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Editors

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FOREWORD

Research is simply formalized curiosity, it is to see what everyone has seen but to think what no one else has thought. Creating solutions to intractable challenges of society through research defines the relevance and impact of a University. The University of the West Indies has enhanced its global reputation stands at the zenith of Caribbean academic excellence and is ranked among the best in the world. One of the key factors that has enabled this achievement is our focus on impactful research, that has made meaningful contributions to the scientific community and in many instances, transforming lives and livelihoods. In this regard, the contribution of the Faculty of Food and Agriculture (FFA) to this has been immense.

Being the founding faculty of The University of the West Indies, St. Augustine Campus with a history that spans over 100 years, stemming from the Imperial College of Tropical Agriculture (ICTA), founded in 1921, the FFA has been involved in research with outcomes that have been transformative.

Notwithstanding this rich history and formidable legacy, we must continue to strive for excellence, we must continue to birth solutions to challenges we face in the region, and we must continue to build upon the successes of the past. This is particularly important given the vulnerability of Caribbean SIDS and the numerous Agri-environmental challenges we currently face and are projected to face as a result of Climate Change. Our research is therefore structured and focused considering

the aforementioned. Research in the FFA is scattered across the Agri-environmental spectrum including; soil, water and land management, climate change, disaster risk reduction, climate-smart approaches, livestock science, food science, nutrition, agricultural extension, economics, entrepreneurship, agronomy, and crop production.

The effectiveness of research outputs is contingent on their uptake and relevance, not only by academics but more importantly by the stakeholders we intend to serve. It is therefore crucial that these outcomes are translatable outside the academic realm and yield tangible benefits to the public at large. If it stays on the shelves of a library, it is like a well-lit lamp that is placed under a bushel with its sphere of influence restrained away from the practicalities of the real world.

Therefore, this Research Digest is meant to showcase the results of the work done at the FFA to address the trending issues of food security, climate, and environment facing society today. The theme for the 2023 FFA Research Day and this ensuing Research Digest is "Ensuring food and nutrition security for all in an era of global uncertainty: implications for consumer health, local food production, and trade."

I am confident that our stakeholders and the general public will find the information contained in this Research Digest useful, as together we build a strong and modern food system for food and nutrition security with good health outcomes in a safe and resilient Caribbean environment.

Special thanks to Dr. Selby Nichols, Deputy Dean of Graduate Studies and Research, and his team for their

excellent job in organizing this 2023 Research Day. To our Graduate students, continue to be bold in sharing your work, be imaginative, be innovative, and ride on the sterling legacy of excellence that has already been crafted for you to make the desired impact. Thanks to all staff who contributed their work and to the School of Graduate Studies and Research for their continued support.

Professor Mark Wuddivira
Dean, Faculty of Food and Agriculture

CONSUMER PRACTICE AND PERCEPTION WITH IMPLICATIONS FOR FOOD SAFETY AND HEALTH

CONSUMER PERCEPTIONS AND PRACTICES OF NUTRACEUTICAL USE DURING THE COVID-19 PANDEMIC AMONG INTERNET USERS IN TRINIDAD AND TOBAGO

Videsh Arjoonsingh, Neela Badrie, and Marsha Singh

The University of the West Indies, St Augustine

Background/justification: The use of nutraceuticals in healthcare and its further potential during the COVID-19 pandemic should be explored. **Objective**: This project was to investigate consumer use of nutraceuticals, and the potential impact COVID-19 may have on this behaviour influenced in Trinidad and Tobago. **Methodology**: This study used an online questionnaire on Google forms that was sent through email, direct messaging and links posted on social media. Data were collected was from October 2021 to January 2022. The data was analysed using SPSS and Microsoft Excel for descriptive analysis and associations between categories. **Results**: Two Hundred and Eighty-six persons completed the survey. Participants were predominantly of East Indian descent (40.2%), tertiary educated (82.5%), and 84.6% were below 34 years of age. Approximately, 78.7% were nutraceutical users with 86% being users of functional foods (86%) being the main nutraceutical used. There were no statistically significant relationships between socio-demographic variables, presence of NCDs, COVID-19 anxiety and frequency of nutraceutical use. However, nutraceutical use was associated with a family history of NCDs ($p<0.05$). There was a significant change in nutraceutical use before the pandemic compared to current use but this change was not linked to COVID-19 anxiety in this study. Many respondents used nutraceuticals to supplement their diet and maintain their health. The most predominant NCD was

respiratory disease among respondents, with diabetes being the most prevalent in their family history. Cost (strongly agree - 29.4%, agree -37.8%) and knowledge and awareness of benefit of nutraceuticals (strongly agree - 35.7%, agree - 21.3%) were main barriers to nutraceuticals use among participants. **Conclusion**: Use of nutraceuticals was high among participants. There is a need for information to guide their state use in this population especially persons with a family history of NCDs.

Keywords: COVID-19. Trinidad and Tobago, Non-communicable diseases, Nutraceuticals.

CONSUMERS' KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS FOOD FRAUD IN TRINIDAD

Andrea Nanan, Marsha Singh, and Neela Badrie

The University of the West Indies, St Augustine

Background/justification: Food fraud can be described as the false representation or interference of, a food item which alters its quality attributes or safety. Food fraud is done for financial gain or to reduce production cost. This can prove to be detrimental to the consumer. **Objective:** The knowledge, attitude, and practices of consumers towards food fraud within Trinidad would be examined to identify and address any gaps in food fraud knowledge. Data coding and analysis were done with IBM SPSS. **Methodology:** This was done using a KAP online questionnaire distributed across Trinidad. Convenience sampling was used in selecting participants. Persons were approached utilizing social media applications. A sample size of 500 participants were collected. Data coding and analysis was done with IBM SPSS Statistics. **Results:** Most (95.2%) persons received a 'satisfactory' score on food fraud and its related terminology, 61.6% of participants received a 'satisfactory' score on food fraud legislation in Trinidad and Tobago and 53.4% of participants obtained a 'satisfactory' score on food fraud incidents locally and internationally. More than 80% of respondents were concerned about food fraud while purchasing food items. Majority of participants identified money, health and trust in companies as ways food fraud can affect them. Checking seals on food items was the only practice shown to have more than 50% of participants

stating they always do this. All other practices showed low percentage of persons always performing them. However, there was a significant difference between reading nutrition labels and education categories (p value – 0.040).

Conclusion:

Results indicated participants displayed satisfactory overall knowledge and attitudes on food fraud however engaged in limited practices which may protect them from food fraud incidents. Government bodies and private agencies should therefore increase consumer awareness and understanding of these practices.

Keywords: Food fraud, Food safety, Economically Motivated Adulteration, Contaminant

COVID-19 A WAKE-UP CALL TO UNDERSTANDING THE SECONDARY IMPACTS OF COMPLEX DISASTERS ON HOUSEHOLD FOOD SECURITY IN SIDS OF THE CARIBBEAN

Marshall, T., Saint Ville, A., Fletcher-Paul, L., and Isaac, W.

The University of the West Indies, St Augustine

Background/justification: Household food security coping strategies differ across SIDS in response to the COVID-19 pandemic. **Objective:** To assess household food security coping in five Small Island Developing States (SIDS) of the Caribbean – Barbados, Belize, Jamaica, The Bahamas, and Trinidad and Tobago. **Methodology**: Secondary data included: 1) World Food Programme (WFP)- Caribbean COVID-19 Food Security and Livelihoods Impact Survey; 2) Google Trends web searches, and 3) Google mobility data. Documentary analysis of regulatory documents was conducted.
Results: Results showed minimal to small increases in mobility related to groceries and pharmacies above the baseline for Belize, The Bahamas, and Trinidad and Tobago but small decreases in Barbados and Jamaica. Across all countries, there were notable spikes in internet web searches on food preparedness (March to April), with web searches highest in Trinidad and Tobago and lowest in Barbados. Regional food security survey showed a third of respondents across countries reported coping strategies of eating less preferred foods, skipping meals or reducing food intake, but more households in Barbados and Belize experienced food insecurity from lack of market access. Coping strategies involved both emotional and logical responses to the pandemic. **Conclusion:** Variations in food security reflected local conditions and indicated the need for national response planning for the second and

third waves to include interdisciplinary, hazard-specific, and place-based considerations to reduce secondary impacts on household food security.

Keywords: Disaster risk reduction, Risk management, Cognition, Human behavior

Source: In Campell Y., and Connell, J. (Eds.) Coronavirus and Islands: Fracturing the 'Old Normal' in the Caribbean and the Pacific, Palgrave Macmillan.

FOOD INSECURITY IN VENEZUELAN MIGRANTS IN TRINIDAD AND TOBAGO USING THE FOOD INSECURITY EXPERIENCE SCALE

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The University of the West Indies, St Augustine

Background/justification: Economic, political, humanitarian and health crises in Venezuela have resulted in mass out migration -thousands of Venezuelans emigrated to Trinidad and Tobago. However, little is known about their food security status in the host country.**Objective:** This study assessed the food security status among Venezuelan migrants and asylum seekers in Trinidad and Tobago and tested the validity of the online application of the food insecurity experience scale (FIES), a tool to measure food insecurity, in a small group. **Methodology:** This convenience, cross-sectional study applied an online questionnaire to 433 Venezuelan migrants in Trinidad and Tobago in 2020. Snowball sampling was used to connect to migrants based on their access to locally-based NGO service providers, and organizations directly connected to the Venezuelan migrant community. Researchers applied the 12-month reference period to the FIES to measure food insecurity at the individual level. Descriptive analyses, Rasch modeling and binary logistic regression were conducted. **Results:** Overall, 61.9% of respondents displayed behaviors characterized as severely food insecure. Significant differences in food security status were observed when categories of employment status (p = 0.032) and paying rent (p = 0.005) were considered. There were greater proportions of unemployed individuals who were severely food insecure (67.6%) compared to those who were employed (56.7%). There were greater proportions of

individuals paying rent who were severely food insecure (62.6%) compared to those who were not paying rent (50.0%). Logistic regression with adjusted odds ratios and 95% confidence intervals revealed that food insecurity was less likely among migrants who were employed (OR 0.112, 95% CI 0.016–0.763) relative to those who were not employed, while food insecurity was more likely among migrants who were paying rent (OR 7.325, 95% CI 1.965–27.312) relative to those not paying rent. The FIES was consistent in assessing food security status. **Conclusion:** These findings provide a rapid assessment that can be used to galvanize international, national and community-level stakeholders to devise and target responses to assist migrants experiencing food insecurity.

Keywords: Asylum seekers, Food security, FIES

S*ource: Frontiers in Public Health.* *https://doi.org/10.3389/fpubh.2022.925813*

DIETARY PATTERNS, FOOD INSECURITY, AND THEIR RELATIONSHIPS WITH FOOD SOURCES AND SOCIAL DETERMINANTS IN SMALL ISLAND DEVELOPING STATES

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Background/justification: Small Island Developing States (SIDS) have high burdens of nutrition-related chronic diseases. This has been associated with lack of access to adequate and affordable nutritious foods and increasing reliance on imported foods. **Objective:** Our aim in this study was to investigate dietary patterns and food insecurity and assess their associations with socio-demographic characteristics and food sources. **Methodology:** We recruited individuals aged 15 years and above from rural and urban areas in Fiji (n = 186) and St. Vincent and the Grenadines (SVG) (n = 147). Data collection included a 24 h diet recall, food source questionnaire and the Food Insecurity Experience Scale. We conducted latent class analysis to identify dietary patterns, and multivariable regression to investigate independent associations with dietary patterns. **Results:** Three dietary patterns were identified: (1) low pulses, and milk and milk

products, (2) intermediate pulses, and milk and milk products and (3) most diverse. In both SIDS, dietary pattern 3 was associated with older age, regularly sourcing food from supermarkets and borrowing, exchanging, bartering or gifting (BEB). Prevalence of food insecurity was not statistically different across dietary patterns. In both SIDS, food insecurity was higher in those regularly sourcing food from small shops, and in SVG, lower in those regularly using BEB. **Conclusion:** These results complement previous findings and provide a basis for further investigation into the determinants of dietary patterns, dietary diversity and food insecurity in these settings.

