

Backyard Fruit Growers' workshop

23rd October 2019,
Boname Hall, MSIRI, Reduit, Mauritius

Report and Recommendations



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Background

The Mauritius Fruit Bat *Pteropus niger* is an endemic, endangered species which causes damage to lychee, mango and longan fruit harvests in orchards as well as mature garden trees across the island. It is also perceived as a messy and noisy animal when feeding on fruit trees by many members of the public. In the face of increasing public pressure and concern from orchard owners over the loss of their fruit crop, three culls of the species were implemented in 2015, 2016 and 2018¹. This caused major concern among international conservation organisations seeking to protect the bat species². However, effective and realistic solutions to the problem remain difficult to find. The Government of Mauritius' Ministry of Agro-Industry and Food Security via its Food and Agricultural Research Extension Institute (FAREI), has tried resolving, and since 2009 have provided substantial subsidies to growers in order to facilitate the purchase of nets to protect their fruit. FAREI's commitment to this initiative is demonstrated by the figures: by 2015, nearly Rs 30 million had been provided to nearly 4500 applicants in order to purchase protective nets. While this scheme is no doubt the most important step in the right direction so far, the logistical details of correctly and efficiently netting trees remains a challenge.

Following the 2016 bat cull, the International Union for the Conservation of Nature (IUCN), acknowledging the difficulty of this situation, offered support to the Mauritian Government through provision of advice from its expert network, in particular its Task Force on Human-Wildlife Conflict and its Bat Specialist Group. In early 2017, representatives of the IUCN SSC Human-Wildlife Conflict Task Force and Chester Zoo (UK) visited Mauritius to discuss this issue with the Mauritian Wildlife Foundation, FAREI, and also the National Parks and Conservation Service (NPCS). During this visit, the issue was discussed in great detail with many stakeholders from fruit exporters, small-scale farmers, large orchard owners and members of the general public, to hear their views, ideas and concerns. Together with the then Deputy Permanent Secretary of the Ministry of Agro-Industry and Food Security it was agreed that a workshop was to be held in Mauritius before the next lychee harvest, to bring together representatives from the range of stakeholders, including fruit growers and traders, netting importers and distributors, researchers, and government extension officers.

¹ There were no official culls in 2017, but at the time of writing this report, a fourth cull was being implemented, and was said to extend into 2020.

² Over a dozen international organisations, including International Union for Conservation of Nature, Bat Conservation International, World Wildlife Fund, BirdLife International, World Association of Zoos and Aquaria, Conservation International, African Wildlife Foundation, Durrell Wildlife Conservation Trust, Chester Zoo, Lubee Foundation, Australasian Bat Society, Institute of Zoology

A first workshop was held on Mauritius in August 2017 ('Netting Workshop'³), followed by a 'Research Workshop' in May 2018 (See full report here: <https://adobe.ly/2YY6OBF>) and in October 2019 by two other workshops, the 'Backyard Grower's Workshop report' (below) and the 'Media Workshop'⁴ ([Media Trust Report](#)).

The 'Backyard Growers' Workshop' arose out of a recognition that backyard growers were a different category to 'orchard growers'. They are far more numerous (tens of thousands), are disaggregated, less organised, have little means to implement expensive or complex solutions, can be more vocal, have widely divergent views on the problem and solutions. They were recognised as a key stakeholder group requiring a specific platform for discussion, and a very important group in the human-wildlife conflict resolution. The objectives of this workshop were to include this important group of stakeholders in the wider policy discourse, to give them an opportunity to air their views, and to understand their perspectives about both fruit bats and their wider concerns regarding fruit growing. This report summarises the 'Backyard Growers' Workshop' and its conclusions and sets out recommendations towards a long-term and sustainable strategy for reducing fruit bat damage incurred by this stakeholder group in Mauritius.

Participants

The meeting was held at the Boname Hall, Mauritius Sugarcane Industry Research Institute in Reduit, Mauritius where workshop facilities were available. 27 participants attended the workshop including small orchard owners, commercial orchard managers, backyard growers, extension officers and research staff from Food and Agricultural Research and Extension Institute and staff of National Parks and Conservation Service, Forestry Service, consumer protection association, Mauritian Wildlife Foundation. In addition to the Mauritian participants, Dr Simon Tollington (Conservation Scientist, Chester Zoo, UK) and Dr Ewan Macdonald⁵ (University of Oxford and Chester Zoo, UK) attended the workshop. Also present was Mr Virat Singh⁶, an Indian journalist and member of the IUCN SSC Task Force on Human Wildlife Conflict who has extensive expertise in wildlife and environmental reporting. The workshop was organised jointly by the Mauritian Wildlife Foundation and Chester Zoo and received support from the staff of FAREI.

