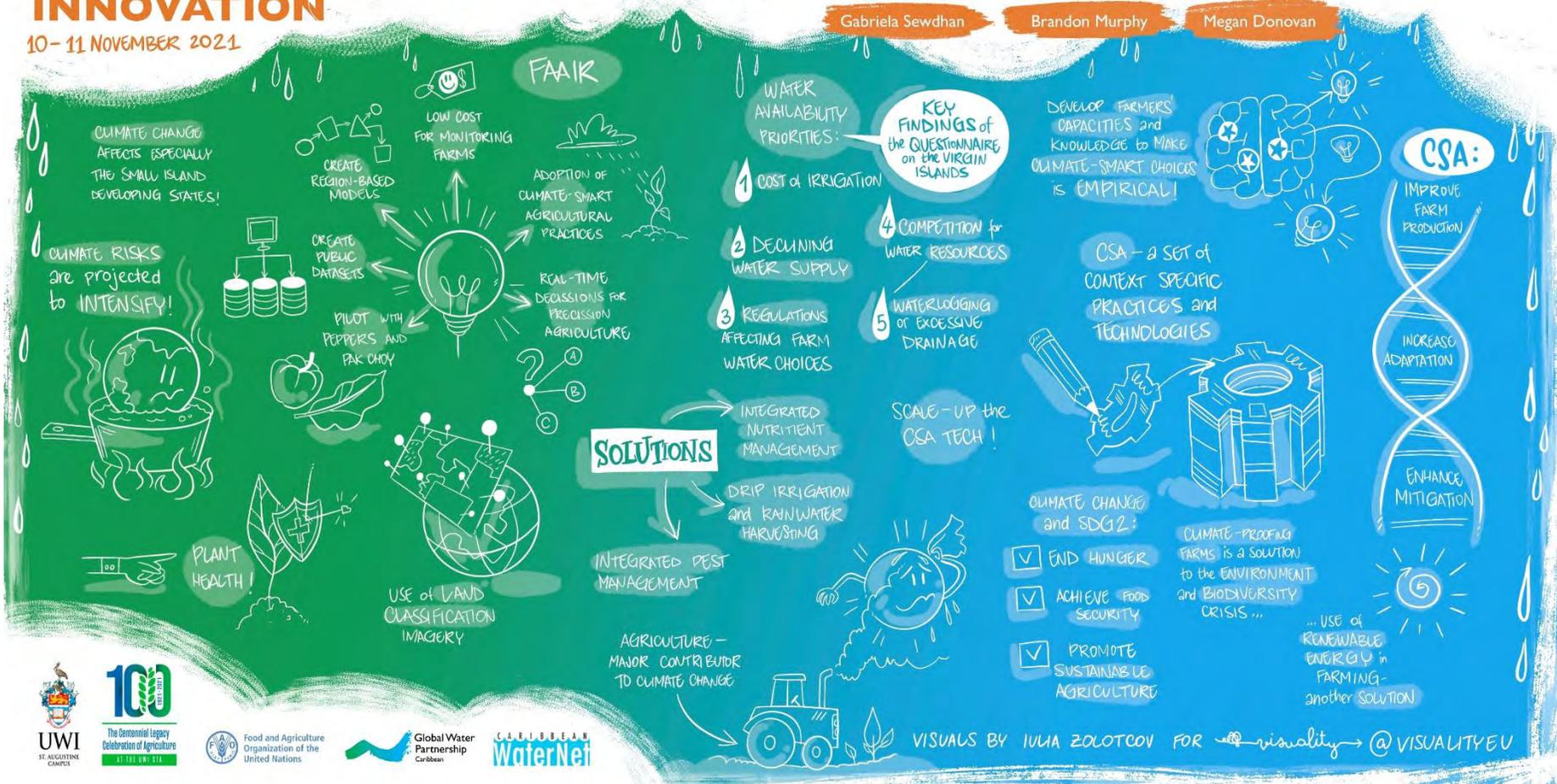
10-11 NOVEMBER 2021

DISASTER RISK MANAGEMENT AND CLIMATE RESILIENT AGRICULTURE

Gabriela Sewdhan

Brandon Murphy

Megan Donovan



VISUALS BY IULIA ZOLOTCOV FOR @visuality @VISUALITYEU

DATA, INFORMATION AND COMMUNICATION TECHNOLOGY 1

Moderated by
Dr Arlette Saint Ville



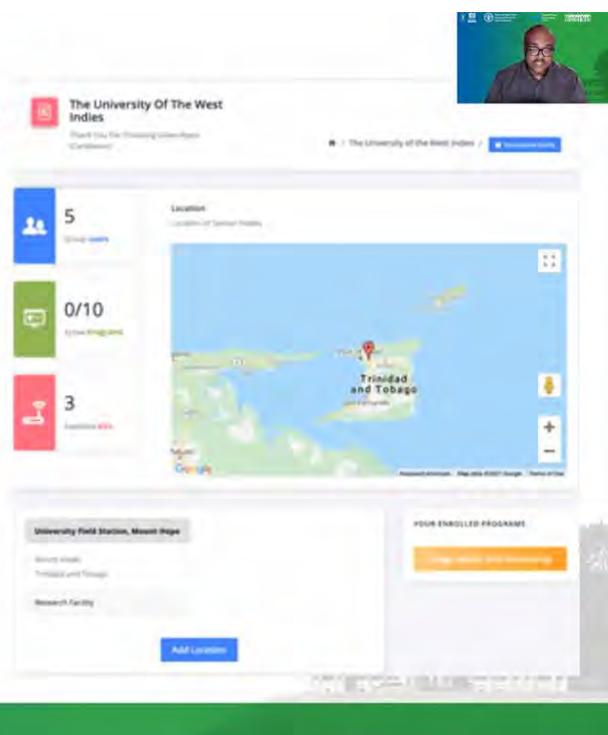
Mr Travis Paul: *Analytics in Agriculture: GreenAlysis System in a Dwarf Pomme Cythere (Spondias dulcis Parkinson) Orchard in Trinidad and Tobago*

Mr Travis Paul presented on a proprietary system known as GreenAlysis which is comprised of field sensors capturing data in real time and remitting to an online database where it can be easily accessed by multiple stakeholders in a user-friendly database.