Keywords: Latent class analysis, Pacific, Caribbean

Source: Nutrients, 14(14), 2891

A COMBINED THEORY OF CHANGE-GROUP MODEL BUILDING APPROACH TO EVALUATING "FARM TO FORK" MODELS FOR SCHOOL FEEDING IN THE CARIBBEAN

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Background/justification: There is a scarcity of research on building nutrition-sensitive value chains (NSVCs) to improve diets and nutrition outcomes of populations in the Caribbean. **Objective:** This study contributes to filling this research gap by outlining a participatory approach to evaluating a NSVC model for "farm to fork" (F2F) school feeding in the Eastern Caribbean Island of St. Kitts. **Methodology:** Using a combined group model building (GMB) and theory of change (ToC) approach, policy actors and other stakeholders (n = 37) across the school feeding value chain were guided through a facilitated process to evaluate the ToC underlying a series of F2F interventions designed to enhance childhood nutrition. **Results:** Stakeholders at the workshop engaged collaboratively to create a causal map of interconnected "system factors" that help explain behaviors contributing to unhealthy eating among children that extended well-beyond the original F2F project ToC that had been used to inform interventions. Through this facilitated GMB process, stakeholders proposed additional food system interventions, and identified multiple "impact pathways"

and “mediating influences” underlying local availability and consumption of nutritious foods in local school environments. Workshop participants were also able to identify leverage points where community-level efforts, alongside research interventions, may ensure that initiatives for building local NSVCs are ultimately institutionalized. **Conclusion:** Developing NSVCs for school feeding and food systems in the Caribbean requires both locally driven innovation and the leveraging of system-wide resources, with lessons for project intervention strategies.

Keywords: Research for Development, Food Security, Saint Kitts and Nevis, Nutrition Sensitive Value Chain

Source: Frontiers in Sustainable Food Systems, 6 https://doi.org/10.3389/fsufs.2022.801731

WHO REALLY COUNTS IN IRAN'S NATIONAL FOOD ASSISTANCE PROGRAM? LESSONS FROM MULTI-STAKEHOLDER PROCESSES IN THE WICKED POLICY AREA OF FOOD SECURITY

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Background/justification: Multi-stakeholder processes - as a necessary part in the development of public policies - can provide diverse perspectives to inform and to improve food security policy-making. Iran's National Food Assistance Program (NFAP) is one of the major welfare programs in Iran that reduces food insecurity to low-income households. **Objective:** This study aimed to identify and to categorize actual and potential stakeholders in NFAP using the stakeholder salience model. **Methodology:** According to Mitchell's theory, stakeholders' attributes (power, legitimacy, and urgency) were assessed based on the nature of their interactions, roles, and level of engagement. **Results:** Results revealed a number of significant but marginalized stakeholders, including Iranian Ministry of Health (office of community nutrition improvement), academia, center for food and nutrition research, target group, charities, and international organizations, who have not received any targeted organizational attention and priority to their claims. The

unbalanced attention provided to some stakeholder groups characterized as “definitive” and “dominant” and ignoring some important ones will jeopardize long-term viability and undermine support for the program with inevitable declines in legitimacy. **Conclusion:** Understanding the change in the stakeholders’ characteristics is the main variable to determine the allocation of organizational resources in response to different and rising stakeholders’ demands and possibly the projects outcomes. This will facilitate and enhance the possibility of knowledge exchange and learning, and greater trust among stakeholders during the food and nutrition policy-making process.

Keywords: Stakeholder Participation, Food Assistance Programs, Public Policies

Source: Cadernos de Saúde Pública, 38, e00341820

FOOD SOURCES AND DIETARY QUALITY IN SMALL ISLAND DEVELOPING STATES: DEVELOPMENT OF METHODS AND POLICY RELEVANT NOVEL SURVEY DATA FROM THE PACIFIC AND CARIBBEAN

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Background/justification: Small Island Developing States (SIDS) have high and increasing rates of diet-related diseases. This situation is associated with a loss of food sovereignty and an increasing reliance on nutritionally poor food imports. A policy goal, therefore, is to improve local diets through improved local production of nutritious foods. **Objective:** Our aim in this study was to develop methods and collect preliminary data on the relationships between where people source their food, their socio-demographic characteristics and dietary quality in Fiji and Saint Vincent and the Grenadines (SVG) in order to inform further work towards this policy goal. **Methodology:** We developed a toolkit of methods to collect individual-level data, including measures of dietary intake, food sources, socio-demographic and health

indicators. Individuals aged ≥15 years were eligible to participate. From purposively sampled urban and rural areas, we recruited 186 individuals from 95 households in Fiji, and 147 individuals from 86 households in SVG. **Results:** Descriptive statistics and multiple linear regression were used to investigate associations. The mean dietary diversity score, out of 10, was 3.7 (SD1.4) in Fiji and 3.8 (SD1.5) in SVG. In both settings, purchasing was the most common way of sourcing food. However, 68% (Fiji) and 45% (SVG) of participants regularly (>weekly) consumed their own produce, and 5% (Fiji) and 33% (SVG) regularly consumed borrowed/exchanged/bartered food. In regression models, independent positive associations with dietary diversity (DD) were: borrowing/exchanging/bartering food (β = 0.73 (0.21, 1.25)); age (0.01 (0.00, 0.03)); and greater than primary education (0.44 (0.06, 0.82)). DD was negatively associated with small shop purchasing (−0.52 (95% CIs −0.91, −0.12)) and rural residence (−0.46 (−0.92, 0.00)). **Conclusion:** The findings highlight associations between dietary diversity and food sources and indicate avenues for further research to inform policy actions aimed at improving local food production and diet.

Keywords: Nutrition, Non-Communicable Diseases, Food Security, backyard gardening

Source: Nutrients, 12(11), 3350

COST OF ADEQUATE NOURISHMENT IN TRINIDAD AND TOBAGO

Selby Nichols and Patrice Prout

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Background/justification: Trinidad and Tobago is a net importer of food. Over 70% of these imports are sold as ready- to- eat items that are used to prepare meals rendering them major sources of calories and nutrients for our population. **Objective**: To determine average cost of adequate nourishment for individual and households locally. **Methodology**: Twenty random nutrient adequate for persons engaged in light physical activity were generated using the Nutrigenie 7.0 dietary software. These menus were costed using the List of Supermarket Prices of Food Items in Trinidad & Tobago (June 2022). For menu items not on the list, supermarkets were visited and the price of items were recorded. The cost menu servings were calculated as the product of the mean cost per unit weight of the item **x** by the weight of the item on the menu. These were summated over meals consumed that day and divided by 20. Costs were calculated for 1 individual and a household of six persons for 1 month of meals using recommended adjustments. **Results**: The cost for adequately nourishing 1 person for a month was $4398 ± 213(SE) TT dollars and approximately $3967TT dollars per person for a family of six persons. **Conclusion**: Persons within the 50% percentile of salaries locally (50^{th} percentile = $ 9380TT) who are in light activities would have to spend ≥ 42% of their monthly income to consume diets with adequate nourishment. Impending increases in food prices may affect the nutritional status of a large

section of our population. This suggests the need for intensification of relevant social programmes and agricultural production to increase access to nutrient adequate diets.

Keywords: Adequate nourishment, Trinidad and Tobago, cost

THE ASSOCIATION BETWEEN ACADEMIC STRESS AND THE RISK OF DISORDERED EATING BEHAVIORS AMONG STUDENTS AT A HIGHER EDUCATIONAL INSTITUTION IN THE CARIBBEAN

Rozette Scotland and Marquitta C. Webb

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Increases in eating disorder mortality and morbidity risk have become a growing health concern. Scholars have amassed a body of literature assessing several risk factors among university students, predominantly focused on the role of socio-cultural influences, depression, anxiety, body dissatisfaction, socially prescribed perfectionism, and self-esteem. This study aimed to determine the association between academic stress and the risk of disordered eating behaviors among students at a university in the Caribbean. A cross-sectional study conducted using a convenience sample of 389 students and an online self-administered questionnaire consisting of demographic questions, the Eating Attitudes Test and the Academic Stress Scale. Inferential statistical analyses were performed to assess associations. Level of significance was at $p \leq .05$. A positive correlation exists between academic stress and disordered eating behaviors ($r = .286$, $n = 389$, $p = .000$). No significant differences were observed between academic stress and disordered eating behaviors by age, gender, or faculty. Acknowledgement of the positive association that exits between academic stress and disordered eating behaviors can aid the development of prevention and management interventions to address the prevalence of

disordered eating behaviors and reduce risk of eating disorders among university students.

Keywords: Academic stress, disordered eating behaviors, university students

POTENTIAL OF DRAGON FRUIT (*HYLOCEREUS SP.*) IN PROMOTING HEALTH AND NUTRITIONAL SECURITY

Rachael Bally and Wendy-Ann Isaac

The University of the West Indies, St Augustine

Background/Justification: There was a 30% increase in the number of people suffering from hunger in the Latin America (LATAM) and Caribbean region during the period 2019-2020 (FAO, 2021). In August 2022, the Caribbean Food Security and Livelihood Survey showed 57% of the Caribbean population experienced food insecurity – a 46% rise in six months. Based on these statements it can be determined that the Caribbean region is experiencing a lack of food security. Food security, as defined by the FAO, refers to the state where all citizens have access to food that meets their preferences and is "safe" and nutritious. Dragon fruit (*Hylocereus sp.*) is a fruit that originated in the LATAM and Caribbean region. However, various species of this genus have been cultivated extensively in the eastern hemisphere. Every part of this plant is edible but particular attention is given to the fruit. **Objective:** To compile the information available on the compounds present in dragon fruit that contribute to nutritional health. Identify challenges for dragon fruit production within Trinidad and the wider region. **Methodology:** Published literature will be critically reviewed and the information available on the compounds present and the health implications of consumption be collated and compared. Dragon fruit farms will be surveyed for diseases and other cultivation challenges. Farmers will be questioned on cultivation,

postharvest handling and storage of dragon fruits. An assessment of cultivation systems to determine the most suitable practices in dragon fruit production will be performed. **Results:** The fruit (pulp and seeds) contains a variety of vitamins and minerals inclusive of vitamin C, vitamin E, pantothenic acid, calcium, magnesium, zinc, potassium, iron, and phosphorus. However, other compounds present (antioxidants and other phenolic compounds) can contribute to improved health as consumption of dragon fruit has been linked to enhanced vascular health and gut motility, along with regulation of the gut microbiome. The foliage has also been proven to contain similar antioxidant compounds as the peels. Research has also linked these fruits with cytotoxic effects against certain forms of cancer. **Conclusion**: As cultivation of this genus increases, this presentation proposes that these fruits and plants form part of the solution to food and nutrition security in the region.