Workshop Summary

The half-day programme on 23rd October 2019 consisted of presentations by participants, discussions and working groups to develop ideas and recommendations in detail.

³ <https://www.mauritian-wildlife.org/mwf-files/files/accounts/Netting%20Workshop%20Report%20Aug%202017.pdf>

⁴ <https://www.sbs.ox.ac.uk/about-us/people/ewan-macdonald>

⁵ <http://www.hwctf.org/members/virat-a-singh>

Presentations:

Dr Vikash Tatayah (Conservation Director, MWF) opened the workshop with a welcome to all participants and explained the process and aims for the workshop. All participants in the room were then asked to briefly introduced themselves.

Mr Iqbal Damoo (Principal Extension Officer, FAREI) presented the situation of backyard fruit growers in Mauritius.

The household census held in 2011 indicated that there were 32073 litchi trees, 115491 mango trees and 13200 logan tree in Mauritius and Rodrigues.

Fruitbat attack was more pronounced in backyards compared to commercial orchards. The damage has been recorded mostly on unprotected litchi trees, ranging between 30 to 50 % backyards due to the fact that the trees are old and are quite tall. In some cases, the damage was as high as 60 to 70%.

It was reported by planters that bats affect gingeli type banana flowers and cause physical damage on fruit bunches. Bats also feed on jackfruit, jamblon, pomme zaco, breadfruit and passion fruit. Other environmental problems associated with bat attack on fruits include noise at night affecting people's sleep, fruit scraps littering on the floor and faeces⁷ everywhere.

It was reported that the traditional method such as burning tyres under the canopy, fire crackers etc were not effective. Less damage was observed on pruned trees and anti-bird netting is the most effective method against damage. The only issue is its manipulation, placement and even removal remain hazardous and is not practical for huge trees.

In 2009 a Fruit Protection Scheme was set up to provide facilities for the orchard and backyard growers to buy nets at 25 % of their cost. The scheme provides a 75% subsidy, and is currently eligible for those applicants who have not benefitted from the scheme during the past 2 years. The subsidy on one net of 12 x 10 m is about Rs 2000 and on a roll of 100 x 12 m is Rs12000. For 2018-2019 the number of beneficiaries were 3317. For the period 2019-2020, backyards owners are eligible for a maximum of 5 nets. However, those who have benefitted for 2017-2018 and 2018-2019 season were not eligible. Thus, FAREI has advised growers to prune their trees after harvest and decrease their height as one method for alleviating their problem. Another facility provided by FAREI was the interface between growers and service providers for installing nets.

Ms Issabelle Desire (Project Officer, MWF), gave a presentation on the 'Studies on the Mauritius Fruit Bat from orchards to backyards: What has happened so far'.

⁶ It is quite likely that people are confusing 'faeces' for 'bat ejecta' which is the fruit pulp and bad quality seeds spat by bats out rather than the pulp with good quality seeds ingested by the bat and carried for kms where they will come out in faeces, and germinate.

She presented the studies on the impact of the Endangered Mauritius Fruit Bat on Commercial Fruit farms and the efficacy of mitigation⁸. She then presented a study to quantify the damage caused by fruit bats to backyard lychee trees in Mauritius and evaluating the benefits of protective netting⁹. She concluded upon a study on the movement ecology of the Mauritius Fruit Bat¹⁰.

Structured discussion of the issues, interests, concerns and options

Question: Can bats be controlled by ultrasound?

Response: Ultra sound may be a solution to control bat damage but has been found to be an inconvenience to dogs. It is being investigated by the National Parks and Conservation Services.

Comments on other deterrents: LED lamps are not effective. The bats become accustomed to them. Fire crackers were not environment-friendly (noise, smoke, etc) and represent a fire hazard.

The National Parks and Conservation Service is trialling an organic spray repellent but bats tend to move to other untreated trees. The bat also has a habit to move to newly ripening fruit.

