

Annex A1

RESEARCH COLLABORATION OPPORTUNITY

Research Collaboration Opportunity Ref No.: RCO-CUGE-2018-01

Project Title: Rapid and non-destructive Detection of Incipient Tree Root Decay

1. Key Challenges and Objectives

- 1.1 Early detection of incipient root wood decay in mature standing trees is very important in urban landscapes as wood strength reduces drastically in the early stages of decay. We are seeking research proposals to develop non-destructive and rapid techniques to detect early incipient root wood decay in 10 common wayside tree species in Singapore. Techniques that can rapidly detect and discriminate volatile organic compounds emitted by infected trees and fungal pathogens are sought. Other rapid and non-destructive approaches will be considered as well. The project will also need to distinguish clearly the root wood decay fungal pathogens.
- 1.2 Wood decay fungi drastically reduces wood strength even in the early stages of the decaying process. However, detection of root wood decay is only possible in its advanced stages. Today there is no non-destructive and rapid technique to detect incipient root wood decay in tropical trees. A method has been developed to detect root wood decay in temperate trees (Please refer to the article by Baietto, M., Pozzi, L., Wilson, A. D., Bassi, D. 2013. Evaluation of a portable MOS electronic nose to detect root rots in shade tree species. Computers and Electronics in Agriculture 96, pp. 117-125). This is one approach that can be potentially adapted to tropical trees.
- 1.3 We are seeking research proposals to develop non-destructive and rapid techniques for the detection of incipient root wood decay by root decay fungi in ten mature standing tree species in Singapore. The 10 tree species are: *Samanea saman*, *Tabebuia rosea*, *Peltophorum pterocarpum*, *Pterocarpus indicus*, *Swietenia macrophylla*, *Khaya grandifoliola*, *Khaya senegalensis*, *Mimusops elengi*, *Syzygium grande* and *Arfeuillea arborescens*.
- 1.4 The proposed project should include (but not be limited to):
 - (i) The technique of rapid detection and discrimination of the volatile organic compounds (VOCs) emitted by infected tree roots and root wood decay fungal pathogens.
 - (ii) Identification of root wood decay fungal pathogens associated with the 10 selected tree species using either molecular or any other reliable techniques.
 - (iii) Identification of all major soil fungal flora associated with 10 selected tree species.

2. Minimum Project Deliverables

The deliverables described here represent the minimum outcomes arising from the proposed project. Additional relevant deliverables that are proposed will be favourably considered during project evaluation.

- (i) VOC method to detect root wood decay fungal pathogens and root-decayed trees of the 10 selected tree species in Singapore that can be used with minimal experience and training.
- (ii) VOC reference library for roots of the 10 selected tree species (healthy and decayed) and wood decay fungal pathogens.
- (iii) Determination of the identities of the root wood decay fungal pathogens from the 10 selected tree species
- (iv) At least one other method to detect the presence of root wood decay fungal pathogens in the 10 selected species.
- (v) Identification of all major soil fungal flora associated with 10 selected tree species.
- (vi) Progress reports at end of year 1 and year 2, and final report at end of project.

3. Budget Limits

3.1 The proposed budget cannot exceed \$600,000.00. Proposals that exceed this limit will not be considered. Please note that this amount is simply an indication of budget availability, not an estimate of expected project cost.

3.2 The project duration should also not exceed 3 years. Proposals requiring more than 3 years can be considered, but with strong justification.

3.3 Please note that NParks' decision on the funding support to be awarded for the project is final.

4. Submission Instructions

Proposals for the Research Collaboration Opportunity as stated above must be submitted to Dr Fong Yok King at fong_yok_king@nparks.gov.sg by 5th November 2018, 1200 hrs.

5. Enquiries

For transparency, all enquiries and associated clarifications will be published (without details on the identity of the person making the enquiry) on the Research Collaboration Opportunity page on the CUGE website. We regret that phone enquiries will not be entertained.

For enquiries, please contact Dr Fong Yok King at fong_yok_king@nparks.gov.sg for enquiries.