CLIMATE RESILIENCE AND FOOD SYSTEMS IN SMALL-ISLAND DEVELOPING STATES

SPATIOTEMPORAL EVALUATION OF DROUGHT IN THE CARIBBEAN USING REMOTELY SENSED DATA: IDENTIFYING ITS POTENTIAL IMPACT ON FOOD SECURITY

Israel Orimoloye

The University of the West Indies, St Augustine Campus

Background/justification: To monitor climate-related events such as drought scenarios successfully in the Caribbean sphere, innovative technology such as satellite information is required. Studies have shown that temperatures and seasonal rainfall patterns in the Caribbean are changing, and conditions are projected to become more varied in the future which will be more pronounced on the agricultural sector. The, Caribbean including the area considered in this study, is experiencing climate-related events such as drought, threatening millions of people with food insecurity. Relentless drought and high food prices have undercut many people's ability to grow crops, livestock, and leading to food shortage. **Objective:** This study aimed at monitoring and assessing drought events and its impacts on food security in Trinidad and Tobago using remote sensing information. **Methodology:** The study used remotely sensed and agricultural crop information to assess drought events and its impact on food security over Trinidad and Tobago. **Result/discussion:** The study revealed that different years were affected in the selected region for this study between 2001 and 2022. Finding from this study revealed that the combined effect of human and natural activities, such as an increase in population, land use change, urbanization, higher temperatures, the associated

increase in evaporation, and less rainfall mean that the study area is likely to experience more intense and frequent climate events including drought episodes. For instance, years 2014 and 2015 observed drought events with low agricultural crop yields recorded in the affected years. This study emphasizes the strong spatio-environmental impacts within Trinidad and Tobago and highlights the associated impacts that characterize high drought stress risk, especially on food security. **Conclusion:** This study contributes to a disaster risk framework to identify areas for specific research and adaptation activities on drought impact on food security in the study area.

Keywords: Drought, remote sensing, assessment, Caribbean, food security, crops

CLIMATE RESILIENCE AGRICULTURAL PRACTICES

CARCASS CHARACTERISTICS AND NUTRITIONAL PROFILE OF WILD *CAIMAN CROCODILUS* (SPECTACLED CAIMAN) MEAT

Daryian Dolly

The University of the West Indies, St Augustine

Background/Justification: One of the largest issues in the CARICOM region is food security and its dependence on importing food from developed nations. Understanding the carcass characteristics and nutritional profile of local neo-tropical species, in this instance *C. crocodilus*, can initiate the regional production of alternative sources of animal protein. **Objective:** Developing standardized primal, sub-primal and commercial cuts, yield standards, and nutritional value for the *Caiman crocodilus* are vital in the process of developing a market for the animals' consumption in the neo-tropical, Caribbean region. **Methodology/Results:** Five adult *C. crocodilus* specimens were captured on the island of Trinidad with an average weight and length of 28.04 ± 11.06 kg, 139.4 ± 16.32 cm respectively. Through carcass fabrication, a dressing percentage of 55.38 ± 1.8% was found and five primal cuts consisting of a neck, torso/rib cage, front leg with shoulder blade, back leg, and tail were determined for this species. Further fabrication of the carcass resulted in four sub-primal cuts, a top fillet, bottom fillet, loin, and breast cut. The fabricated tail of *C. crocodilus* constituted 28.32 ± 4.5% of the carcass weight with the highest meat to bone ratio by cut of 6.43. The results of the proximate analysis to determine the moisture, protein, lipid, and ash content of a homogenized sample of neck and tail meat

presented values of 5.31 ± 3.03, 21.36 ± 4.07, 6 ± 5.40, and 0.25 ± 0.03 respectively on a dry matter basis. **Conclusion:** This study supports the utilization of *C. crocodilus* meat as an additional protein source by illustrating the fabrication, carcass characteristics and nutritional profile of a local neo-tropical species. This species therefore has the potential to be utilized for animal production within the region.

Keywords: *Caiman crocodilus*, meat cuts, nutritional profile, proximate analysis

THE EVALUATION OF NON-STATIONARY CLIMATE EVENTS ON THE FREQUENCY OF GASTROENTERITIS IN BARBADOS, 2013-2021

Romario Cumberbatch, Neela Badrie, and Marsha Singh

The University of the West Indies, St. Augustine Campus and CCRIF SPC

Background/Justification: Climate change can considerably increase the risks associated from existing and emerging foodborne diseases, mainly through increases incidence of extreme events, increases in air temperatures, and variations in precipitation frequency and intensity. For the Caribbean Small Island Development States, there are research gaps regarding how societal and environmental systems mitigate the impact of climate change on food safety, especially foodborne diseases. This study sought to analyze the relationship between non-stationary climate events and climatic factors against the incidence of gastroenteritis in Barbados. In addition, correlation between causative agents of gastroenteritis and demographics factors of Barbados. **Objectives**: The aim of this study is to evaluate the relationship between non-stationary climate events (El Niño and La Niña) and other climatic factors on the prevalence of gastroenteritis in Barbados. To determine the main causative agent(s) of gastroenteritis among demographic factors in Barbados. To evaluate the possible repercussions of this relationship on the local community. **Methodology:** With the use of data collected by the Surveillance Unit of the Ministry of

Health and Wellness, Barbados and The Barbados Meteorological Services, a retrospective study was conducted in Barbados to evaluate the impact of non-stationary climate events on the incidence of gastroenteritis during the period of 2013-2021. The following parameters were evaluated: climatic factors (rainfall, relative humidity, and ambient temperature), El Niño and La Niña indices, causative agents, number of cases, and local demographics (gender, age, years, and months). The parameters were analyzed using Pearson's Correlation, Chi Square Test of Independence, and Descriptive Analysis. **Results:** The results of analyses revealed significant differences ($P< 0.05$) in age ($P< 0.01$), months ($P< 0.01$), and years ($P< 0.01$) against causative agents of gastroenteritis for the period of 2013-2021. The Pearson's correlation analysis of climate factors revealed weak-moderate positive correlations against the incidence of gastroenteritis. While the Descriptive Analysis of gender against causative agents revealed males to be more susceptible to specific causative agents of gastroenteritis. **Conclusion:** The findings suggest that evaluating demographical factors and shifts in non-stationary climatic patterns are crucial to adapting early warning systems for outbreaks of gastroenteritis as the effects of climate change worsen.

SPATIOTEMPORAL MONITORING OF DROUGHT AND ITS IMPACTS ON FOOD SECURITY

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Background/justification: Increasing demand for food and environmental stressors are some of the most challenging problems that human societies face today and these have encouraged new studies to examine drought impacts on food production. Seeking to discuss these important issues in the South African context, this study analysed the impacts of drought on food security in one of the country's largest commercial agricultural lands. **Objective:** This study aimed at monitoring and assessing agricultural drought and its impacts on food production in Free State Province South Africa. **Methodology:** Earth observation and crop data were acquired from Application for Extracting and Exploring Analysis Ready Samples (AppEEARS) and GrainSA databases, respectively for years 2011/2012 to 2020/2021 over Free State Province. Two crops namely, maize and sorghum, were obtained from the database and analysed accordingly to quantify drought impacts on the two crops. The acquired data were analysed using programming. **Results:** The result reveals that the years 2015 and 2018 were affected by extreme drought events (<10%) where the majority of the study area was impacted. Years 2011, 2016, 2017 and 2019 were severely affected by drought (>30%) and impacted the agricultural sector in the study area. Findings further

revealed maize production observed the lowest recorded in the year 2014 and 2015 with about 2236,00 and 1190,50 tons, respectively. More so, results further showed that sorghum production recorded the lowest production in years 2019, 2016 and 2015 with about 23, 600, 24, 640 and 24, 150 tons, respectively during the period of study.

Conclusion: The results confirm the impacts of drought on maize and sorghum productions in the year 2015 was similar to other years that recorded the lowest productions during drought years. This development might have impacted food security in the study area, and this outcome will enable decision-making bodies on food security to enhance improved strategy in vulnerable areas.

Keywords: Agricultural Drought, Earth Observation Data, Food Security, Potential Impacts

BREEDING AND REPRODUCTIVE BEHAVIOUR OF THE NEO-TROPICAL OPOSSUM, *DIDELPHIS MARSUPIALIS INSULARIS*, ALLEN 1902 UNDER CAPTIVE CONDITIONS

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Background/justification: Developing a captive breeding system for the widely hunted Caribbean species of opossum *Didelphis marsupialis insularis* can greatly aide in the management and conservation of this species in the neo-tropics. Although, this species possess ideal traits for captive breeding in this region that is high tolerance to heat and humidity, high reproductive rate, and resistance to disease, challenges due to its aggressive behaviour and limited information on its breeding behaviour have prevented a system from being developed for this species. **Objective:** The present study describes a breeding system, and the reproductive behaviour of this species under captive conditions. **Methodology**: Six (1 male;5 females) adult opossums were maintained and managed for breeding over a ten (10) month period. **Results**: Pouch litter sizes averaged 5±2.5 with a range of 2 to 8. Gestation length was found to be 13.25±0.96 days and 4 litters (n=23) were successfully weaned at 11-13 weeks. It was found that the male *D. m. insularis* exhibits behaviours of interest that can serve as indicators for receptivity of the female. **Conclusion**: Overall this species can be successfully reared and bred under captive conditions in the neo-tropics.

Keywords: *Didelphis marsupialis insularis*, captive breeding, opossum, reproduction

THE POTENTIAL OF VETIVER GRASS (*CHRYSOPOGON ZIZANIOIDES)* FOR FOREST RESTORATION IN ABANDONED QUARRIES

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Background/justification: In 2013, the Trinidad and Tobago Ministry of Energy and Energy Industries estimated that there are 90 active quarries across Trinidad and Tobago, with 50% extracting sand and gravel. Across Eastern Trinidad and much of the Caribbean, sand and gravel quarrying has become a major environmental issue. While abandoned quarries offer immense potential for forest restoration, their soils are often left highly degraded, making the land unsuitable for natural revegetation and vulnerable to continued degradation. Soft engineering solutions, such as Vetiver grass (*Chrysopogon zizanioides*) have been widely used to address erosion, but the full potential of Vetiver for water redistribution and its application for companion planting is yet to be explored. Current literature suggests that Vetiver will not only be highly resilient to the harsh conditions in abandoned quarries, but it may also improve the hydraulic and microclimatological conditions to aid in tree survival and reestablishment. **Objective:** To determine the ecohydrological potential of Vetiver grass to improve the rate of forest restoration. **Methodology**: The saplings of two local plant species will be alternated in two rows with, and one without, Vetiver at high and low topographic

locations at National Quarries, Sangre Grande. The two Vetiver treatments will consist of an already established hedgerow and a new hedgerow. Various plant growth parameters will be taken every two months. Capacitance soil moisture sensors at the 10cm, 20cm, 40cm and 80cm depths will be monitored for 1 year, while surface temperature and humidity will be measured with thermochrons. Rainfall and isotope samples will be collected twice within the year to analyse the ecohydrological influence of Vetiver grass on the saplings. **Results:** Though Vetiver may improve water retention and some microclimatological conditions, such as subsurface temperature and humidity, there is little evidence for expedited forest regrowth or sapling survival under the current conditions at the Quarry. **Conclusion:** Further studies may be needed to explore the viability of Vetiver exclusive rehabilitation campaigns prior to forest reestablishment.

Funding Sources: IAMovement

Keywords: Vetiver, Forest Rehabilitation, Quarry

PERSPECTIVES ON STRENGTHENING LOCAL FOOD SYSTEMS IN SMALL ISLAND DEVELOPING STATES

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Background/justification: Small Island Developing States (SIDS) share high burdens of nutrition-related conditions, including non-communicable diseases, associated with an increasing reliance on imported, processed foods. Improving health through increasing the production and consumption of local, nutritious foods is a policy objective of many SIDS governments. **Objective:** This study aimed to understand contemporary challenges and opportunities to strengthening local food systems in two case study settings, Fiji and St. Vincent and the Grenadines. **Methodology:** Fifty-two in-depth, semi-structured interviews were conducted with key stakeholders involved in local food production. Interviews were analysed by both country teams using thematic analysis. **Results:** Small Island Developing States (SIDS) share high burdens of nutrition-related conditions, including non-communicable diseases, associated with an increasing reliance on imported, processed foods. Improving health through increasing the production and consumption of local, nutritious foods is a policy objective of many SIDS governments. Local food production networks in both settings included formal governance bodies as well as more informal connections through civil society and communities. Their main function was the

sharing of resources and knowledge, but levels of trust and cooperation between the stakeholders varied in a market open to intense competition from imports. Local food production was hindered by few and slow investments by local governments, dated technology, and lack of knowledge. Stakeholders believed this marginalisation was occurring against a background of rising preferences for imported foods in the population, and increasing disinterest in employment in the sector. Despite the challenges, strong narratives of resilience and opportunity were highlighted such as national pride in local produce for commercialisation and local diets. **Conclusion:** Efforts to support local food production in SIDS should focus on strengthening governance structures to prioritise local produce over corporate and import markets, assist collaboration and co-learning, and support alternative agro-food practices.