Question: What colour of net is better, black or white?

Response: White nets are preferable as they are more reflective. The chances of bats getting entangled is lower when using white nets. However, the suppliers often only have black nets in stock and there is no alternative.

It usually depends on the importer which net colour(s) is being imported. There needs to be a guideline issued to the importers.

Question: Are you aware that the nets have been trapping bats?

Response: When the net is resting loosely on canopy of trees, instead of being rigid on a frame or else propped up with bamboo/wood/PVC poles, bats will get entangled in the net.

⁷ Oleksy R Z, Ayady C L, Tatayah V, Jones C, Froidevaux J S P, Racey P A & Jones G (2018). The impact of the Mauritian flying fox *Pteropus niger* on commercial fruit farms and the efficacy of mitigation. *Oryx*. doi:10.1017/S0030605318001138.

⁸ Tollington S, Kareemun Z, Augustin A, Lallchand K, Tatayah V & Zimmermann A (2019). Quantifying the damage caused by fruit bats to backyard lychee trees in Mauritius and evaluating the benefits of protective netting. *Plos One*. PONE-D-19-09000R2

⁹ Oleksy R Z, Ayady C L, Tatayah V, Jones C, Howey P W, Froidevaux J S P, Racey P A & Jones G. (2019). The movement ecology of the Mauritian flying fox (*Pteropus niger*): a long-term study using solar-powered GSM/GPS tags. *Movement Ecology*

It was claimed that some people were intentionally catching the bats in this way for food, but this is illegal.

Question: Are there more bats in the south of Mauritius? Are they doing more damage?

Response: Bats have changed their feeding habits since that there is a scarcity of native/endemic fruits in the remaining forests of Mauritius and they are feeding on commercial fruits also during food shortages. Bats are also known to move around the island in response to geographical food shortage or food availability. At times of the year, there appears to be more bats in the north.

Question: Can FAREI plant more fruit trees in the forest area to provide more food for bats, then there will no need to kill them.

Response: An agro-forestry project has started in Petit Sable. Some of the trees planted produce fruits that are eaten by bats. However, in native forests, the advice was to plant native and endemic species only.

Question: Has the damaged caused by exotic (introduced) birds been measured?

Response: Exotic (introduced) birds are also considered pests of fruits. There have been studies that have tried to assess the bird damage. Mauritius has not had a lot of cyclones which would control the exotic birds. So, the population of introduced birds has proliferated, compounding the damage to fruits.

Working Groups

The attendees were divided in three diverse groups to discuss the problems, and propose solutions. A representative in each group was invited to present the group findings to the workshop participants. The detailed presentations for each group are set out in the Appendix. The findings have been summarized for ease of reading and presented in the Conclusion and Recommendations section.

Group 1



Group 2



Group 3



Conclusions and Recommendations

Following the presentations of each group a discussion took place based on the points raised. Points from the discussion are listed in the Appendix.

The conclusions and recommendations are summarized in this section in four main categories.

Tree Management

Pruning

- Assistance is needed for pruning large trees. There were various suggestions as to who could help: SMF. Fire Brigade. Sugar Planters Mechanical Pool Corporation. Or private companies offer the service at a fee.
- Training sessions available

Netting

- Installation of nets:
 - How to install nets? Running demonstrations was suggested in various parts of the island
 - Who can install nets? To maintain a data base if a grower needs to subcontract this work
- Visit an orchard which is netted for media and planters

General

- Guidelines and training on management of trees:
 - Planting
 - Pruning
 - Fertilizing
 - Weeding
 - Intercropping
 - Mechanisation options
- Options for new varieties of tree

Research

- Repelling bats – methods to look into:
 - lighting
 - ultrasound
 - organic repellent (being researched by NPCCS)
 - fluorescent or reflective netting
- Repelling monkeys: methods to look into
- Fruit Flies: These affect fruit production greatly. The Ministry of Agro-Industry is investigating a solution
- Human theft: Options available
- New varieties of tree: (dwarf, early bearing+ resistance to pest + disease): advantages and disadvantages
- Cost benefits calculated for effective methods
- Storage methods post-harvest

Communication

- WhatsApp or Facebook group: to share information
- Collect data which would help research
- Factsheets available
- Workshops / Campaigns organised to communicate:
 - New developments
 - Pruning
 - Netting
- Data base of contacts for:
 - Pruning
 - Netting

General

- To inform of land that can be leased long term to create orchards
- Proforma contract made available for backyard growers when their trees are 'bought' and guidelines for registration.