These sensors capture information relating to wind speeds, temperature, GPS coordinates and relative humidity. The technology is easily installed and applicable for a variety of crops providing significant range and processing capabilities.

Methodology - Interface

- User friendly interface
- Sensors send data directly to database and results, locations are shown online
- Ability to manage teams and facilities



Mr Paul concluded by demonstrating the multiplicity of benefits provided by this system. It can be used as a forum for collaborative discussion and resolving issues. The captured data are visible to researchers, farmers, technical officers and all interested stakeholders on a global scale, from any web-enabled device. This platform also provides opportunities for networking, improved farm management and even a facility for training for students and researchers.

Mr Jeet Ramjattan: Social Media for Augmenting Virtual Communities of Practices Among Agricultural Extension and Advisory Professionals.

Over the past few years there has been a rapid development in ICTs and social media platform use with a visible shift to digital transformation, catalysed by the COVID-19 pandemic. Within Trinidad and Tobago, 2019 data revealed that internet penetration has shown a 76% increase in both rural and urban areas.

This research study was aimed at assessing social media adoption and identifying Communities of Practice (CoPs) on the various mainstream platforms. These CoPs share concerns, debate on relevant topics and pertinent cultural issues and are classified in 5 categories namely; public, private, farmers associations, non-profit organizations, and research and educational institutions.

Mr Ramjattan noted that there are various complexities in traditional extension systems surrounding funding and a low extension officer to farmer ratio. There is also a research gap in how social media is being used and mis-used within the sector. This study characterized and analysed use collecting data over a 3 year period. He concluded that although there has been a drastic increase in use of, and engagement on social media, there is still a need to build capacity of content creators, administrators and page curators.

Conclusion



This study concluded

- **Social media use within CoPs is critical for sharing, learning, and networking possibilities between resource extension personnel and clientele**
- **Agricultural CoPs are building communities using a variety of communication and media strategies, such as crowdsourcing, promotion, networking, and marketing**
- **The social media networking tools Facebook and WhatsApp enable online exchanges and engagements which provide support among various agricultural COPs**
- **Social media engagement levels vary according to the type of content, form of media and communication strategies used**

Professor Gary Wayne Garcia: An Historical, Biographical, Social and Disciplinary Account of the Contribution of ICTA-UWI Agriculture (1921 to 2021) to the Caribbean and World Food and Agriculture

Professor Garcia's presentation gave an original, extremely detailed and comprehensive analysis of the historical, political and socio-economic circumstances surrounding the evolution of the institution from 1921 to 2021. This paper was divided into 3 phases; 1921-1950, 1951-1990, and 1991-2021. It also showcased scientists and their contributions towards the different agricultural disciplines.

Why was the Imperial College of Tropical Agriculture [ICTA] established in the British Colony of Trinidad?



Ragbir and Duncan (2015), Gianetti (1974) and Hutchinson (1974) have given a detailed explanations of this.

In a nutshell however, it was because, the Trinidad colony and the **Plantation owners therein were willing to give the land and financial resources to establish the institution.**

It was Sir Norman Lamont, owner of the Palmiste Estate in Trinidad, who in 1902 first called attention to the need for establishing an Agricultural College within the Tropics.

The result was that Trinidad offered the land at St Augustine and the local planters raised 50,000 pounds sterling as the capital contribution for the building (Gianetti, 1974).

The colony had an expanding crop plantation agriculture base, had an abundance of available land, railway and port infrastructure, oil that was important to Britain during the First World War, and Trinidad was a gateway to South America.



Prof Garcia concluded by noting a redevelopment and a return to the original aim of the ICTA, noting the need to reinvigorate agricultural interest suited to and conceptualized for the type of farms and farming methods prevalent throughout the Caribbean.

Ms Roshni Sita Ramsingh: A Virtual Transplant: Moving Plant Clinics from Face to Face to Online – The Extension Training and Information Services Division of Trinidad and Tobago Experience

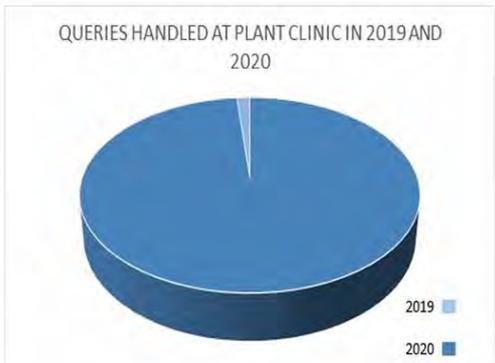
Plant Clinics were established in Trinidad and Tobago through an international initiative by the Centre for Agriculture and Biosciences International (CABI). In 2011, the first face-to-face plant clinics were conducted with the aim to create a central database on national plant health issues; provide impartial plant management advice to farmers; and provide services to householders and kitchen gardeners.