Keywords: Food security, Food access, Production networks, Resilience

Source: Food Security. *https://doi.org/10.1007/s12571-022-01281-0*.

A REVIEW OF EXISTING INTEGRATED COASTAL ZONE MANAGEMENT (ICZM) INDICATOR BASED TOOLS AND THEIR SUSTAINABILITY FOR THE CARIBBEAN CONTEXT

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Background: Climate change continues to pose a threat to the global community, particularly Small Island Developing States (SIDS) and their vulnerable coastal environments. There has been a high level of certainty regarding the effects of climate change, including rising sea levels, increased coastal erosion, and more intense and more frequent climatological phenomenon; all of which put a strain on the coastal environments. The Caribbean coastline has been an important aspect of the livelihoods of persons from SIDS, not only for tourism, but for fisheries as well as land-based agriculture. In response to this, structural and non-structural coastal management techniques have been implemented. These include policy-based initiatives and physical barriers to protect the weakened coast. To assess their progress, there have been methodologies developed at varying scales to monitor and to improve future coastal management solutions. These tools, however, have been created and tested in parts of the world that do not reflect the environmental, socio-economic and governance status of the Caribbean. **Objective**: This paper aims to analyse and describe the deficiencies of these existing tools and determine what they are lacking

for suitability in the Caribbean Region. **Methodology**: This analysis was done by conducting a review of the UNESCO IOC indicator-based methodology, the WG-ID indicator-based methodology, the IWCAM Indicator based methodology for SIDS and the tool used in Project SUSTAIN. **Results**: Some of the deficiencies were determined to be the lack of inclusion of emerging issues in SIDS such as indigenous and local knowledge, the threat of invasive species, the limited consideration for the capacity of SIDS as well as the impact on agrobiodiversity. **Conclusion**: By including these themes in the development of a tool specific to the context of Caribbean SIDS, it provides a basis for more informed decision making regarding coastal management, which would improve disaster risk reduction efforts across our agricultural sector and by extension, the region.

Keywords: Integrated Coastal Zone Management (ICZM), Small Island Developing States (SIDS), SIDS-specific, Indicator-Based

FIELD-SCALE CALIBRATION OF THE PAR CEPTOMETER AND FIELDSCOUT CM FOR REAL-TIME ESTIMATION OF HERBAGE MASS AND NUTRITIVE VALUE OF ROTATIONALLY GRAZED TROPICAL PASTURE

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Destructive sampling method is regarded as the standard approach for evaluating pasture herbage. However, non-destructive methods for managing pastures are rapidly gaining acceptance because they provide faster results that can influence real-time decision-making. The objective of this study was to calibrate the PAR Ceptometer and FieldScout CM as non-destructive tools for real-time prediction of herbage mass and nutritive value, respectively of rotationally grazed pasture. Sixty (60) herbage samples were cut from three (3) rotationally grazed paddocks to determine herbage mass (HM) and nutritive value [crude protein (CP), apparent neutral detergent fiber (aNDF), apparent acid detergent fiber (aADF) and *in vitro* organic matter digestibility (IVOMD)] after leaf area index (LAI) and light interception (LI) [PAR Ceptometer], sward height (SH) and chlorophyll index (CI) [FieldScout CM] measurements were taken. There were strong positive correlations between sward physical characteristics and CI (r^2 = 0.74 to 0.90) and between CI and CP (r^2 = 0.81). The LAI (Y = 4, 287x − 1762) and LI (Y = 149.9x − 5, 925) accounted for 81 % and 75 % of variability in HM, respectively. The CI accounted for a maximum of 68 % variability of CP. However, concordance correlation coefficient (CCC) of these prediction models were poor. Models with highest prediction accuracy for HM were those with SH (c_b= 0.89) and LAI (c_b= 0.81). Regression

bias was the main sources of error for HM prediction models, while the primary error for CI predicted aNDF (75.4 % MSPE) and IVOMD (95.5 % MSPE) occurred at random. It was concluded that the PAR Ceptometer produced unreliable estimates of HM while the FieldScout CM is capable of producing reliable predictions of aNDF and IVOMD of rotationally grazed mixed *Brachiaria arrecta* and *Digitaria eriantha* pastures.

Keywords: Leaf area index, Light interception, Chlorophyll index, Prediction model

Source https://doi.org/10.1016/j.atech.2022.100037

LOW NITROGEN FERTILISER RATES AND STAGE OF MATURITY INFLUENCE NITROGEN FRACTIONATION AND *IN VITRO* RUMINAL NITROGEN DEGRADABILITY IN TROPICAL GRASSES

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This study evaluated the interactive effects of low rates (0, 25, 50 and 75 kg N ha^{-1}) of nitrogen (N) fertilizer application and stage of maturity on total N, N fractions and *in vitro* ruminal N degradability in *Brachiaria* hybrid, *Megathyrsus aximus* and *Paspalum atratum*. The grasses were harvested at 4-, 8- and 12-weeks regrowth, except for *P. atratum* that was harvested at 6 and 12 weeks. There was a significant N fertilizer rate × stage of maturity interaction ($p < 0.001$) on total N, buffer soluble N (BSN), buffer insoluble N (BISN), acid detergent insoluble N (ADIN) and *in vitro* ruminal N degradability (ND) in all grass species. Total N, BISN and *in vitro* ruminal N degradability increased linearly with N fertilizer rate up to 50 kg ha^{-1} in *Brachiaria* hybrid and *M. maximus* and were highest in grasses harvested at 4 weeks maturity. Nitrogen fertilization rate was positively correlated with total N, BISN ($r = 0.70$ to 0.97) and ND ($r = 0.60$ to 0.98) in *Brachiaria* hybrid and *M. maximus* forage. We concluded that N fertilisation rate of 50 kg ha^{-1} per application interval is adequate to improve N, N fractions and N degradability of tropical grass forage.

Keywords: *Brachiaria* hybrid, buffer soluble nitrogen, *Megathyrsus maximus*, *Paspalum atratum*

Source *https://doi.org/10.2989/10220119.2021.1931446*

PROTEIN REQUIREMENT OF THE JUVENILE RED-RUMPED AGOUTI (*DASYPROCTA LEPORINA*) FED DIETS FORMULATED WITH TROPICAL FORAGES

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The rearing of neotropical animals for meat has the potential to improve food security in the Caribbean, South and Central America. Neo-tropical animal species are well adopted to these environments and can be maintained on unconventional feedstuffs such as forages, fruits and vegetable waste. The red-rumped agouti (*Dasyprocta leporina*) is a neotropical animal with potential for captive rearing for meat production. However, its dietary protein requirements are largely unknown. Therefore, this study was done to investigate protein requirements in captive reared juvenile male agoutis. Nine juvenile male agoutis were allocated to one of three treatment groups with varying levels of crude protein (CP). The treatment groups were low crude protein (LP – 100 g/kg DM), medium crude protein (MP – 125 g/kg DM) and high crude protein (HP – 150 g/kg DM). After an initial 6-weeks adaptation period, measurements of dry matter and nutrient intake and weight gain were recorded weekly for 5 weeks. Daily CP intake was unaffected by dietary CP levels ($P > 0.05$). However, apparent CP digestibility (61.2 %) and intake of digestible CP (4.5 g/day) were highest with MP diet. Dry matter intake of LP diet was 17 % and 39 % higher than

MP and HP diets, respectively. Intake of gross energy was highest (1.2 MJ/day) in agoutis fed the LP diet. It was therefore concluded that dietary CP of 100 – 125 g/kg DM can satisfy minimum daily intake of 4.0 g digestible CP which was adequate to achieve average daily gain of approximately 5.0 g in the captive reared juvenile male agouti.

Keywords: Digestible crude protein, CP intake, dry matter intake, daily weight gain

NITROGEN AND CRUDE PROTEIN FRACTIONS OF COMMERCIAL CONCENTRATE FEEDS FORMULATED FOR RUMINANTS IN TRINIDAD AND TOBAGO VARIES WITH FEED TYPES

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Commercial concentrates are the main supplemental feeds used by farmers in Trinidad and Tobago (T&T) to off-set nutritional or herbage deficit of forage-based diets for ruminants. While the CP contents of these commercial feeds are known, the quality of the protein for different classes of ruminants is unknown. Therefore, this study examined the nitrogen (N), crude protein fractions and ruminal CP degradability of the most popular concentrate feeds used for feeding ruminants in T&T. Samples of eight (8) commercial concentrate feeds from the two leading manufacturers were collected over a five-months (5) period and evaluated for total nitrogen (N), buffer soluble N (BSN), buffer insoluble N (BISN), non-protein N (NPN), neutral detergent insoluble N (NDIN), acid detergent insoluble N (ADIN), protein fractions A, B_1, B_2, B_3, C, true protein, rumen degradable protein (RDP), rumen undegradable protein (RUP) and *in vitro* ruminal crude protein degradability. Dairy ration-2 (206 g/kg DM) and Small ruminant ration-2 (139 g/kg DM) had highest and lowest CP contents, respectively. All-purpose ration-2 had the highest BSN (336 g/kg DM) and NPN (189 g/kg DM) and lowest ADIN (21.1 g/kg DM) and BISN (664 g/kg DM) contents. Crude protein fraction B_1 was lowest while B_2 highest in Dairy ration-2. Dairy ration-2 also had the highest concentration of RUP (150 g/kg DM) and Small ruminant ration-1 the lowest (82.6 g/kg DM).

Highest 3-h *in vitro* ruminal CP degradability was observed in All-purpose ration-2. It was therefore concluded that N and CP fractions of commercial concentrate feeds in T&T varies with feed type. Dairy ration-2 and Small ruminant ration -2 can supply the most RUP for the lactating dairy cow and fattening lamb, respectively, making them the best concentrate feeds on the market for these classes of ruminants.

Keywords: Rumen degradable protein, rumen undegradable protein, buffer soluble N, *in vitro* ruminal CP degradability, non-protein nitrogen

ESTIMATION OF THE BEST OPERATING CONDITIONS FOR LAYER PRODUCTION FOR THE NOVEGEN BROWN LAYER STRAIN OF BIRDS IN TRINIDAD AND TOBAGO: A BIO-ECONOMETRIC ANALYSIS

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Background CARICOM countries produce 122 million dozen eggs per year and is close to 100% self-sufficiency. In response to climate change and a warmer weather, predictions are that the layer industry will be faced with heat stress, and this will seriously affect the layer industry. The industry as a mitigating factor need to start exploring the use of more robust strain that may show heat tolerance and good adaptability. The NOVOgen brown is one strain, which seems to outperform the classic brown strain of layers. A study was conducted in Tobago. **Objective:** The main objective of the study was to identify the critical points that would give the best operating conditions for this strain. **Methods:** A quadratic four-variable with linear term production function model was estimated using regression. Calculus techniques were then applied to the model. **Results:** The data indicated that the mean quantity of eggs produced was 234(st.dev =135) dozen of eggs. Average feed consumption was 0.91 kg (st.dev.0.2kg) of

feed per week and an average stocking density of 0.17 (st.dev. =0.24) m^2 of floor space). The theoretical maximum quantity of eggs produced was calculated as 860 dozen of eggs per week. The best operating conditions occurred at a temperature humidity index of 27.30, birds were consuming 1kg of feed on a weekly basis, they were 22 weeks in their laying cycle, and they had a stocking density of 0.1944m^2 of floor space per bird. **Conclusions:** It was concluded that the best operating conditions fell within the industry standard. If farmers were able to achieve all these conditions simultaneously then egg production could be increased by 360 dozen of eggs on a weekly basis.

