University of Nottingham
UK | CHINA | MALAYSIA

Food Security for Small Island Developing States

FSSIDS 2020 International Workshop

Contents

Foreword

Welcome to the workshop on *Food Security for Small Island Developing States* (FSSIDS 2020). The workshop is being organized and supported by the Future Food Beacon at the University of Nottingham, UK and Future Food Beacon Malaysia at the University of Nottingham, Malaysia.

Islands generally, and especially those in the Asia-Pacific region, have diverse environments, cultures, economies and food systems. But islands also share many things. They are at the front line of economic, political, cultural and environmental change. Nearly all depend upon tourism or global trade, while also managing 30% of the world's largest exclusive economic zones, and housing some of the world's critical biodiversity hotspots. All have, or continue to experience, legacies of colonialism, issues of displacement, and territorial tensions with larger political entities.

In this context, the workshop will explore the following themes for food security in small island developing states:

1. nutrition and public health,
2. sustainable food production and supply, and local agriculture,
3. food-related waste and food processing,
4. trade, policy and governance,
5. climate change and environment, and
6. culture, heritage and food sovereignty.

It is hoped the workshop will mark the start of a network of researchers, community workers, food producers, policy makers and others who

will continue to discuss, think about and address issues related to island food systems. We hope the network will go on to facilitate funding applications to support this research.

Finally, it is important to acknowledge the effort participants have made to attend the workshop during the COVID-19 pandemic. Although the pandemic necessitates an online workshop, we hope there will be opportunities in the near future to meet face-to-face and work together in person.

We hope you find the workshop enjoyable and productive.

FSSIDS 2020 Organizing Committee

Chiew Foan Chin (Co-Chair)
Andrew Clarke (Co-Chair)
Pau Loke Show
Christina Supramaniam
Chung Hong Tan

List of Countries and Time Zones

MY	GB	LK	ID TH VN	PH	VU	FJ KI NZ	WS
13:00	06:00	10:30	12:00	13:00	16:00	17:00	18:00
14:00	07:00	11:30	13:00	14:00	17:00	18:00	19:00
15:00	08:00	12:30	14:00	15:00	18:00	19:00	20:00
16:00	09:00	13:30	15:00	16:00	19:00	20:00	21:00
17:00	10:00	14:30	16:00	17:00	20:00	21:00	22:00

Country Abbreviations

MY	*Malaysia*	*PH*	*Philippines*
GB	*United Kingdom*	*VU*	*Vanuatu*
LK	*Sri Lanka*	*NZ*	*New Zealand*
TH	*Thailand*	*FJ*	*Fiji*
VN	*Vietnam*	*KI*	*Kiribati*
ID	*Indonesia*	*WS*	*Samoa*

* Please login to Microsoft Teams 10 minutes before the start of the workshop. The desktop app for Microsoft Teams can be downloaded here. The link to the FSSIDS group on Microsoft Teams can be found here.

Programme Schedule

**** The programme schedule is based on Malaysia time (MYT)***

Tue, 1st Sep 2020

12:50 Start of Teams session
13:00 Welcome by Dr. Andrew Clarke
13:05 Keynote Address by Prof. David Salt, Director of the Future Food Beacon, University of Nottingham
13:25 Introduction to Future Food Beacon Malaysia by Dr. Chiew Foan Chin
13.35 Programme briefing by Dr. Andrew Clarke
13:40 Participant self-introductions (3 minutes each; chaired by Dr. Chung Hong Tan)
15.30 10-minute break

1st Session Presentations
Culture, Heritage and Food Sovereignty
Sustainable Food Production and Supply, and Local Agriculture
Chairperson – Dr. Chiew Foan Chin

15:40 *"Crop and Food Histories in Oceania: Palaeobenchmarking Future Food Systems"* by Dr Andrew Clarke
15:55 *"The Durian Explosion – From Small Scale Orchards to Monocrop Plantations: Just How Sustainable Is It?"* by Dr. Gaik Cheng Khoo
16:05 Q&A
16:20 Closing for Day 1

Wed, 2nd Sep 2020

2nd Session Presentations
Nutrition and Public Health
Sustainable Food Production and Supply, and Local Agriculture
Chairperson – Dr. Andrew Clarke