The Division facilitated 3 aspects of the clinics namely, diagnosis, prescription and the organization and management. Initially, there was a high level of engagement and use, but this quickly dwindled leading to a waste of time and resources. The advent of the COVID-19 pandemic and related lockdowns and restrictions, forced the division to “transplant” the virtual clinics to an online forum which drastically increased engagement as shown below.

RESULTS

- **In the year 2019**
 - 10 Face to face clinics
 - Dealt with 30 queries
 - Reached 30 persons

- **September 2020 to September 2021**
 - 25 Virtual Plant clinics
 - Dealt with 900 queries
 - Reached 104 122 persons



QUERIES HANDLED AT PLANT CLINIC IN 2019 AND 2020



Ms. Ramsingh concluded that overall, there were less constraints with the virtual clinics. The information was more widely accessible by multiple stakeholders, and the Division was able to give more holistic diagnoses using uploaded pictures of the entire plant and its surrounding environment. However, she noted that there was still a real need to develop technical capacity and ICT infrastructure within the Division and the wider Ministry. Virtual plant clinics continue to be held every Wednesday at noon via Facebook.

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DATA, INFORMATION AND COMMUNICATION - PT. 1

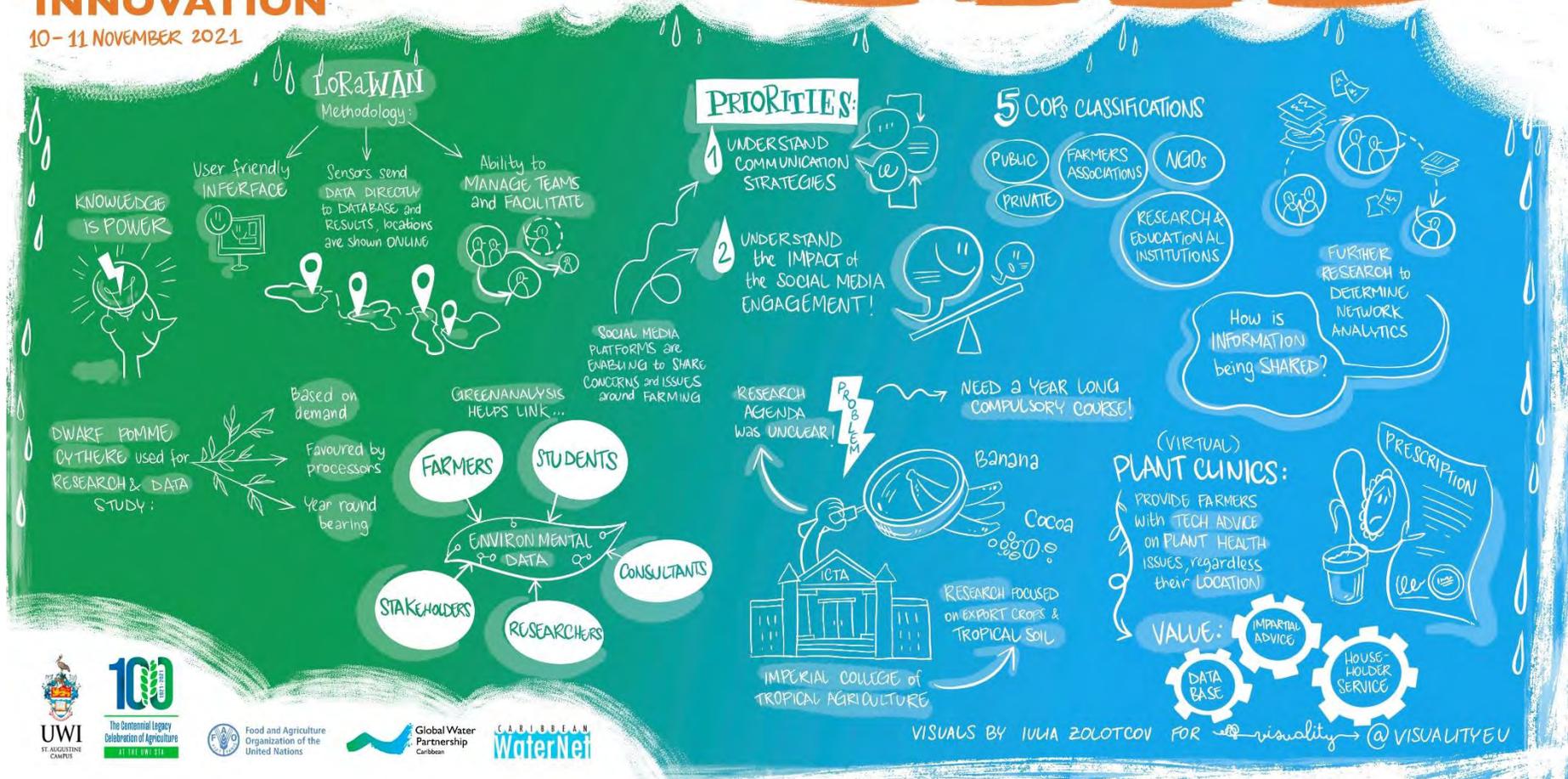
Travis G. Paul

Jeet Ramjattan

Prof Gary Garcia

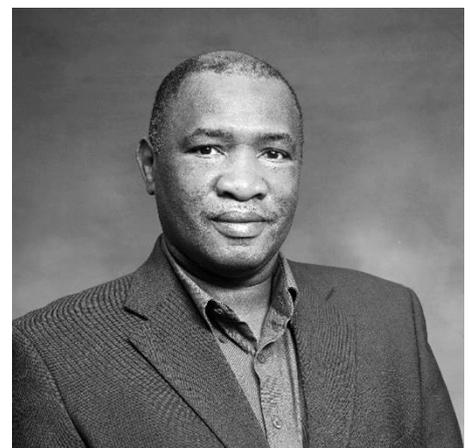
Roshni Sita Ramsingh

PT. 1



DATA, INFORMATION AND COMMUNICATION TECHNOLOGY 2

Moderated by
Dr Selby Nichols



Mr Andre John: Assessment of Risk Communication: Mitigation of Contamination of Fruits and Vegetables due to Flooding in Plum Mitan Sangre Grande, Trinidad and Tobago