Keywords: Estimation, Layer productivity, Tobago, Novegen Brown

ASSESSING VULNERABILITIES TO CLIMATE CHANGE IN TRINIDAD & TOBAGO USING A RAPID VULNERABILITY ASSESSMENT

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Background/justification: In recent times, the impacts of climate change can be undeniably seen across the globe. These impacts can be devastating not only ecologically but socially as well; in particular to those who reside in coastal communities and depend on the sea and other related natural resources for their livelihood. The nexus between climate change and poverty is an understudied concept in the Caribbean and therefore this study is significant in addressing this pressing issue. This study assesses vulnerability in the coastal community of Orange Valley, Trinidad & Tobago as an example of how other small, coastal communities in Small Island Developing States (SIDS) can use a multi-disciplinary lens for positive community change. **Objectives:** To understand the triggers that affect household vulnerability and equally important, the mitigation and explore existing, and find new adaptation strategies that these households can use to combat the impacts of climate change. **Methodology:** A Rapid Vulnerability Assessment (RVA) was used. There are many conceptualizations of RVAs but the one employed was participatory in nature to illustrate a 'ground-up' approach. The RVA was conducted through community engagement workshops and focus groups, based on the Sustainable Livelihood Framework.
Results: Over the past twenty years, residents of the community have seen numerous climatic and non-climatic events which have had an impact on their livelihoods. The

novel Corona Virus, storm surges, increased flooding in areas historically not so prone, crime, and other events that stymie their livelihoods were recorded. Relative poverty as well as transient poverty abound. Residents noted that increased incidence of climate change can exacerbate their precarious position. **Conclusion:** Intervention is needed in areas that promote livelihood diversification as well as capacity building is needed for the village council to advance residents' interests.

Keywords: Vulnerability Assessment, Sustainable Livelihood Framework, Climate change, Caribbean

REGIONAL FARM-LED AGRICULTURAL PRACTICES

USING GROUP MODEL BUILDING TO DESCRIBE THE SYSTEM DRIVING UNHEALTHY EATING AND IDENTIFY INTERVENTION POINTS - A PARTICIPATORY, STAKEHOLDER ENGAGEMENT APPROACH IN THE CARIBBEAN

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Background/justification: Many Small Island Developing States of the Caribbean experience a triple burden of malnutrition with high rates of obesity, undernutrition in children, and iron deficiency anemia in women of reproductive age, driven by an inadequate, unhealthy diet. **Objective:** This study aimed to map the complex dynamic systems driving unhealthy eating and to identify potential points for intervention in three dissimilar countries. **Methodology:** Stakeholders from across the food system in Jamaica (n = 16), St. Kitts and Nevis (n = 19), and St. Vincent and the Grenadines (n = 6) engaged with researchers in two group model building (GMB) workshops in 2018. **Results:** Participants described and mapped the system driving unhealthy eating, identified points of intervention, and created a prioritized list of intervention strategies. Stakeholders were also interviewed before and after the workshops to provide their perspectives on the utility of this approach. Stakeholders described similar underlying systems driving unhealthy eating across the three countries, with a series

of dominant feedback loops identified at multiple levels. Participants emphasized the importance of the relative availability and price of unhealthy foods, shifting cultural norms on eating, and aggressive advertising from the food industry as dominant drivers. They saw opportunities for governments to better regulate advertising, disincentivize unhealthy food options, and bolster the local agricultural sector to promote food sovereignty. They also identified the need for better coordinated policy making across multiple sectors at national and regional levels to deliver more integrated approaches to improving nutrition. **Conclusion:** Group Model Building proved to be an effective tool for engaging a highly diverse group of stakeholders in better collective understanding of a complex problem and potential interventions.

Keywords: NCDs, Unhealthy Diet, Small Islands, Systems Science

FOOD SELF-SUFFICIENCY POTENTIAL IN THE CARIBBEAN: A BACK OF THE ENVELOPE CALCULATION AND SOME FOOD SECURITY INTERPRETATIONS

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Food security has for a long time been at the forefront of the Caribbean policy discourse. In this context, it is critical to distinguish between concepts such as food security, nutrition security, food sovereignty, food self-reliance and food self-sufficiency. This study contains a simple calculation of the potential for food self-sufficiency in the Caribbean, i.e. the extent to which countries can satisfy their food needs from own domestic production. The results indicate overall low levels of food self-sufficiency potential. The implications are interpreted in the current context of North America dominated food imports in relation to the potential for enhancing regional trade complementarity and food security.

MODELLING CARIBBEAN FOOD IMPORT DEMAND USING ERROR-CORRECTED LA-AIDS

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Background/justification: Developing countries, such as those in the Caribbean, can rely on estimates of determinants of aggregate food imports to guide policy. However, the trade-offs and complementarity among key food groups, based on trade categories, are critical for policy makers to understand demand needs and potential shortfalls as global food prices fluctuate, relative to local prices for specific food types. This study fills the data gap for the Caribbean in this area of research. **Objectives:** This study aims to: (i) explore the time series properties of the data and determine if a dynamic specification is necessary; (ii) develop a theoretically consistent empirical framework that can be used to estimate the demand for imported food within the Caribbean; and (iii) to calculate reliable long- and short-run price and income elasticities of demand for the eight imported food groups. **Methodology:** This study compares the static and an error-corrected dynamic linear approximate almost ideal demand system model to study the import demand for eight major food categories within the Caribbean region between 1961-2019: dairy and eggs, fats and oils, fruits and vegetables, meat and seafood, staples, sugar and honey, spices and tea, and beverages. **Results:** It was found that imported food within the region are all normal goods. In addition, imported food was found

to have more elastic demand in the long-run but inelastic demand in the short-run. **Conclusion:** The difference in the magnitude of the estimated elasticity parameters in both time horizons indicates the need to adopt a dynamic approach in the calculation of import demand elasticities since they are extremely valuable in policy analysis.

Keywords: LA-AIDS, Food Import Demand, Elasticities, Error-Correction Model

AN AGGREGATE FOOD IMPORT DEMAND FUNCTION FOR THE CARIBBEAN: A COINTEGRATION ANALYSIS

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Background/justification: The concept of the determinants of import demand has become a major policy issue in most developing countries, especially due to persistent high Food Import Bills, alongside significant trade deficits, which negatively impact the economy. Therefore, this study empirically examined the factors determining import demand in the Caribbean to provide up-to-date estimation, policy advice and fills the existing gap in the empirical literature in this area. **Objectives:** This study aims to: (i) examine the effects of relative prices, per capita real income, tourist numbers, export revenue, and domestic food production on the region's food import demand; (ii) determine if there exists a long-run, short-run, or both relationships among demand determinants; and (iii) estimate and interpret price and income elasticities of aggregate food import. **Methodology:** Cointegration analysis to examine aggregate annual food import demand in the Caribbean between 1979 and 2018. The long- and short-run relationships were estimated between food imports, relative prices, real per capita income, tourist numbers, export revenue from merchandise, and domestic food production using the autoregressive distributed lag model

and bounds testing approach. **Results:** The augmented Dicky-Fuller test confirmed non-stationarity of the model variables. Once cointegration was established, an error-correction model was specified to separate the food import demand's long-run and short-run dynamics. Real per capita income, tourist visits, and domestic food production were major determinants of food import demand in both time horizons, while relative prices had little impact on food import. **Conclusion:** Imported food was found to be price inelastic. The adjustment parameter revealed that about 97.5% of short- to long-run disequilibrium is corrected yearly. Increases in local food production has the most potential to dampen the growth rate of food import volumes, followed by potential increases in price ratios. Regional governments should therefore focus on rapidly increasing local food production to reduce the region's Food Import Bill.

Keywords: Caribbean, Cointegration, Error-Correction Model, Food Import

MAMMARY DISEASES IN A CAPTIVE REARED AGOUTI (*DASYPROCTA LEPORINA*) IN TRINIDAD

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Introduction: The agouti (*Dasyprocta leporina*) is a neotropical rodent that is utilized for its meat by hunters as well as wildlife farmers. There is a dearth of information on infectious diseases that affect these animals. At present, there has been no recording in the literature on diseases of mammary tissue in these animals. **Objectives**: The objective of this report is to report the cause of the enlarged mammary tissue in a captive reared female agouti. **Method**: This case reported on the abnormal mammary enlargement of a four year old female agouti post-partum. Blood, milk and tissue samples were taken for diagnostics to determine the cause of disease. Histological samples confirmed the swelling of the mammary gland as a diffuse mammary hyperplasia. Hematological values obtained were within the reference range of agoutis reared in captivity. **Results:** The milk samples that were taken cultured Staphylococcus spp. in one mammary gland (left inguinal). The cultured bacteria in the milk samples confirmed this animal had mastitis. The bacterial cultured (*Staphylococcus aureus*) was sensitive to tetracyclines, ampicillin, trivetrin and ceftiofur. **Conclusion**: To the authors' knowledge, this is the first record in the literature on mastitis in the agouti. Thus, this information will add to the knowledge of diseases in captive reared agoutis.

Keywords: Staphylococcus aureus, mammary gland hyperplasia, wildlife farmers, infectious diseases

Source: Jones, Kegan Romelle, Kavita Ranjeeta Lall, Rod Suepaul, and Gary Wayne Garcia. 2020. "Mammary Diseases in a Captive Reared Agouti (Dasyprocta leporina) in Trinidad" Veterinary Sciences 7, no. 3: 137. https://doi.org/10.3390/vetsci7030137

ANTHELMINTIC USAGE ON THE PERFORMANCE OF THE AGOUTI (*DASYPROCTA LEPORINA*) REARED INTENSIVELY IN TRINIDAD AND TOBAGO, WEST INDIES

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Introduction: Anthelmintic drugs have been used strategically in livestock reared in the tropics. These drugs have been used in the treatment of endoparasitism which have resulted in an increase in the animals' performance. The agouti (*Dasyprocta leporina*) is a neo-tropical rodent with the potential for domestication and has been farmed intensively in Trinidad.**Objectives**: However, the objective of this research was to investigate the effect of anthelmintic use of the growth performance of the agouti. In searching the literature, it was found that this type of study on the agouti has not been done. **Method:** In this experiment fourteen weaned agoutis weighing 1kg were divided into two groups randomly. The first group (T1) was not given any anthelmintic treatment but the second group (T2) was treated with Endovet Ces® subcutaneously every three months. **Results**: There were no significant differences ($p > 0.05$) between the two groups in the carcass weight, weight gain, dressing percentage (hot and cold), heart, lungs, skin, head and feet. However, a significant difference ($p < 0.05$) was seen between groups in the weight of liver and pluck. To the authors knowledge this is the first time that carcass parameters has been presented in literature. The live weight of the animals at the end of the experiment ranged from 2.4 kg to 2.6 kg and animals had a dressing percentage of 57% to 55%. **Conclusion**: The results are

suggestive that the use of anthelmintic drugs in agoutis reared intensively had no significant effect on weight gain and dressing percentage.