End-note

Although the objective of the workshop was to discuss conflict between backyard growers and Mauritius Fruit Bats, most of the growers were predominantly concerned about yields in general and not bats in particular. It suggests that the growers do not have an intrinsic problem with the bats per se and that some of the problems might in part be mitigated by helping fruit growers solve other non-bat related issues. The workshop received active participation from attendees in a friendly and mutually respecting atmosphere. It ended with a lunch served at the Boname House, in an equally friendly atmosphere. Participants vowed to continue collaborating to reduce the human-wildlife conflict between Mauritian growers, in particular backyard tree owners, and the Mauritius Fruit Bat.

Acknowledgement

This workshop would not have been possible without the keen participation of all attendees, especially backyard growers. We are also grateful for funding received from Chester Zoo (UK), and assistance from the IUCN Human Wildlife Conflict Task Force, the Mauritius Sugar Industry Research Institute, and the Food and Agricultural Research and Extension Institute.

Appendix

Attendees

Attendance for the Backyard Fruit Grower's Workshop held on 23rd October 2019 at the Mauritius Sugar Cane Industry Research Institute.

No	Name	Position	Organisation
1	Pokeerbux M. Fayar	Director	Trendist
2	Koopla Veenayakraye	Research Scientist	FAREI
3	Shivan K. Bhogun	Forest Conservation and Enforcement officer	Forestry Services
4	De Chalain Eric	Non-Sugar Operation Manager	ALTEO AGRI Ltd
5	Bajan Dheema	Resp. Officer	ALTEO AGRI Ltd
6	Salamut Farmeen	Operation officer	Terragri
7	Goblet Yann	Responsible Pepiniere/ Assistant a la diversification	Cie de Beau Vallon
8	Ramburn Nirmala Devi	Horticulture Consultant	Independent
9	Soomary Shailendre	Assistant Research Scientist	FAREI
10	Krishna Bundhoo		Swan Life
11	Govinden Kuppan	General Manager	Clinique Mauricienne
12	J .Ghoolet		Cop Society
13	J. Padaruth	Entrepreneur	Self-employed
14	Iqbal Damoo	Principal Extension Officer	FAREI
15	D. Bheema	Senior Extension Officer	FAREI
16	Simon Tollington	Conservation Scientist	Chester Zoo
17	Virat Singh	Journalist	
18	Ewan Macdonald	Researcher	Oxford University
19	Jayen Chellen	Gen Sec	ACIM
20	Jimmy Anthony	Managing Director	Senneville Agricultural Ltd
21	Hussenboccus Kenal		Backyard growers
22	Lofur T.K		Backyard growers
23	Houshna Banu Naujeer	Senior Officer	National Parks and Conservation Service
24	Issabelle Desire	Project officer	Mauritian Wildlife Foundation
25	Vikash Tatayah	Conservation Director	Mauritian Wildlife Foundation
26	Jean-Hugues Gardenne	Fund-raising Manager	Mauritian Wildlife Foundation
27	Deborah de Chazal	Executive Director	Mauritian Wildlife Foundation

Working Groups Information

The detailed results of the group discussions are collated and presented below.

Group 1

Problems	Solutions	Remarks
Bats	Netting	Difficulty in fixing nets/ finding labour
Flies (Fruit)	Insecticides	Time/Renew every week
White bugs	Monoshot	Time/Renew every week
Ants	Monoshot	Time/Renew every week
Birds	Pruning	New research on sound/light
Thieves		
Monkeys	Innovation	Ongoing issue
Fire		
Marketing		

Group 2

Identified problems that farmers face.

