ECONOMICS AND MECHANICS OF SUSTAINABLE STINGLESS BEE BREEDING AND REARING

Rosliza, J., Mohd Fahimee, J., Nurul Ammar I.

INTRODUCTION

Pollinator

Cause of decline- wild/domesticated

- habitat loss and fragmentation

-Agrochemical

-Pathogens

-Alien species

-Climate Change

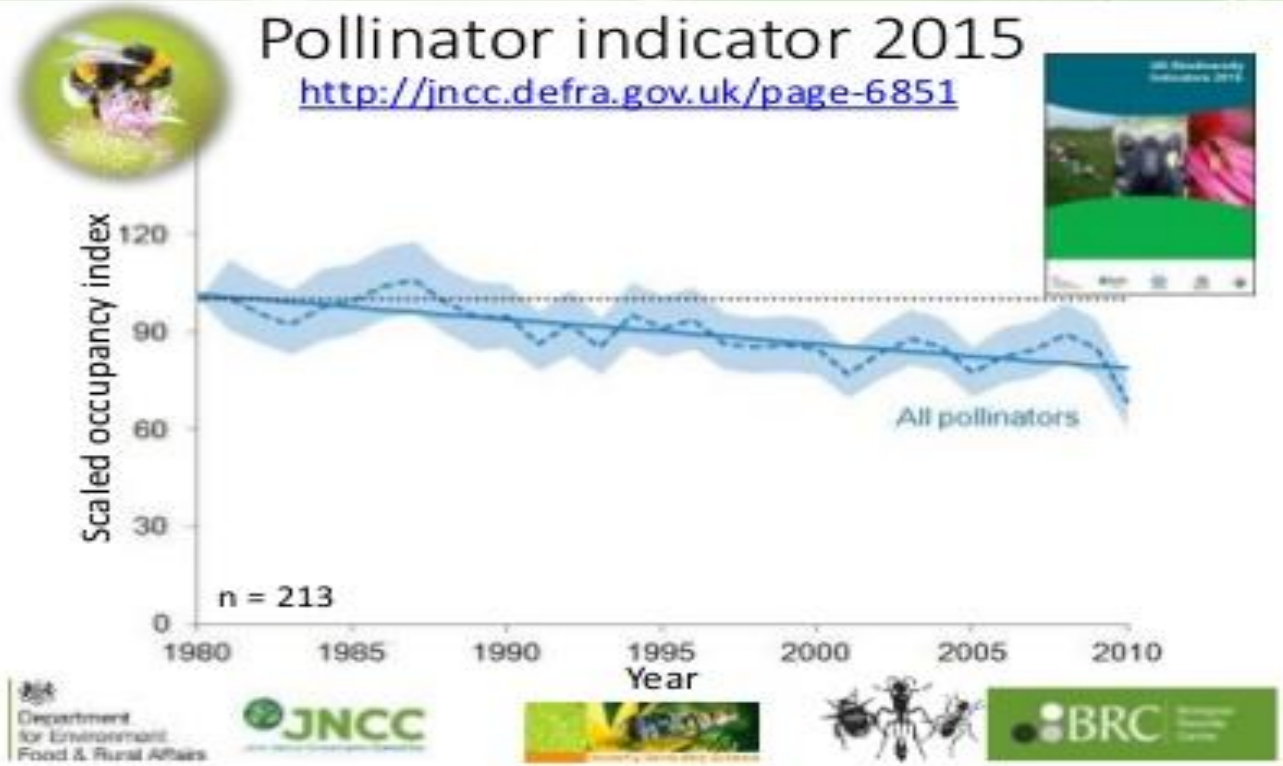
INTRODUCTION

Pollinator decline resulted:

Ecological and Economic impact

- Affect the maintenance of wild plant diversity, ecosystem stability, crop production, food security and human welfare

Trends in pollinators



- New Government Indicator for 2015 to track status & trends of pollinators
- Uses volunteer-collected records

28 – 51% of species less widespread between 1980–2010

14 – 27% of species became more widespread (depending on criteria)

ECONOMIC VALUE OF POLLINATION SERVICES

ECOSYSTEM SERVICES:DIRECT & INDIRECT ECONOMIC VALUE

- Over 75% of world's crop plant rely on pollination by animals (mostly insects) estimated @ €153 billion (Gallai et al. 2007)
- 9.5% of the value of the world agricultural production used for human food in 2005
- Vegetables and fruits were the leading crop categories in value of insect pollination with about €50 billion each, followed by edible oil crops, stimulants, nuts and spices.
- Pollination service by insects in Malaysia estimated worth USD 6 billion (Agriculture & Forestry)
- Loss of pollinators reduces crop yield through reduced and unreliable pollination

ECONOMIC VALUE OF POLLINATION SERVICES

Malaysia Agriculture Produce Value (2015)

- Fruits (RM 3.17b)
- Vegetables (RM3.37b)
- Coconut (RM612 mil)
- Floriculture (RM412mil)
- Spices (RM138mil)
- Cash crops (RM392mil)