Keywords: *Dasyprocta leporine*, agouti, anthelmintic, dressing percentage, Trinidad

Source: Jones, K. R., and G. W. Garcia. "Anthelmintic usage on the performance of the Agouti (Dasyprocta leporina) reared intensively in Trinidad and Tobago, West Indies." Brazilian Journal of Biology 83 (2021) https://doi.org/10.1590/1519-6984.246780

NUTRITIVE VALUE OF AGOUTI (*DASYPROCTA LEPORINA*) MEAT IN COMPARISON TO SELECTED DOMESTICATED ANIMALS

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Introduction: Presently the world is facing tremendous challenges in feeding persons who reside in developing countries. This is due, among other factors, to increasing incidences of global pandemics and climate change. As such alternative protein sources must be investigated. One such protein source for human consumption can come from the wildlife or non-domesticated neo-tropical animals. One such animal is the agouti (*Dasyprcota leporina*) that has been reported to have the potential to be domesticated. If this animal species is to be used as an animal protein for humans, the nutritive value of its meat must be known. **Objectives**: To the authors' knowledge there is little information on the nutritive content of agouti meat. As such the aim of this experiment was to record the proximate composition and mineral content of agouti meat. **Method**: The meat parameters of the agouti were also compared to other domesticated species (chicken, rabbit and guinea pig). Meat samples from each species were analysed to determine mineral content, proximate composition as well as fatty acid composition.

Results: Results showed that the agouti had the highest protein (22.18%) content with the lowest fat (1.96%) and energy (22.50 kJ/g) content when compared with the

domesticated species. The mineral analysis showed that agouti meat had the highest iron (87.21µg/g). The agouti and guinea pig had the lowest sodium (7624 and 2135µg/g) contents in comparison to chicken and rabbit. The fatty acid profile of agouti meat was not analysed and this is an area in urgent need for investigation. However, the fatty acid analysis was done for guinea pig, rabbit and chicken meat. The guinea pig meat was found to have the lowest saturated fatty acids (29.06%) and the highest polyunsatured fatty acids (41.92%). This showed that guinea pig meat is a healthy option for human diets if taken in the correct amounts. **Conclusion**: This study proves that the agouti and guinea pig meat can be a healthy alternative source of animal protein for the developing countries and with further research can be developed into a functional food.

Keywords: polyunsaturated fatty acids, saturated fatty acids, developing countries, functional foods

Source: Jones, Kegan Romelle, Candice Kistow, Deron James, and Gary Wayne Garcia. (2021)."Nutritive value of agouti (Dasyprocta leporina) meat in comparison to selected domesticated animals." Tropical Agriculture 98, no. 4,395-405

SYSTEMIC BACTERIAL INFECTION IN A CAPTIVE AGOUTI (*DASYPROCTA LEPORINA* LINNAEUS, 1758)

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Introduction: The agouti (*Dasyprocta leporina*) is a neotropical rodent which has the potential to be domesticated. As such, some research studies have been done on the biology of this animal. Recently, these animals are being kept in captivity as a source of animal protein. Animals which are kept in captivity may present diseases that would not have been reported in the wild due to lack of observation or the lack of occurrence.

Objectives: The aim of this short communication is to report a case of systemic bacterial infection that affected the lungs and liver of a captive agouti. **Method**: This case reported on the abnormal mammary enlargement of a four year old female agouti post-partum. Blood, milk and tissue samples were taken for diagnostics to determine the cause of disease. Histological samples confirmed the swelling of the mammary gland as a diffuse mammary hyperplasia. Hematological values obtained were within the reference range of agoutis reared in captivity.

Results: Bacterial analysis revealed that the infection was caused *by Escherichia coli*. Bacterial infections have been reported in the mammary tissue as well as the skin of the agouti, but to the authors' knowledge, this is the first report of systemic infection in the agouti affecting several organs. This case was seen in a nine-month-old male agouti that was being housed at the University of the West Indies Field Station (UWI, UFS). The animal showed no apparent sign of disease except for lethargy and subsequently died

before any treatment was administered. **Conclusion**: These findings showed that the agouti may have been under some stress (nutritional or environmental) which predisposed this animal to this infection. Future work has to address the nutritional requirements for the growing agouti as well as some treatment options for managements of similar cases in the future.

Keywords: Escherichia coli, mammary gland, wildlife farmers, infectious diseases

Source: Jones, Kegan Romelle, Kavita Ranjeeta Lall, Rod Suepaul, and Gary Wayne Garcia. 2020. "Systemic Bacterial Infection in a Captive Agouti (Dasyprocta leporina Linnaeus, 1758)", The Scientific World Journal, vol. 2022, Article ID 8300247, 5 pages, 2022. https://doi.org/10.1155/2022/8300247

MORPHO-HISTOLOGICAL STUDIES OF THE GASTROINTESTINAL TRACT OF THE ORANGE-RUMPED AGOUTI (*DASYPROCTA LEPORINA* LINNAEUS, 1758), WITH SPECIAL REFERENCE TO MORPHOMETRY AND HISTOMETRY

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Introduction The agouti (*Dasyprocta leporina*) is a neo-tropical rodent that has the potential to be domesticated. These animals are considered to be omnivores from studies conducted in the wild and in captivity. However, an in-depth morphometric and histometric analysis of the gastrointestinal tract of this animal was never conducted. **Objectives**: Thus, the objective of this paper was to give a quantitative analysis of the gastrointestinal tract of the agouti and relate it to the feeding habits of the animals. **Method:** Six adult male *D. leporina* were collected for this study from the Neotropical Wildlife Unit at The University of the West Indies Field Station (UFS) in Valsayn, Trinidad and Tobago. Gross *in situ* morphological observations were then made and photographed. The entire gastrointestinal tract from the esophagus to the anus was removed, and the length of the different segments was measured. Gross anatomical features were examined in each segment, and specimens were collected and preserved in formalin and embedded in paraffin for histologic examination. The relative size of each segment of the digestive tract was determined by dividing the segment length by the length of the entire digestive tract. Tissue samples collected for histological examination were fixed in 10% buffered neutral formalin and processed for routine paraffin embedding. **Results**: The digestive

tracts of six adult males were used for this study. The results showed that the esophagus was thick (mean thickness of 1023.78 ± 28.97 µm) and lined by keratinized epithelium with scant esophageal glands. Mucosa-associated lymphocytic infiltration was robust throughout the GI tract. These findings suggest that the esophagus was well adapted to a coarse diet. The simple stomach with well-developed gastric glands in the fundus region (mean thickness of 605.39 ± 28.68 µm) was indicative of an adaptation to a carnivorous diet. The small intestine constituted approximately 80% of the length of the GI tract. The remarkable development of the jejunum with a greater villus length (mean thickness of 182.50 ± 27.38 µm) indicated a greater absorptive capacity in frugivorous and carnivorous diets. The long cecum and well-developed colon clearly indicated that the GI tract was well adapted to frugivorous and herbivorous diets. Overall, *D. leporina* showed that it is well adapted to an omnivorous diet.
Conclusion: These results suggest that *D. leporina* can be fed a balanced omnivorous dry diet with a high protein content of plant or animal origin that is well suited to the architecture of the GI tract in captivity.

Keywords: agouti, gastrointestinal tract, gross anatomy, histology, histometry, morphometry

Source: Jones, Kegan Romelle, Roger Edmund John, and Venkatesan Sundaram. 2022. "Morpho-Histological Studies of the Gastrointestinal Tract of the Orange-Rumped Agouti (Dasyprocta leporina Linnaeus, 1758), with Special Reference to Morphometry and Histometry" Animals 12, no. 19: 2493. https://doi.org/10.3390/ani12192493

ANATOMY OF THE VERTEBRAL COLUMN, RIBS AND STERNUM IN ORANGE RUMPED AGOUTI (*DASYPROCTA LEPORINA* LINNAEUS, 1758): STRUCTURAL AND FUNCTIONAL PERSPECTIVES

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Introduction: The orange rumped agoutis (*Dasyprocta leporina*) are large, frugivorous rodents that belong to the order Rodentia and infraorder. Caviomorpha, a rodent infraorder with diversified anatomical characters among the members. *D. leporina* is a very popular exotic meat in Trinidad and Tobago with an estimated 90,000 agoutis hunted in Trinidad and Tobago during the hunting season every year. **Objectives**: The present study aims to investigate the gross and radiographic anatomy of the axial skeleton of this animal. These descriptive data from the present study will assist clinicians in radiographic assessment in clinical practice and serve as a base for future biomechanical, taxonomical and domestication studies on these rodents. **Method:** A total of eight adult orange rumped agoutis of both sexes including 5 males and 3 females (more than 2 years old) were purchased from wildlife farmers in Trinidad. The animals were euthanized by the use of a mixture of ketamine (35 mg/kg body weight) and xylazine (5 mg/ kg body weight). The digital radiographic images were obtained by Siemens mobile full-wave X-ray machine (Siemens Medical Solutions, Erlangen, Germany) using the following settings: 65 kV, 200 mA, exposure time of 0.08 s and 100 cm focus film distance. **Results**: The vertebral formula was found to be $C_7T_{12}L_7S_5Cy_{5–6}$. The well-developed occipital crest,

caudally oriented prominent axis spine and well-developed transverse processes from C3–C7 indicated a highly flexible neck with greater sagittal mobility. Articular facets were horizontal in anterior series while oblique in the posterior series, which enabled them to perform both lateral and sagittal movements during locomotion. The caudally directed thoracic spines, T12 as anticlinal vertebra and prominent mamillary process in the posterior series were suggestive of strong dorso-ventral flexion/extension and rotation. The robust lumbar vertebrae, well-developed transverse processes with cranio-ventral extension, were the feature for powerful sagittal/dorsoventral movement. The presence of spinous processes and well-developed transverse processes in all caudal vertebrae was an indication of a highly movable tail. The ribs were 13 pairs with first seven as sternal and six as asternal. They were laterally compressed in the anterior series as a cursorial adaptation. **Conclusion**: Strong muscular attachment to vertebrae provides this rodent speed, agility, dexterity and strength suitable for survival in food.

Keywords: cursorial adaptations, *Dasyprocta leporina*, functional morphology, vertebral column

Source: Sundaram, V., Jones, K., Mootoo, N., & Tomar, M. P. S. (2021). Anatomy of the vertebral column, ribs and sternum in orange rumped agouti (Dasyprocta leporina Linnaeus, 1758): Structural and Functional perspectives. Anatomia, Histologia, Embryologia, 50, 985– 995. https://doi.org/10.1111/ahe.12742

CARCASS FABRICATION: NON-DOMESTICATED NEOTROPICAL MAMMALS VS. SELECTED DOMESTICATED LIVESTOCK

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Introduction: The agouti (*Dasyprocta leporina*) is a rodent belonging to the family Dasyproctidae that is found in the Neotropics. The agouti is hunted in the wild and farmers have begun rearing the animals intensively. The animal is a source of meat protein for rural villages in this region. **Objectives**: The objective of this research was to investigate the fabricated carcass of two non-domestic neotropical mammals; the agouti and the manicou and compare it to two domesticated animals.
Method: This study compared the various meat cuts and fabricated parts of selected domesticated and non-domesticated neotropical mammals. The domesticated animals utilized were eight chicken (*Gallus domesticus*) and eight rabbits(*Oryctolagus cuniculus*),whilst the non-domesticated species were eight agoutis (*Dasyprocta leporina*) and three manicous (*Didelphis marsupialis insularis*). The carcasses were processed in two ways; four carcasses were singed and the other four carcasses were processed by removing the skin with a knife. The manicous' carcasses were only singed. They were captured by hunters in comparison to the chickens, rabbits and agoutis which were reared in captivity. The agoutis were fed local crops and vegetables and were supplemented with commercial ration (Mastermix®). However, for the chickens and the rabbits, the majority of their diets consisted of commercial ration (Mastermix ®)
Results: The chickens and rabbits had the greater live

weights in comparison to the agoutis. The chickens had the highest live weight (3725 ± 167 g), the agoutis had the lowest live weight (2614 ± 354 g) and the rabbits had a live weight of 2691 ± 283 g, between that obtained from the chickens and agoutis. The agoutis and manicous also had less hot carcass weights in comparison to the chickens and rabbits. There were no live weights recorded for manicous, due to the fact that the manicous were collected by hunters in the forests. The hunters only recorded the carcass weights after the animals were eviscerated. The manicous and the agoutis produced less carcass weight and meat in comparison to the domesticated species, but were considered more sustainable because they can be fed crop and agricultural by-products, which are not fit for human consumption, and convert them into animal protein for human consumption. **Conclusion**: Further work must be done on the non-domesticated species to attain the growth rates and the most economical time period for market

Keywords: Agouti (*Dasyprocta leporina*), rabbit (*Oryctolagus cuniculus*), manicou (*Didelphis marsupialis insularis*), chicken (*Gallus domesticus*)

Source: Nunes, Khyla Kelsha, Gary Wayne Garcia, and Kegan Romelle Jones. (2020) "Carcass fabrication: non-domesticated neotropical mammals vs. selected domesticated livestock." Tropical Agriculture 97, no. 3, 197-203.