- Fruit flies- pest
- Fruit quality- bad
- Pest + diseases+ flowering
- Unharvested fruits left on trees
- Fruit loss
- Labour to work is scarce
- Bats damage fruits
- Birds damage fruits
- Theft
- Lack of appropriate equipment for orchards
- Availability of good quality planting material- need new varieties
- Orchard equipment required
- Rats
- Lack of know-how on orchard management
- Placing of nets on backyard trees
- Cultural practice for orchard management
- Pruning of tall/big trees in backyard-high cost
- Land use changes-more urbanization-planting area-orchard+backyard
- Marketing-Local+Export
- Compensation schemes-planter's insurance +Problem quantity loss/damage

Six problems prioritized + solutions

1. Fruit bat damage (Orchard + Backyard)

- Pruning- challenges (High cost, especially to prune a large tree)
- Proper tree management
- Proper netting-Challenges
 - How to place nets + cost involved?
 - insurance scheme for fruit loss
 - planting material, so as to have dwarf varieties
 - outsource placement of nets
 - Special Mobile Force to assist- government decision to facilitate this.

2. Theft

- CCTV installed
- Police patrol
- Fruit sellers – to have licence fruit vendors, declare goods, prove legal acquisition
- Strict law enforcement

3. Lack of know-how on orchard and tree management

- Awareness material (Pamphlets) at point of sale (for public and for private orchards)
- Hands on training of farmers/orchard growers
- Adoption of novel or modern technology
- Social media-platform for learning + sharing knowledge

4. Availability of planting material / varieties

- New varieties (dwarf, early bearing+ resistance to pest + disease)

5. Land use changes

- Creation of mini-orchards and green spaces in urban areas

6. Fruit loss

- Post-harvest storage and processing-value addition

Group 3

Problem	Solution	Action
Tree structure: Huge canopy size and morphology of backyard/orchard fruit tree	<ul style="list-style-type: none"> - Sensitisation and awareness campaign - Management of the fruit trees 	<ul style="list-style-type: none"> - New model orchard - Conduct national campaign
Pest (birds, monkey, bats)	<ul style="list-style-type: none"> - Holistic approach in the control of the pests 	<ul style="list-style-type: none"> - Netting - Bagging - Lighting - Ultra sound device - Repellent /scaring devices
Pest and disease (Fruit flies/ anthracnose/ core rot disease/ white flies/ mealy bugs)	<ul style="list-style-type: none"> - Integrated management of pests and diseases - Orchard management 	<ul style="list-style-type: none"> - Control on a large scale basis/island wise basis e.g. fruit flies control - Environment friendly solutions
Cost	<ul style="list-style-type: none"> - Sensitise on cost benefits - Financial and environment solutions 	<ul style="list-style-type: none"> - Incentives - Training - Value chain (Processing/production/post-harvest/Marketing)
Labour	<ul style="list-style-type: none"> - Skilled labour - Mechanisation - Expertise 	<ul style="list-style-type: none"> - Provide training - Availability of labour - Incentives/schemes for mechanisation
Weed management	<ul style="list-style-type: none"> - Weed control other than herbicides 	<ul style="list-style-type: none"> - Mechanical weeding - Inter-cropping

Points arising from the presentation of the working groups information

Tree Management

- Installation of nets is a problem. SMF to help prune big trees. Fire Brigade to assist.
- Sugar Planters Mechanical Pool Corporation to offer services to prune trees?
- Private companies to offer the service, with safety measures required?
- Instruction needed on how to plant trees. How to make orchards more manageable.
- Demonstration on how to put a net on a tree. Sensitisation and awareness campaign needed. Site visit to trees being netted for media and planters.
- Labour is a problem

Research

- Repelling bats – methods to look into: Divali flashing lights on tree – ultrasound – organic repellent (being researched by NPCS), fluorescent or reflective netting.
- Government has invested massively to control or eradicate fruit flies, which also affect fruit production greatly. The Ministry of Agro-Industry has a lab to do male sterile technique to be released in zones affected or island-wise. Can produce 100 000 sterile males per week for release. Must now work with and sensitise planters to avoid pesticide applications that will kill the sterilised male fruit flies.

Communication

- WhatsApp or Facebook group – to maintain relationship with fruit producers.
- Use the communication to collect data on what is happening.
- Suggest that MWF and FAREI periodically communicating new measures to the planters

General

- Advise on reforestation.
- Where can land be available to plant orchards? Land Bank? Issue of long-term lease as an orchard is a long-term investment.
- Formal contract with terms and conditions was needed between planters and buyers of fruit or trees, and that the contract was registered.
- Observation that conflict may have calmed down already with orchard growers who have taken measures to protect their crop.
- MWF to send all workshop reports to participants.