As a hydroclimatic disaster affecting the Caribbean region, flooding increases risk exposure to chemical and biological contamination of fruits and vegetables. This contamination is then manifested as food-borne illnesses through human consumption of raw vegetables.

Mr John's research sought to investigate the role and current state of risk communication within an area considered to be "The Nation's Food Basket" and the second largest locale of fruits and vegetables. Additionally, this region is also prone to flooding and experienced adverse effects from the 2018 Flood Disaster. The study identified the current risk communication methods, the duties and responsibilities of agencies and ministries, and gaps and overlaps of roles and duties among these agencies. It also highlighted stakeholders' disposition on the current risk communication framework, as well as farmers' disposition on the severity of food-borne risk associated with floods.

Statistics showed that 2 out of 5 farmers salvage produce from flood waters for economic reasons while some utilised surface water after floods. Farmers also overlooked risks due to lack of experience with disease outbreaks, lack of surveillance and community officers.

Interview Results

Job Title	Challenges
Extension Officer	No food safety, crisis communication programme developed → depends on the officer to develop his or her own approach; no clear guidelines to treat with such. Extension officers can only advise farmers not to sell produce after flooding based on state law and policy
NAMDEVCO Field Officer	1) Field officers to conduct field visits frequently 2) Inactive Plum Mitans farmers group; getting information to all farmers is tedious/ inefficient
Agriculture Assistant 3	Farmers overlook risk , few sell produce that came in contact with flood water. No experience in disease outbreaks nor and factories remotely around the area. No community officer - fire control;/slash and burn activities. State pumps Maintenance
Technical Assistant	Cleanup efforts are untimely ; flood severity remains the same. Traditional Communication ; not as effective as field visits.

Mr John recommended the development of a Plum Mitan Lab to assess food safety and quality, more manpower, lectures and workshops providing training, and an active farmers group using an integrated communication framework with a participatory approach.

Dr Jeanelle Joseph: *Digitalization of Caribbean Extension: Regional Perspectives, Challenges and Opportunities*

Dr Joseph's presentation stressed the importance of extension and advisory services and the critical role which they hold in Caribbean agriculture. While internet usage is considered high in the region, there has been a surge in the use of video conferencing tools, social media platforms, and live chats since the beginning of the pandemic. The study also showed that digital transformation policy is written into Ministries, but there is still a need for the policy to be operationalized.

Country	Population	Digital Penetration
Anguilla	15,117	90%
Antigua & Barbuda	98,731	81%
Bahamas	393,913	86%
Barbados	287,711	82%
Dominica	72,167	72%
Grenada	113,021	66%
Haiti	11,541,685	32%
Jamaica	2,973,463	54%
St. Kitts & Nevis	53,544	85%
St. Lucia	184,400	78%
St. Vincent & The Grenadines	111,263	71%
Trinidad & Tobago	1,403,375	77%

Source: Internet World Stats, November 10, 2021

Some of the challenges identified during the research were limited ICT literacy, the digital divide (access to mobile networks and devices), digital readiness and willingness on the part of farmers and extension officers, connectivity issues and funding.

Dr Joseph concluded that there should be a rebranding and repositioning of extension as trending perspectives show little to no confidence in extension and related services. Staff also need to be retrained to acknowledge advancements in ICTs to promote greater use and adoption within the sector.

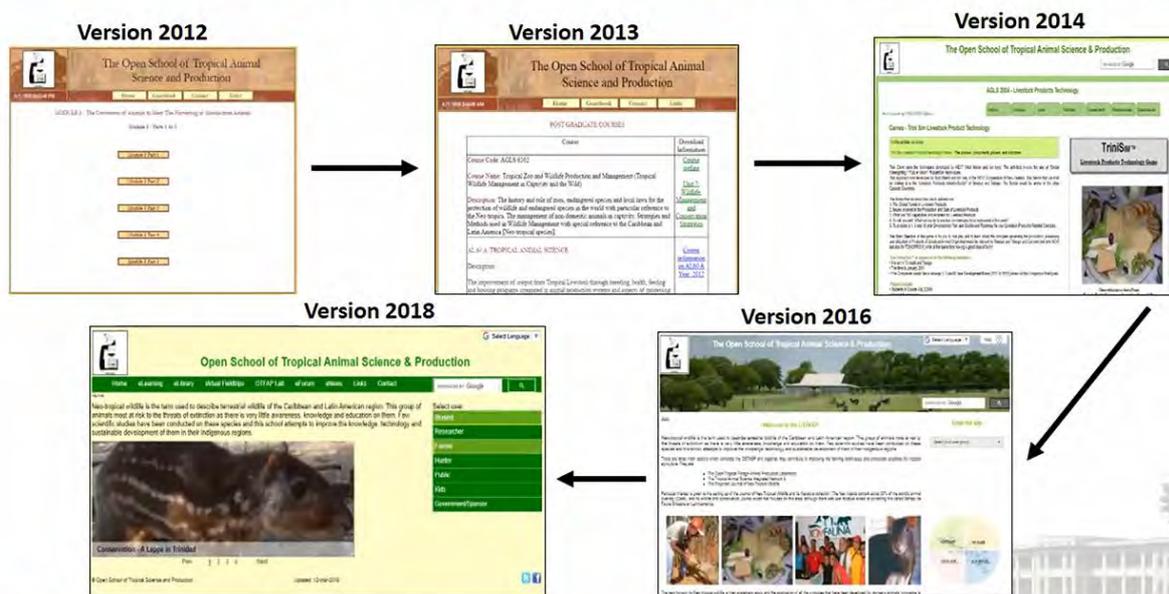
Ms Stacey-Marie Syne: The Open School of Tropical Animal Science and Production (OSTASP) 2001 to 2021