12:50 Start of Teams session
13:00 *"Probiotics and Spirulina for Health"* by Assoc. Prof. Dr. Nguyen Hoang Khue Tu
13:15 *"The challenges of producing sufficient food products that can compete with inexpensive nutritionally-lacking imports"* by Prof. Richard Beyer
13:30 Q&A
13:40 10-minute break

3rd Session Presentations
Nutrition and Public Health
Food-related Waste and Food Processing
Chairperson – Dr. Pau Loke Show

13:50 *"Mothers' criteria for the selection of emergency food for infants in a disaster prone area"* by Prof. Bernard Nino Membrebe
14:05 *"Functional aspect of microalgae: Future Prospect for food ingredients"* by Dr. Heli Siti Halimatul Munawaroh
14:20 Q&A
14:30 10-minute break

4th Session Presentations
Sustainable Food Production and Supply, and Local Agriculture
Climate Change and Environment
Chairperson – Dr. Christina Supramaniam

14:40 *"Sustainable Food Production and Supply, and Local Agriculture"* by Ms. Alitiana Mua
14:55 *"Algal biomass: Natural food source for milkfish"* by Acd. Prof. Alvin Culaba
15:10 *"Edible solutions for postharvest problems of fruits and vegetables"* by Prof. Asgar Ali
15:25 Q&A
15:40 Closing for Day 2

Thu, 3rd Sep 2020

Grant Application Session

12:50 Start of Teams session
13:00 Session briefing by Dr. Andrew Clarke
13:05 Presentation on grant applications by Dr. Peter Noy
13:25 Instructions for small group discussions by Dr. Andrew Clarke
13:30 Small group discussions (please refer to Theme Groupings on p. 10)
16:00 Closing for Day 3

Fri, 4th Sep 2020

FSSIDS Network Session

14:20	Start of Teams session
14:30	Session briefing by Dr. Chiew Foan Chin
14:35	Small group presentations (5 minutes each, chaired by Dr. Chiew Foan Chin)
15:00	Brain-storming and discussion session (chaired by Dr. Chiew Foan Chin & Dr. Andrew Clarke)
16:00	Workshop closing

Themes Groupings

Group	Themes
1	Nutrition and Public Health
2	Sustainability of Food Production and Supply, Local Agriculture
3	Food-related Waste and Food Processing
4	Trade, Policy and Governance
5	Climate Change and Environment
6	Culture, Heritage and Food Sovereignty

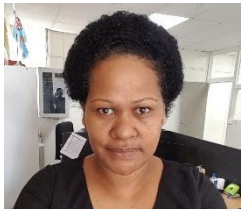
Group	1	2
Facilitator	▪ ***Ee Von Goh***	▪ ***Chiew Foan Chin***
Participants	▪ Bernard Nino Membrebe	▪ Alvin Culaba
	▪ Nguyen Hoang Khue Tu	▪ Asgar Ali
	▪ Richard Beyer	▪ Kinaai Kairo
	▪ Soma Mitra	▪ Susan Azam-Ali
	▪ Andy Salter	▪ Alitiana Mua

Group	3	4
Facilitator	▪ ***Pau Loke Show***	▪ ***Christina Supramaniam***
Participants	▪ Law Chung-Lim	▪ Deborah Hall
	▪ Malinee Sriariyanun	▪ Dominador Aguirre, Jr.
	▪ Miang Hoong Lim	▪ Ganganee Chandima Samaraweera
	▪ Peter Noy	▪ Simon Ridgway
	▪ Heli Siti Halimatul Munawaroh	▪ David Salt
		▪ Taare Aukitino

Group	5	6
Facilitator	▪ ***Chung Hong Tan***	▪ ***Andrew Clarke***
Participants	▪ Alex Lechner ▪ Miller Alexander Rajendran ▪ Seuseu Tauati ▪ Trevor Johnston	▪ Dinh-Toi Chu ▪ Festo Massawe ▪ Gaik Cheng Khoo ▪ Patricia Matanjun

List of Abstracts

A. Alitiana Mua, Ms.



Sustainable Food Production and Supply, and Local Agriculture

Fiji's Ministry of Agriculture has a daunting task ahead. That is, beyond recovery, the Fiji Government through the Ministry of Agriculture must immediately address the impact of COVID-19 particularly with those who lost their jobs or, faced reduced working hours.