(Eg. Coconut - index dependency ratio 25% to insect pollinator- RM153 mil contributed by the pollination services

THREATS TO POLLINATOR INSECTS

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Zika spraying kills millions of honeybees

by Sandee LaMotte, CNN
Updated 1500 GMT (2300 HKT) September 2, 2016

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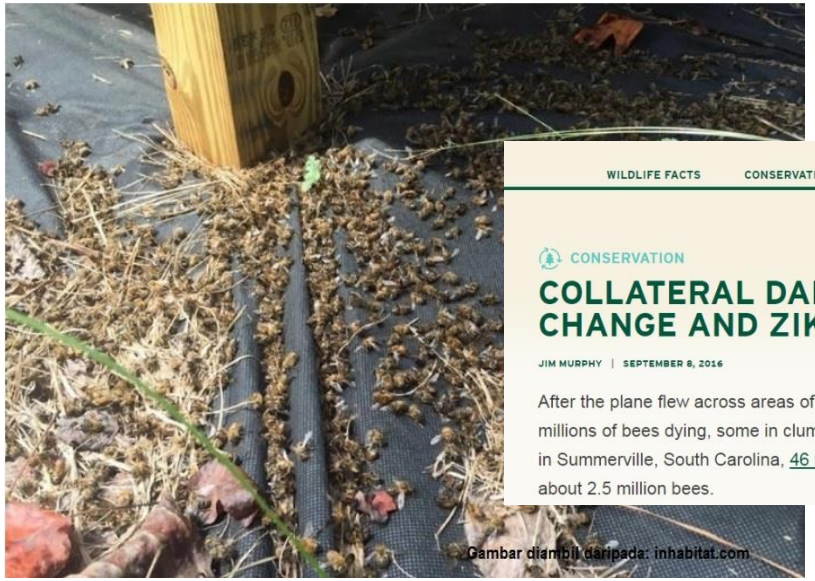

Gambar diambil daripada: inhabitat.com

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Morning Mix

'Like it's been nuked': Millions of bees dead after South Carolina sprays for Zika mosquitoes

By Ben Guarino September 1

Most Read

Pengusaha kelulut dalam dilema

Berdepan gulung tikar disebabkan sarang kelulut terpaksa dimusnahkan akibat diserang serangga perosak

MENGABANG TELIPOT- Pengusaha madu kelulut di negeri ini kemungkinan akan gulung tikar jika fenomena madu meletup disebabkan serangan serangga perosak seperti kumbang dan lalat dipercayai berpunca akibat peralihan cuaca panas selepas fenomena El Nino terus merebak tanpa dapat dikawal.

Ketua Kumpulan

Shamsul Bahri melihat serangga yang dijumpai di sarang kelulut menggugakan taleskop.

kepada serangga yang tertekan itu membiak dengan begitu cepat," katanya ketika ditemui di makmal UMT, di sini, semalam.

Menurut Shamsul Bahri lagi, ketika ini hampir 90 peratus pengusaha kelulut di Kedah membakar lebih 2,000 sarang bagi mengelak serangan itu merebak ke sarang yang lain.

"Sekarang ini, kaedah yang kita syorkan kepada pengusaha kelulut adalah membakar sarang yang diserang serangga ini supaya dia tidak merebak ke tempat lain.

"Keadaan ini mengakibatkan pengusaha mengalami kerugian yang teruk dan kemungkinan industri ini akan pupus jika fenomena ini tidak dapat diatasi," katanya.

Katanya lagi, ketika ini industri perusahaan kelulut jatuh dengan teruk termasuk hasil yang semakin sedikit serta kebimbangan orang ramai untuk membeli madu kelulut kerana bimbang bahan itu telah tercemar akibat serangan serangga perosak itu.