Neo-Tropical Animal Wildlife (NTAW) refers to non-domestic terrestrial and aquatic wildlife native to tropical areas of Latin America and the Caribbean. These populations have been facing consistent population decline and extinction due to unregulated hunting and poaching, deforestation, and neglect due to improper forest management.

Ms Syne presented OSTASP as a means for farmers in the Caribbean region to veer away from European domestic animals which were introduced and explore the benefits of NTAW, which are generally better-suited for our tropical climate.

The OSTASP began as a paper-based system and transitioned to the virtual website in 2014. Over the past 7 years, Ms Syne has been involved in the redevelopment and redesign of the website, continuously adapted to consider feedback from users, learner emotion, and accessibility requirements.

Results - ePortal design recommendations implemented



The current version of the website now serves as an e-portal with free resource sharing, and extensive, accessible information on both knowledge and production of NTAW, as well as an eCompendium covering climate change awareness and carbon offsetting. It also doubles as a guide for pet owners. Ms Syne concluded by indicating that the e-portal provides a valuable blueprint and innovative tools for fostering an efficient, effective online learning environment, and developments continue to be enhanced with updated content, function and design.

Professor Wayne Ganpat: Advancements in ICT Adoption in Extension: Synthesizing Contemporary Research in the CARICOM Region

Professor Ganpat's research into the advancements of ICT adoption in extension was fuelled by the status of ICT adoption within Africa and the realization that farmers in the Caribbean were ahead of extension officers in adopting ICTs.

It was noted that while extension adoption followed the traditional adoption curve, officers in Grenada, Belize and Saint Lucia were utilizing ICTs for their personal and professional benefit but not for interacting with farmers.

Those extension officers who were early adopters of ICTs indicated that they were influenced by professionalism, education and training, personal beliefs about ICTs including the level of confidence derived from its use, and social influence from peers.

Stewardship Training Program



Changing practices to incorporate ICTs , although plateaued, continues to be a challenge.

Individuals with experience and understanding of their community's technology needs, and display leadership to move the process forward

Stewarding includes selecting and configuring technology and supporting its use in the community.

Knowledge mobilization and management are critical for continued 2-way flow of information.

Effective community engagement, digital awareness/literacy, planning, coordinating, impact assessment and evaluation

The technology Stewardship program is ongoing!



Professor Ganpat ended by stating that the Steward Training Program was a noteworthy development, but there should be more training programmes to encourage extension officers and farmers to take ownership of ICTs as the main tool going forward. COVID-19 has proved to be a driving factor in augmenting adoption but there is a need for support from policy makers for increased resources, training and infrastructure.

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DATA, INFORMATION AND COMMUNICATION - PT. 2