IS THE STRATEGIC USE OF AN ANTHELMINTIC NECESSARY IN THE MANAGEMENT OF AGOUTI (*DASYPROCTA LEPORINA*)?

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Introduction: Agouti (*Dasyprocta leporina*) is a rodent that is found in the neotropical region. This animal is hunted for its meat but has recently been reared in captivity as a source of meat protein in rural communities. **Objectives**: The objective of this study, therefore, was to investigate the effect of an anthelmintic on the growth and reproductive performance of agouti.**Method:** This study was done in two phases, with the first phase investigating the growth and carcass parameters of agouti. The second phase investigated the effect of an anthelmintic on reproductive performance. In the first phase of the experiment 14 weaned agoutis, each weighing around 1 kg, were divided randomly into two groups. The first group was not given any anthelmintic treatment but the second group was treated with Endovet Ces® subcutaneously for every 3 months. **Results**: There were no significant differences ($P > 0.05$) between the two groups in the carcass weight, weight gain, dressing percentage (hot and cold), heart, lungs, skin, head and feet. However, a significant difference ($P < 0.05$) was seen between groups in the weight of liver and pluck. The live weights of the animals, at the end of the experiment, for animals that were not dewormed and those that were dewormed were 2.4 kg and 2.6 kg respectively. The dressing percentage of animals in the treatment groups were 57% and 55%. The results suggest that the use of anthelmintic drugs in agoutis reared intensively had no

significant effect on weight gain and dressing percentage. The second phase was a 20-month experiment that was carried out to evaluate the effect of an anthelmintic on the growth and performance of agouti reared in captivity; thirty-two animals were divided in two treatment groups (15 females and one male for each group) based on a randomized study design. In the first group (control group), animals were not given subcutaneous injections of Endovet Ces® (ivermectin and praziquantel) at 0.2 mg/kg every 3 months. The second group was given Endovet Ces® every 3 months. Reproductive data were collected at parturition including birth weight, litter weight, litter size and gender of offspring. The results showed that there was no statistical difference ($P > 0.05$) between the treatment groups with respect to birth weight, litter weight, litter size and gender. **Conclusion**: Therefore, these animals can be kept in captive conditions, without being dewormed, to produce efficiently with proper feeding and housing management.

Keywords: *Dasyprocta leporina*, agouti, anthelmintic, dressing percentage, Trinidad

Source: Jones, Kegan Romelle, and Gary Wayne Garcia. (2020)"Is the strategic use of an anthelmintic necessary in the management of agouti (Dasyprocta leporina)?." Tropical Agriculture 97, no. 4, 281-291.

ANTHELMINTIC USAGE ON THE REPRODUCTIVE PARAMETERS IN CAPTIVE REARED AGOUTIS (*DASYPROCTA LEPORINA*) IN TRINIDAD AND TOBAGO, WEST INDIES

Kegan R. Jones and Gary W. Garcia

The University of the West Indies, St Augustine

Introduction: The agouti (*Dasyprocta leporina*) is a rodent belonging to the family Dasyproctidae that is found in the Neotropics. The agouti is hunted in the wild and farmers have begun rearing the animals intensively. The animal is a source of meat protein for rural villages in this region. **Objectives**: The objective of this project was to observe the effect of anthelmintic use on the reproductive performance of captive reared agoutis. **Method**: A 20-month experiment was carried out to evaluate the effect of an anthelmintic on the reproductive performance of the agouti (*Dasyprocta leporina*) reared in captivity. This experiment was conducted in the humid tropics of Trinidad and Tobago. Sixteen animals (15 females, 1 male) placed in each of the two treatment groups in a completely randomized study design. In treatment 1 (T1) animals were given subcutaneous injections of Endovet Ces® (Ivermectin/Praziquantel) at 0.2 mg/kg every three months. Treatment 2 (T2) was the negative control group where animals were not exposed to an anthelmintic. Reproductive data were collected at parturition which included birth weight, litter weight, litter size and gender of offspring. **Results**: The results showed that there was no statistical difference ($p > 0.05$) between the treatment groups with respect to birth weight, litter weight, litter size and gender. However, agoutis that were dewormed had a higher birth weight (220.24 g vs 209.1 g) and litter weight (369.8 g vs 343 g). The same values were obtained for the

litter size (1.7 vs 1.7) and animals that were dewormed had a higher female offspring to male offspring (2.41:1 vs 1.11:1). This experiment demonstrated that the use of an anthelmintic strategically in the management of captive reared agoutis had no statistical effect ($p > 0.05$) on the reproductive parameters. **Conclusion**: Therefore, these animals can be kept in captive conditions without being dewormed and produce efficiently with proper feeding and housing management.

Keywords*: Wildlife, mortality, Ces® Endovet, Ivermectina, Praziquantel*

Source: Jones, Kegan Romelle, and Gary Wayne Garcia. "Anthelmintic usage on the reproductive parameters in captive reared Agoutis (Dasyprocta leporina) in Trinidad and Tobago, West Indies." Brazilian Journal of Biology 83 (2021). https://doi.org/10.1590/1519-6984.246781

POST-WEANING PERFORMANCE OF THE AGOUTI (*DASYPROCTA LEPORINA*): A NEOTROPICAL RODENT WITH POTENTIAL FOR DOMESTICATION

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Introduction: In the neotropical region, agouti (*D. leporina*) is one of the most hunted species utilized as a source of meat protein. This rodent has been identified as a selective group of animal that has the potential to be domesticated, and some authors have also grouped them as mini-livestock. **Objectives**: This project aimed to observe the effect of different weaning times on the weight gain in agouti (*Dasyprocta leporina*). The goal was to acquire an appropriate weaning time for offsprings. **Method**: The experiment was performed at The University of the West Indies Field Station Farm (UFS) where animals were divided into four treatment groups, with each treatment group consisted of four animals. Treatment 1 offsprings were weaned at four weeks, treatment 2 offsprings were weaned at three weeks, treatment 3 offsprings were weaned at two weeks, and treatment 4 offsprings were weaned at one week. The offsprings were raised experimentally for their first seven weeks. **Results**: There was no significant difference ($P>0.05$) recorded in offsprings live weight and average daily gain (ADG) for treatments 1, 2, and 3. However, offsprings reared in treatment 4 had significantly ($P<0.05$) less live weight and weight gain in comparison to the other groups at seven weeks. Offsprings in treatment 4 also experienced 50% mortality (2/4 animals died), one animal removed from the experiment due to progressive weight loss, and one offspring remained in the experiment for its duration. The

other treatment experienced no loss (0% mortality). Based on the results of the experiment, agouti offsprings should not be weaned at one week due to high mortality and low live weight at the end of seven weeks. **Conclusion**: Animals can be weaned between 2 and 4 weeks of age with no detrimental effects. Dependent on the level of production, animals can be weaned at 2 or 4 weeks depending on the operators desired litters per year.

Keywords: Weaning age, wildlife, mortality, agouti

Source: Singh, Hanna-Maria Samantha, Kegan Romelle Jones, "Post-weaning Performance of the Agouti (Dasyprocta leporina): A Neotropical Rodent with Potential for Domestication", Veterinary Medicine International, vol. 2021, Article ID 6664656, 5 pages, 2021. https://doi.org/10.1155/2021/6664656

EVALUATION OF UNCONVENTIONAL SUPPLEMENTS TO THE DIET OF INTENSIVELY REARED AGOUTI (*DASYPROCTA LEPORINA*) IN TRINIDAD, WEST INDIES

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Introduction: A feed trial was carried out to evaluate potential unconventional feed resources such as *Trichanthera gigantica* and moruga hill rice (*Oryza glaberrima*) as a partial supplementation to the diet of adult male agoutis *(Dasyprocta leporina*). Supplemental feeding of the agouti will decrease feeding cost to produce this animal and aid in sustainable agricultural practices. Male agoutis were used as this physiological state was the easiest to attain as well as male animals are generally used for meat production. **Objectives**: The objective of the experiment was to investigate the effects on the live weight that feeding broken rice and hulls from the Moruga Hill Rice (*O. glaberrima*) and Trichanthera (*T. gigantica*) at different ratios will have on the agouti. **Method**: The trial consisted of 16 male agoutis that were allocated into four dietary treatments using a completely randomized experimental design. Four diet treatments were used in the experiment; treatment 1 (T1) was the positive control which consisted of rabbit ration whilst treatment 2 (T2) to 4 (T4) had different ratios *of O. glaberrima, Trichanthera gigantica* and Rabbit Ration. The feeding trial had 8-week duration. T2 consisted of 5% *T. gigantica*, 35% *O. glaberrima* supplemented for rabbit ration. T3 had 10% *T. gigantica* and 40% *O. glaberrima* supplemented for rabbit ration. T4 consisted of 15*% Trichanthera* and 45% *O. glaberrima* supplemented for rabbit ration in the diet.

Results: Proximate analysis showed that Dry Matter (DM) and Ash were highest in T4 and lowest in T2. Whilst ether extract (EE) and crude protein (CP) were highest in T2 and lowest in T4. Crude fibre (CF) was highest in T3 and lowest in T2. The weights of the agoutis at the start of the experiment (2595 g–2971 g) were not significantly different to their final weight (2469–2762 g) ($p > 0.05$). There was a significant difference seen between treatments groups and weeks of the experiment ($p < 0.05$). There was no significant difference in the interactions between treatment and weeks ($p > 0.05$). T1 and T2 were not significantly different ($p > 0.05$) with respect to average daily gain (−0.98 g/d, −1.61 g/d) and weight loss (55 g, 90 g). **Conclusion**: T2 can be used as an alternative feed source than rabbit ration (control diet) for adult male agoutis. As the final body mass of the male agoutis did not change with the inclusion of 40% *Trichanthera* and Moruga hill rice, this substitution can be used to maintain male agoutis before slaughter. However, higher amounts of supplements may be detrimental to this animal.