As if that's not enough, Fiji is susceptible to Natural Disasters (TC Harold in 2019) which simultaneously spiraled the impact of COVID-19 leaving occupants of; Southern Lau, Vatulele and Kadavu without proper Food source for more than five months.

Fiji's Ministry of Agriculture in its effort to address the socio impact of COVID-19 and TC Harold accelerated the implementation of its 2019-2023 Strategic Development Plan (SDP), supplying the masses with free vegetable seeds, cuttings and planting materials.

The Ministry of Agriculture seized this opportunity by fulfilling two critical primary and strategic objectives;

- Securing the country for its food and nutritional requirements and progressively expanding agriculture to its full potential to raise national income and become the leading export earner for the country.

- At the same time, addressing secondary objectives in improving the livelihood of rural communities, provide employment opportunities and use sustainable agricultural practices to mitigate climate change issues.

The Ministry's rapid response plan in the wake of the global pandemic and TC-Harold was through the announcement and implementation of an Agriculture Response Package, built on up-scaling several existing initiatives. This included the Up-Scaling of Backyard gardening initiative and Farm Support programme. The series of policies and initiatives formulated to bolster agricultural output and growth realizes the Ministry of Agriculture's aspiration of **"Grow Beyond"** targeting incremental growth and spearheading a paradigm shift in Agriculture.

The 2020/2021 Ministry of Agriculture Financial Year's budget however, focusses on 16 new initiatives with a goal of providing, **Food Security, Agriculture Growth and Expansion**. This presentation discusses Government's investment in protecting people, the economy and building a resilient social protection system that can weather shocks, create strategies for the informal sector, promote gender equality and design a new generation of resilient green jobs that support, inclusiveness, resilience and Youth led entrepreneurship.

B. Alvin Culaba, Acd. Prof.

Algal biomass: Natural food source for milkfish

Biomass resources are important resource and commodity in the Philippines. They are organic materials that come from plants and animals. The 3rd generation biomass has emerged such as algal biomass which have huge potential for food application for aquaculture. This industry contributes significantly to the country's food security, employment as well as global export. In 2012, it accounted for Php 200 billion to the country's Gross Domestic Product (GDP). One of the major issues affecting the aquaculture industry is the high cost of farm inputs such as the aquafeeds, which accounts up to 70% of milkfish production. Algal biomass, colloquially known as *lab-lab*, grows in abundance. It offers a good alternative as a naturally-growing rich material consumed by milkfish (*chanos chanos*), which is the most important farmed fish in terms of volume, production value, and geographic spread of the industry across the country. However, their availability and supply issues need to be addressed as they tend to grow only during hot weather and disappears during wet season. In this study, the Lab-lab was collected, dried, and powdered. Convective drying technology showed better performance in terms of drying time, drying capacity, and specific energy consumption per kg of dried lab-lab compared to other drying technologies. Nutrient analysis showed that Lab-lab is rich in minerals. Feeding trial experiments further revealed that 25% of the powdered Lab-lab can be added to the formulated aquafeed diet which would yield a 0.003 average daily growth the same as a 100% formulated diet. Utilization of Lab-lab would provide a good natural-based food source for milkfish. By

substituting with 25% lab-lab would bring down the overall cost aquafeed to Php 47.29 per kg of milkfish, and additional income to farmers.

C. <u>Andrew Clarke, Dr.</u>

Crop and Food Histories in Oceania: Palaeobenchmarking Future Food Systems

Oceania (the approximately 25,000 islands of the Pacific Ocean) is a region of diverse crop and food histories. It contains some of the oldest crops, and some of the newest. It contains food species that were transported as people migrated (so-called commensal species), and food species that were encountered in new environments. This talk will provide an overview of Pacific settlement and crop histories, with a focus on Remote Oceania and Polynesia. The role of genetics in elucidating crop histories will also be discussed. There is increasing interest in how this research into past events and processes might inform food systems in a changing world, and especially in islands. This 'palaeobenchmarking' is in its infancy, and I will discuss a framework for how it might usefully be applied to islands.

D. Asgar Ali, Prof.

Edible solutions for postharvest problems of fruits and vegetables

One of the thrusts in food research is to develop processes that will extend product shelf-life. Fruit and vegetables continue to respire after harvest. Methods that are being used in the fruit and vegetable industry to extend shelf-life include low temperature, and low-oxygen storage.