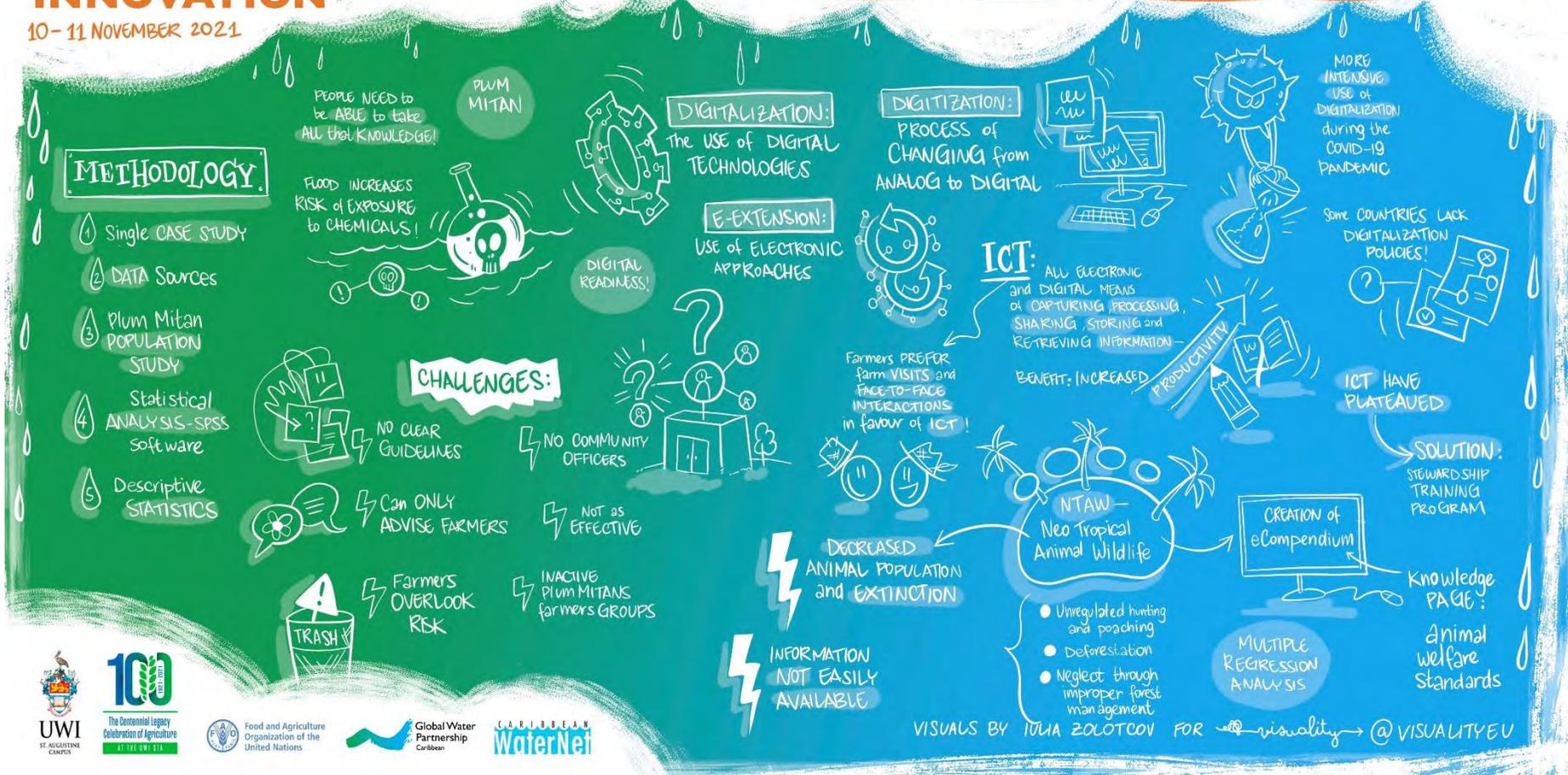
Andre John

Dr Jeanelle Joseph

Stacey-Marie Syne

Prof Wayne Ganpat

PT. 2



Closing Ceremony

Dr Gaius Eudoxie recapped Day 2 with the aid of visual summaries and invited Dr Lystra Fletcher-Paul to bring closing remarks

Closing Remarks – Dr Lystra Fletcher-Paul

“Regional research is alive and well.”

Dr Fletcher-Paul brought the FFA’s Centennial Legacy Conference to a close by complimenting all presenters for delivering engaging, interesting presentations and fostering informative discussions surrounding pertinent issues in Caribbean agriculture.

She reiterated several key recurring themes as follows:

- Effective governance – the need for national and regional policies and supportive mechanisms for implementation
- Participatory training and retraining of extension officers and farmers
- Collaborative networking and partnership among all stakeholders
- Renewed commitment and increased communication
- Collection and sharing of reliable data and analytics
- Cultural confidence – UWI researchers are poised to make valuable contributions on the world stage.

Dr Fletcher-Paul extended thanks to all those responsible for organizing the conference, and acknowledged all participation in celebrating an iconic and momentous occasion.



KEY TAKEAWAYS

100

"Regarding partnerships:

1. We will need more applied research in low- and middle-income countries, especially looking at the locally available substrate that could be used to feed insects.
2. We are trying to bridge the link between the insect industry and the feed industry to make them more aware of these products and the benefit for livestock.
3. We need to make the government more aware of the legislative need to allow the feed industry and farmers in the livestock industry to benefit from the use of insects."

- Ms Daniela Battaglia

100

"Engage with major corporations within the tourism sector, tourists and food producers to showcase how insect products can be adapted presently into the food that we consume... We should start hooking them into the discussion in the Caribbean saying how we can use their power to impress upon the communities that we work with that insects are the future food and feed."

- Mr Damian Malins

100

"This should be the opportunity for anybody, anywhere in the world to use insects as a protein source and to work together with the local companies who have local knowledge of their buyer side streams... Knowledge is there, you just need to combine it."

- Mr Tom Van Ravensberg and Mr Koen Volkers

100

"Assess the needs of the Caribbean. Look at case studies from other regions and then make sure that whatever is put into place is adapted so it has the greatest chance for success."

- Ms Wendy Lu McGill



"Legislation or a solid regulatory framework is essential to build confidence. Scientific evidence and the regulatory context would be used to strengthen trust with stakeholders and consumers as well."

- Mr Constantin Muraru



"What we can do to help agriculture play a bigger role in the GDP is maximize on production... It's truly the use of technology and exploring those avenues."

- Mr Rakesh Bhukal



"We mustn't see the problem first... don't get deterred by the cost rather, focus on how this money could be utilized to increase efficiency."

- Mr Nkosi Felix



"When parents become actively engaged in thinking about what their children are eating and the outcomes on their health and nutrition, we will not be able to stop them from taking action, being advocates and even demonstrating if they need to."

- Dr Arlette Saint Ville



"In order to make proper decisions we have to have a proper collection of data. Collaboration is also important as well in making decision for the country."

- Mr Travis G. Paul



"When developing technology, we have to be able to ensure that it can be of use... to do so we have to have proper inclusion and participation of the people who it's actually going to benefit."