Keywords: *Trichanthera gigantica*, Oryza glaberrima, Moruga hill rice, agouti, rabbit ration,proximate analysis

Source: John, Eden Natalia, and Kegan Romelle Jones. 2020. "Evaluation of Unconventional Supplements to the Diet of Intensively Reared Agouti (Dasyprocta leporina) in Trinidad, West Indies" Veterinary Sciences 7, no. 3: 108. https://doi.org/10.3390/vetsci7030108

AN INVESTIGATION OF ENVIRONMENTAL CONDITIONS ON EGG PRODUCTION FOR THE NOVOGEN BROWN LAYER STRAIN IN A TROPICAL CLIMATE, TRINIDAD AND TOBAGO WEST INDIES

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Background: CARICOM countries food import bill is 4 billion US dollars, producing 122 million dozen of eggs per year and is close to 100% self-sufficiency. Thus, making egg production a major part of the agricultural sector in CARICOM enhancing the food and protein security of the region from the poultry sector. In response to climate change and a warmer Caribbean, predictions are that the layer industry will be faced with heat stress beyond the bird's comfort zone which will seriously impact the layer industry. The industry as a mitigating factor need to start exploring the use of more robust strain that may show heat tolerance and good adaptability. One recent strain in the market that have shown good promise is the NOVOgen brown® which seems to outperform the classic brown strain of layers. **Objective:** A study was conducted in Tobago to examine the effect of the tropical climate

(environmental parameter collected were ambient temperature, maximum and minimum humidity and THI) on egg production, feed intake and rectal temperature of the NOVOgen brown housed in open sided naturally ventilated house. **Methods:** A quadratic production function model was estimated using regression. Calculus techniques were then applied to the model. **Results:** The theoretical maximum quantity of eggs produced was 478.53 dozen at a temperature humidity index of 27.22. Bird RT between houses ranged from 40.46 to 40.70 ^{0}C which was within the normal range. **Conclusions:** It was concluded that the NOVOgen brown housed in open sided naturally ventilated house performed adequately under current climatic conditions in Tobago. However, at 1.5 ^{0}C warming as THI move above 27 this layers strain with in the region will start to experience a drop in egg production due to heat stress.

Keywords: Tobago, Novogen Brown, Egg production, Rectal Temperature.

OPTIMUM NITROGEN FERTILIZATION RATE AND NITROGEN USE EFFICIENCY FOR *BRACHIARIA* HYBRID AND *MEGATHYRSUS MAXIMUS* VARIES WITH STAGE OF REGROWTH

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Traditionally, recommended nitrogen (N) fertilization rates that maximize biomass yield and nutritive value in tropical grass forages tend to be fixed and do not consider possible stage of maturity-induced variations. Therefore, this study investigated biomass yield and nutritive value of *Brachiaria* hybrid and *Megathyrus maximus* at different stages of maturity in response to incremental levels of N fertilizer. Both grasses were fertilized with urea at rates equivalent to 0, 25, 50, and 75 kg N ha^{-1} and harvested after 4-, 8-, and 12-week regrowth. Crude protein (CP) had a linear response to increasing N fertilization at all stages of regrowth. Herbage yield of *M. maximus* was optimized with 57.1– 63.0 kg N ha^{-1}, while herbage yield in 4-weeks regrowth *Brachiaria* hybrid was optimized with 59.1 kg N ha^{-1}. The combination of herbage yield, 24-h *in vitro* organic matter digestibility, and CP were optimized with 59.1 and

68.2 kg N ha^{-1} in 4-weeks regrowth *Brachiaria* hybrid and 8-week regrowth *M. maximus*, respectively. The efficiency of N fertilizer use for herbage and CP yield was highest with 25 and 75 kg N ha^{-1}, respectively except for 8-weeks regrowth *Brachiaria* hybrid. It was concluded that the herbage yield and nutritive value of 4-weeks regrowth *Brachiaria* hybrid and 8-weeks regrowth *M. maximus* are optimized with 59.1 and 68.2 kg N ha^{-1}, respectively, while all other stages of regrowth were optimized with 75 kg N ha^{-1}.

Keywords: herbage characteristics, nutritive value, optimum N rate, ruminants, tropical forages

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NUTRITIVE VALUE AND HERBAGE MASS OF *PUERARIA PHASEOLOIDES* (TROPICAL KUDZU) IN UN-UTILIZED OPEN GRASSLANDS IN NORTH-EASTERN AND CENTRAL TRINIDAD AND TOBAGO

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Pueraria phaseoloides is an important forage for ruminants in the tropics. However, its nutritive value and availability in areas easily accessed by ruminants and ruminant farmers in Trinidad and Tobago is unknown. This study, therefore, evaluated the effects of harvest date and location on the nutritive value, herbage mass and crude protein yield of *P. phaseoloides* in un-utilized open grasslands in three locations with high livestock density in Trinidad. *Pueraria phaseoloides* herbage (whole fraction and leaf) trailing on the upper canopy of open un-utilized grasslands were harvested in the late wet season of 2019 (October - November), early dry (January - February) and early wet (July - August) seasons of 2020 following a stratified random sampling scheme. The crude protein (CP) concentrations of *P. phaseoloides* leaves (235 g/kg DM) and whole fraction (217 g/kg DM) were highest in Wallerfield during the early wet season. Neutral detergent fibre (NDF), acid detergent fibre (ADF) and lignin were lowest in the early dry season ($P < 0.01$). Crude protein yield (376–478 kg CP ha^{-1}) and herbage mass (1,742 – 2,654 kg DM ha^{-1}) were highest during the late wet and early dry season, respectively. In vitro organic matter digestibility (IVOMD) of *P. phaseoloides* leaf (548 – 598 g/kg) and whole fraction (549 – 580 g/kg) were highest in the late wet season. It was, therefore concluded that open un-utilized grasslands in Trinidad and Tobago produced significant amount of *P. phaseoloides* herbage year-round

to support ruminant livestock production. However, the nutritive value, herbage mass and CP yield of *P. phaseoloides* herbage were highest during the late wet and early dry seasons.

Keywords: Harvest date, Crude protein concentration, Crude protein yield, Season Tropical forages

Source https://doi.org/10.1016/j.jssas.2022.05.002

INTERACTIVE EFFECTS OF GROWTH STAGE AND NITROGEN FERTILIZATION ON HERBAGE CHARACTERISTICS AND NUTRITIVE VALUE OF *PASPALUM ATRATUM*

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Paspalum atratum is a tropical grass with potential to contribute to forage availability in areas dominated by waterlogged acidic soils. However, little is known of the interactive effect of N fertilization and stage of harvest on its nutritive value. Therefore, the objectives of this study were to evaluate the interactive effects of N fertilization and harvesting stage on herbage characteristics and nutritive value of *P. atratum* (Cv. Ubon) and to determine the optimum N fertilization rate at each stage of regrowth. *P. atratum* seedlings were planted in 18,631-cm^3 plastic pots containing growth media amended with 0, 25, 50, and 75 kg N/ha. Forage was harvested after 6- and 12-weeks regrowth. Nitrogen fertilizer had a significant effect ($p < 0.05$) on herbage yield, sward height, crude protein yield, crude protein concentration, and 12- and 24-h in vitro ruminal organic matter digestibility (IVOMD). *P. atratum* fertilized with 50 kg N/ha produced the highest dry matter yield (1,133 kg DM/ha) at 12-weeks regrowth. Crude protein (CP) was highest (133 g/kg DM) in 6-weeks regrowth forage that received 50 kg N/ha. IVOMD at 12 and 24 h of incubation was highest in 6-weeks regrowth forage amended with 0 and 50 kg N/ha, respectively. Herbage characteristics and nutritive value of *P. atratum*

showed a quadratic response to N fertilization at both regrowth stages. Response surface optimization indicated that N fertilizer application rates of 56.0 and 52.3 kg N/ha maximized *P. atratum* herbage yield, CP content, and 12-h IVOMD at 6- and 12-weeks regrowth, respectively. It was, therefore, concluded that the herbage yield and nutritive value of 6- and 12-weeks regrowth *P. atratum* is optimized with N fertilizer rates of 56.0 and 52.3 kg N/ha, respectively.

Keywords: herbage yield, nitrogen fertilization, nutritive value, Paspalum atratum, stage of maturity

Source ***https://doi.org/10.1111/grs.12348***

INFLUENCE OF COMBINED YEAST CULTURE AND ENZYMATICALLY HYDROLYZED YEAST ON *IN VITRO* RUMINAL FERMENTATION IN CONTRASTING FEED SUBSTRATES

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Feed additives such as live yeast cultures have increasingly been used in ruminant feeds to improve animal performance and feeding efficiency. However, it is not clear how inactive combined yeast cultures affect ruminal gas production, fermentation kinetics and efficiency. Therefore, this study was done to determine the influence of incubating different substrates with a combined yeast culture + enzymatically hydrolyzed yeast (YC + EHY) on *in vitro* ruminal gas production, fermentation kinetics and metabolizable energy. Six contrasting substrates (*Trichantera gigantea* and *Glircidia sepium* leaves, *Brachiaria* hybrid (cv. Mulato II) leaf + stem and leaf only, *Cynodon nlemfuensis* and a commercial concentrate dairy feed) were incubated with and without YC + EHY in buffered rumen fluid and gas production measured at 2, 4, 6, 8, 10, 12, 15, 19, 24, 30, 36, 48 and 72 h post incubation. *In vitro* fermentation parameters (a, b, a+b and c) were unaffected by YC + EHY except for the lag phase in *T. gigantea*, which that reduced by 31.3 % when it was incubated with YC + EHY. Supplementation with YC + EHY also did not affect metabolizable energy, 72-h organic matter digestibility, 24-h gas or CH_4 production within substrate. However, cumulative gas and methane production at peak

fermentation in the commercial concentrate feed was reduced by 20 % when incubated with YC + EHY. It was concluded that YC + EHY has the potential to improve microbial colonization of *T. gigantea* substrates and reduce gas and methane production at peak fermentation in commercial concentrate feeds.

Keywords: fermentation kinetics, fermentation efficiency, tropical forages, inactive yeast culture, Celmanax

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FOOD SOURCES AND DIETARY QUALITY IN SMALL ISLAND DEVELOPING STATES: DEVELOPMENT OF METHODS AND POLICY RELEVANT NOVEL SURVEY DATA FROM THE PACIFIC AND CARIBBEAN

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Background/justification: Small Island Developing States (SIDS) have high and increasing rates of diet-related diseases. This situation is associated with a loss of food sovereignty and an increasing reliance on nutritionally poor food imports. A policy goal, therefore, is to improve local diets through improved local production of nutritious foods. **Objective:** Our aim in this study was to develop methods and collect preliminary data on the relationships between where people source their food, their socio-demographic characteristics and dietary quality in Fiji and Saint Vincent and the Grenadines (SVG) in order to inform further work towards this policy goal. **Methodology:** We developed a toolkit of methods to collect individual-level data, including measures of dietary intake, food sources, socio-demographic and health indicators. Individuals aged ≥15 years were eligible to participate. From purposively sampled urban and rural

areas, we recruited 186 individuals from 95 households in Fiji, and 147 individuals from 86 households in SVG. **Results:** Descriptive statistics and multiple linear regression were used to investigate associations. The mean dietary diversity score, out of 10, was 3.7 (SD1.4) in Fiji and 3.8 (SD1.5) in SVG. In both settings, purchasing was the most common way of sourcing food. However, 68% (Fiji) and 45% (SVG) of participants regularly (>weekly) consumed their own produce, and 5% (Fiji) and 33% (SVG) regularly consumed borrowed/exchanged/bartered food. In regression models, independent positive associations with dietary diversity (DD) were: borrowing/exchanging/bartering food (β = 0.73 (0.21, 1.25)); age (0.01 (0.00, 0.03)); and greater than primary education (0.44 (0.06, 0.82)). DD was negatively associated with small shop purchasing (−0.52 (95% CIs −0.91, −0.12)) and rural residence (−0.46 (−0.92, 0.00)). **Conclusion:** The findings highlight associations between dietary diversity and food sources and indicate avenues for further research to inform policy actions aimed at improving local food production and diet

Keywords: Nutrition, Non-Communicable Diseases, Food Security, Backyard Gardening

Source: Nutrients, 12(11), 3350

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