Tropical fruits and vegetables bear a special problem in that they are chilling sensitive. Therefore, low temperature cannot be used effectively to extend storage life as, for example, can be done for apples. Often these commodities are shipped long distances to customers in temperate zones by air resulting in higher prices for consumers. Shipment by sea would be desirable, but not currently possible due to the rapid ripening and deterioration of these products.

Fruits and vegetables can be classified as climacteric or non-climacteric. Climacteric fruit continue to ripen after harvest, whereas non-climacteric does not. Ripening is a process that includes development of color, flavor and texture (softening). Many important tropical fruits are climacteric, such as banana, mango, papaya, avocado, and guava. These fruit ripen rapidly during transit and storage, thus often requiring rapid shipment by air. There is an opportunity with climacteric fruit, however, to slow down ripening after harvest and, thus, extend the shelf life. This can be done with controlled atmosphere (CA) storage, modified atmosphere packaging (MAP), or with edible coatings. In all cases the atmosphere created is that of

relatively low oxygen (O_2) and high carbon dioxide (CO_2) compared to standard atmosphere. The low O_2 and high CO_2 depress ethylene production which is required to turn on ripening genes that effect color changes, aroma and degradation of cell walls that result in softening.

An alternative method would be to use an edible film or coating that would control metabolic activities similar to controlled atmosphere storage. An edible film could be developed as a barrier for moisture, gases, and solute movement as well as reducing decay. The ability of the film to suppress respiration, or control metabolic processes in the stored product is dependent on the differential permeability of the coating to carbon dioxide, oxygen and water.

In conclusion, coatings are simple, environmentally friendly, and relatively inexpensive technology that can extend the shelf-life of tropical fruits and vegetables provided there is a good storage and temperature control.

E. <u>Bernard Nino Membrebe, Prof.</u>

Mothers' criteria for the selection of emergency food for infants in a disaster prone area

Evaluation of food quality is a prerequisite to every emergency food planning. It is of a huge concern in the aftermath of any kind of emergency or disaster to provide food assistance. Thus, involving mothers' perception on their criteria on the selection of emergency food for their infants serve as one of the pillars of an effective disaster management plan. In this study, a researcher-constructed 10-items survey questionnaire was analysed using Grade Response Model of Item Response Theory (IRT) in R Packages for Statistics. Results revealed that mothers' criteria for the selection of emergency food for their infants give emphasis on the harmful substances that might trigger allergic reaction (Criteria 2), and the presence of pesticides and other chemicals to the food (locally available raw materials) (Criteria 9) which will be given to their infants. Likewise, appropriate amount of energy needed for the growth of infant (Criteria 1), taste acceptability (Criteria 4 and Criteria 10), and raw materials production (Criteria 5) were also perceived important. Further, result of the performed Kruskal-Wallis Test and Nemenyi Multiple Comparison Test showed that among the six identified categories of disaster foods for infants, cereal grain and processed cereals were found to be significantly different from the other food groups, wherein cereal grains rank first while processed cereals ranked last.

F. Gaik Cheng Khoo, Dr.

The Durian Explosion – From Small Scale Orchards to Monocrop Plantations: Just How Sustainable Is It?

The opening of the China market to the Malaysian export of whole nitrogen frozen musang king since last year has seen a mad dash as more forested and agricultural land are being opened or converted for durian production, leading to threats to wildlife habitat and displacement of indigenous people. So far only 1% of the China market are eating durian and the current supply cannot meet the growing China demand. China imports 300,000 tonnes of durian annually, mostly from Thailand while Malaysia exported 17,000 tonnes of frozen vacuum-packed durian pulp to Singapore, Thailand, Hong Kong, Australia, United States and China. The high price for the premium durian clone, Musang King, is spurring many people to be involved in the industry as planters, distributors, retailers, consultants and marketeers.

This presentation explores whether the shift from small scale orchards to monocrop plantations can be economically, socially and ecologically sustainable. It argues for caution in the sole reliance on producing only one clone, the Musang King, for export, for reasons which will be delved into and advocates for a stronger regulation of the industry in keeping with UN sustainable development goals. How can the durian boom contribute in equal measure to “environmental sustainability, economic empowerment and social re-engineering” by being sustainable over time without causing environmental damage and displacing indigenous and local communities?