- Mr Jeet Ramjattan



"What we've realized is that things are not going to go back to the way they were before COVID-19, so the virtual clinic is a start and we will be developing as we go along."

- Ms Roshni Sita Ramsingh



"There is an old adage that says knowledge is power, and if that was ever true it's even essential now in this current digital economy...we are seeing as far as information, communication and technology that we have more data tools than ever before, and when we are able to harness that data, there will be far reaching implications for innovation in the agricultural sector."

- Dr Arlette Saint Ville



100

"I repeat, ICTs are the future... We have to ramp up ICT use and we have to train extension officers. It will only benefit our region."

- Professor Wayne Ganpat



100

"We can share knowledge, bounce ideas and even get the ball rolling on trying to facilitate these new initiatives into something that could actually be more influential in impacting policy formation."

- Mr Andre John



100

" 'If you eat, you are involved in agriculture' – Wendell Berry.

If we really focus on those words, then of course the agriculture production system within the region will continue to move up."

- Dr Jeanelle Joseph



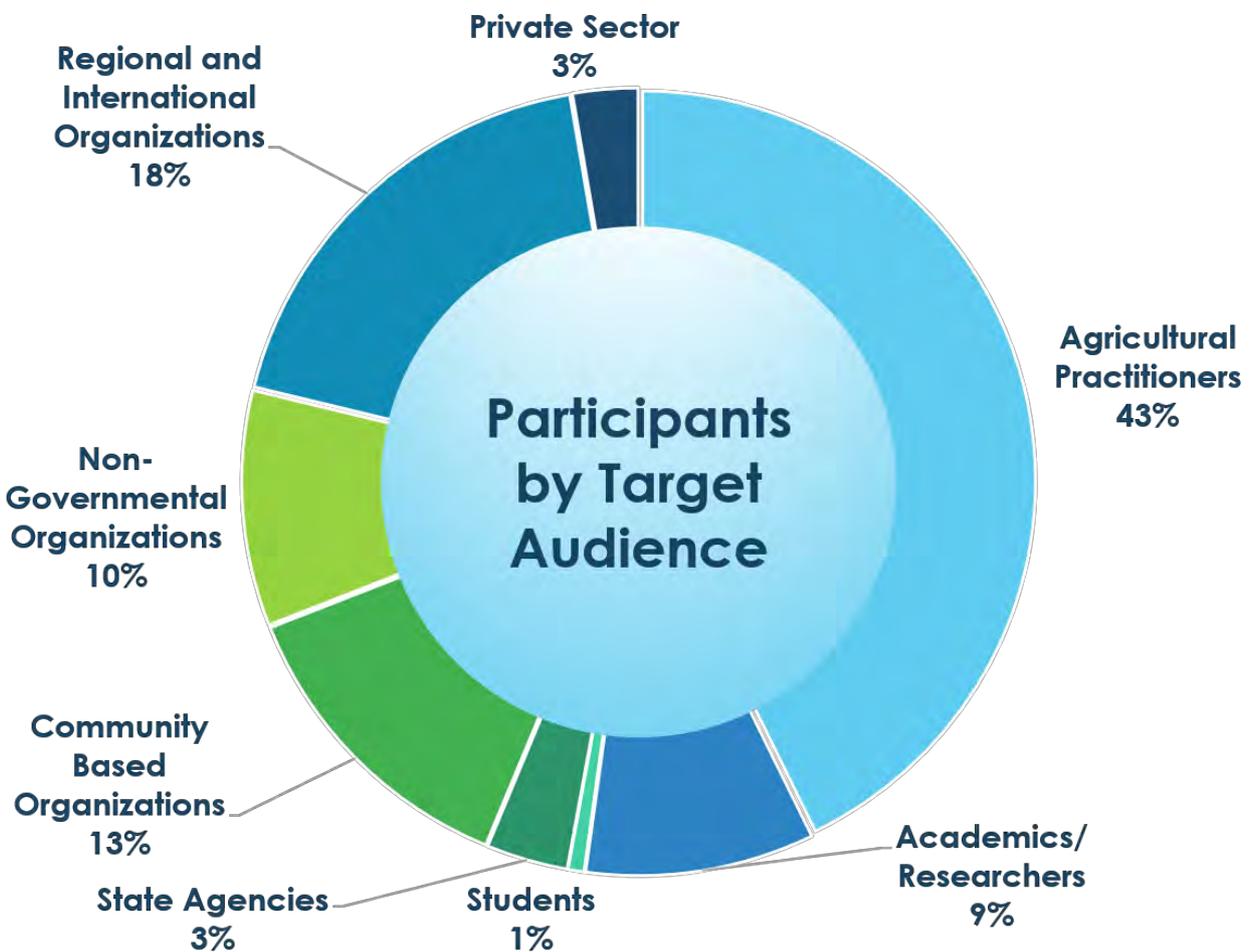
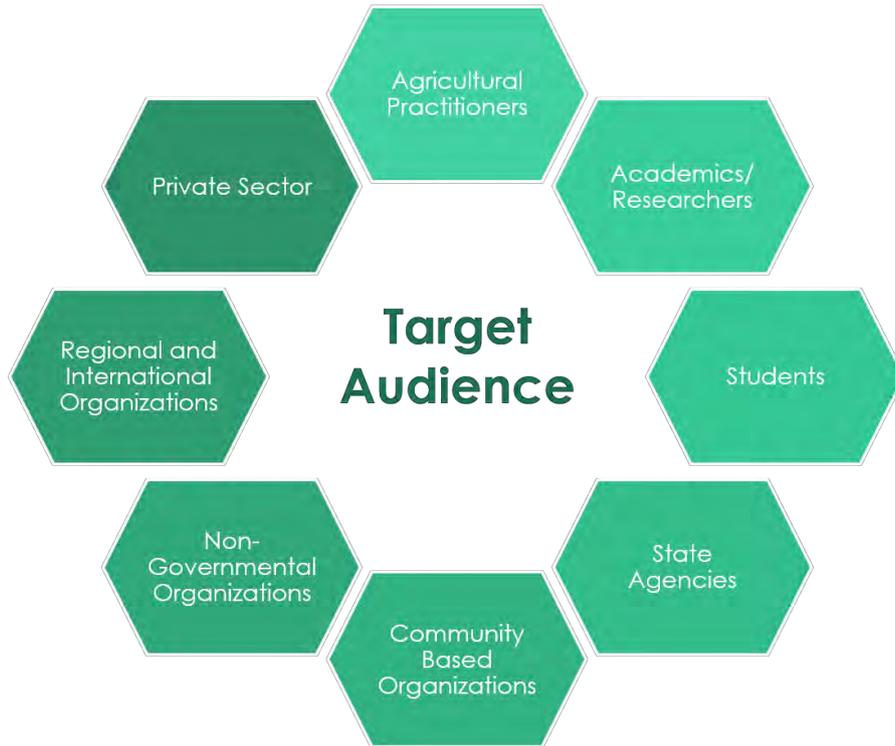
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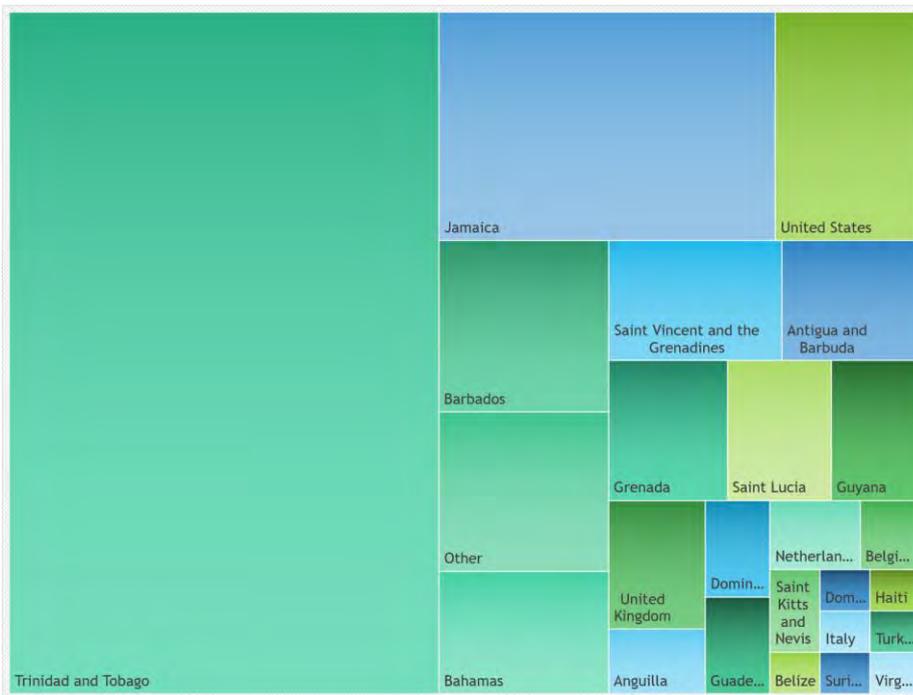
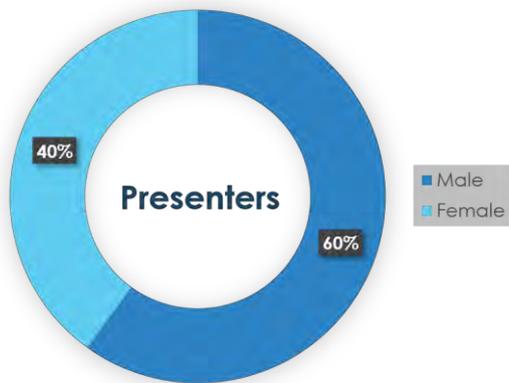
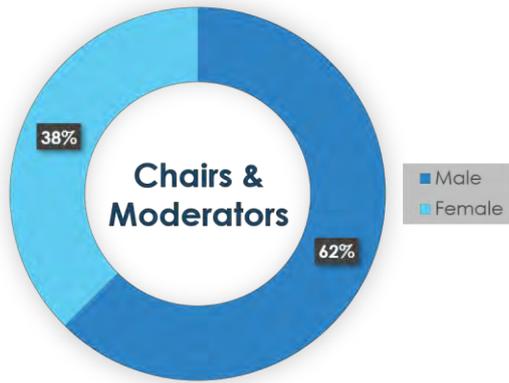
"There's much potential for this new tropical animal wildlife species to provide us with ecological, social and economic benefits."

- Ms Stacey-Marie Syne



ANALYTICS





- Anguilla
- Antigua and Barbuda
- Bahamas
- Barbados
- Belgium
- Belize
- Dominica
- Dominican Republic
- Grenada
- Guadeloupe
- Guyana
- Haiti
- Italy
- Jamaica
- Netherlands
- Other
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and the Grenadines
- Suriname
- Trinidad and Tobago
- Turks and Caicos Islands
- United Kingdom
- United States
- Virgin Islands (British)



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AT THE UWI STA



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