G. Heli Siti Halimatul Munawaroh, Dr.

Functional aspect of microalgae: Future Prospect for food ingredients

The utilization of microalgae as an alternative source for producing novel natural functional compounds becomes attractive since it does not compete with the fulfilment of food demands, can grow with limited nutrients, and requires a relatively short time for their cultivation compared to plants. Microalgae serve many functional compounds which are fulfil the wide range of applications and are under exploration to be evaluated for possible use as new functional ingredients. The high content of essential unsaturated fatty acids (EPA and DHA) in several strains has made microalgae eligible as alternative options to partially substitute the recently used vegetable oils. The microalgae polysaccharide such as extracellular polysaccharide (EPS), dieckol, and carrageenans have been extensively gaining attention due to their pharmacological activities for potential medical applications. The rich protein content has possessed some strains of microalgae as a great source of the essential amino acids. In addition, the rich content of microalgae pigments has been widely used for cosmetics, natural food colorant, antioxidant, antiinflammatory agents, anticancer, antidiabetic, antiviral, fluorescent labels, and natural sensitizer. Even though microalgae can be a sustainable source of a huge number of high-value compounds, further research should be carried out to solve the bottleneck to largely use microalgae as food commodities. Knowing the chemical composition of the different microalgae will help to target the valuable compounds, while the knowledge of growing conditions and extraction could help in optimizing the

production of the interested compounds and to extract valuable targets with high yields and activities.

H. <u>Nguyen Hoang Khue Tu, Assoc. Prof. Dr.</u>

Probiotics and Spirulina for Health

Probiotics and Spirulina have many significant health effects suggested in nutritional supplements or processed foods in the pharmaceutical industry. However, the understanding about them is still not interested much. Probiotics are defined as live microorganisms that when introduced into the body with a sufficient amount will have many positive effects on the digestive system. It is impossible to determine a general dose that is needed for probiotics. Some products affect at a small dose (<~1–10 billion CFU/dose in over-the-counter products) while others required considerably high. The dosage used should be studied intensively and consult an expert for health benefit. People only knows probiotics used in case of pseudomembrane colitis. Moreover, using probiotics for aquaculture disease easily let the antibiotic resistance increase. Spirulina is a filamentous cyanobacterium, photoautotrophic microalgae. Scientists are interested in the blue-green alga named Spirulina platensis as it has high nutritional content such as 70% protein content, minerals, vitamins, amino acids and essential fatty acids. Spirulina did not show high hygiene when used as functional food. It should be checked before used. Otherwise, probiotics and Spirulina have been studied on immunological regulations, anti-microbial activity, antioxidant activity, anticancer and so on. Thus, it is important to develop probiotics and Spirulina in many potential products for health to prevent some diseases involving to pathogens such as virus, bacteria and others. In the study, the combination probiotics with Spirulina in granules were

done and showed in-vitro biological effects highly than one component. This product might improve our health in future.

I. Richard Beyer, Prof.

The challenges of producing sufficient food products that can compete with inexpensive nutritionally-lacking imports

Inadequate soils in atoll states and undulating surfaces in volcanic Pacific island states hamper large scale, mechanised farming and industrial scale food production. Raw material supplies to small and, many crops are highly seasonal. Supplies to local consumers is supplemented by imports. Many of these imports are nutritionally deficient but are supported by impelling advertising. They are brightly packaged and provide instant, but rarely long-term satiety.

Island cuisines are dominated by a range of starchy staples including taro, cassava, yam, breadfruit and banana/plantain. Additional nutrients are provided by fish, coconut and a range of leafy green vegetables pawpaw and guava. However, the people of the Pacific have increased rice consumption because of its low cost and convenience.

Processing activity is increasing around the region driven by entrepreneurial drive to compete, and that is reinforced by government drives to increase local consumption.

Processing opens opportunities. Attractive products can be produced from seasonal crops that can compete for consumer appeal. More importantly processing extends shelf life increasing the availability of highly seasonal crops.

Many examples of processed food products will be given that have not been produced on unsophisticated equipment and technology. Some of these products have reached demanding markets in Australia, New Zealand and the United States.

Extending seasons is a financial imperative and a number of strategies will be described that demonstrate the benefits of partial processing at season height.

Workshop Participants

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