Sinar Harian Edisi Terengganu 4 Julai 2016 MS.40

WILDLIFE FACTS CONSERVATION GARDEN HABITATS STUDENTS AND NATURE GET OUTSIDE

CONSERVATION

COLLATERAL DAMAGE: POLLINATORS, CLIMATE CHANGE AND ZIKA

JIM MURPHY | SEPTEMBER 8, 2016

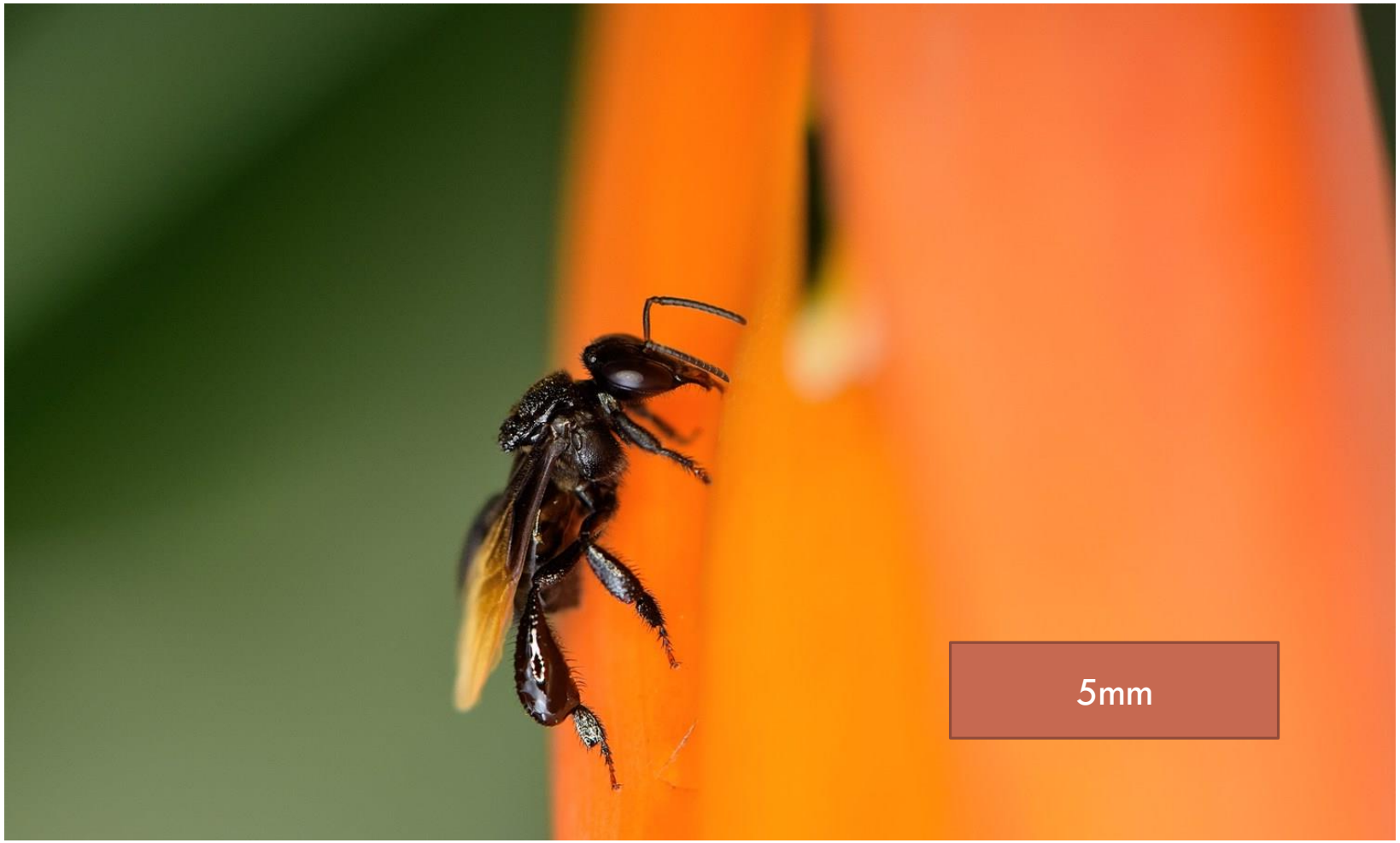
After the plane flew across areas of South Carolina, the scene was grim: millions of bees dying, some in clumps in front of their hives. In one instance in Summerville, South Carolina, 46 hives reportedly died on the spot, totaling about 2.5 million bees.

SHARE & SAVE
TWEET
JOIN

PREFERENCE OF TREES TO BUILD NEST

Genus	Pemilihan pokok di kawasan pertanian	Pemilihan pokok di kawasan perhutanan	Lain-lain
Heterotrigona	Durian, Rambutan, Langsat, Kelapa, Cempedak, Nangka, akasia, pinang		Sarang semut, Sarang anai-anai
Geniotrigona	Durian, Langsat, , Rambutan, kelapa	Meranti,Kelat	
Lepidotrigona	Rambutan, langsat, ,	Sepetir, meranti, kelat dan cengal	
Tetragonula/ Tetragonilla/ Sundatrigona	Rambutan, langsat, cempedak, kelapa, sarang semut	Cengal, meranti, kelat	Sarang semut
Tetrigona	Rambutan, Langsat	Akasia, kelat, meranti, rengas, Cengal	Sarang semut, di dalam bangunan
Homotrigona	Tiada maklumat	Kelat, Meranti, Balau,	Tiada maklumat
Pariotrigona	Rambutan	Tiada maklumat	Tiada maklumat
Lophotrigona	Rambutan, durian,	Kelat, Meranti, Damar hitam	Tiada maklumat

TETRAGONILLA COLLINA



TETRIGONA

4 species

- *Tetrigona apicalis*
- *Tetrigona melanoleuca*
- *Tetrigona peninsularis (kemerahan)*
- *Tetrigona binghami*

- White wing

TETRIGONA APICALIS

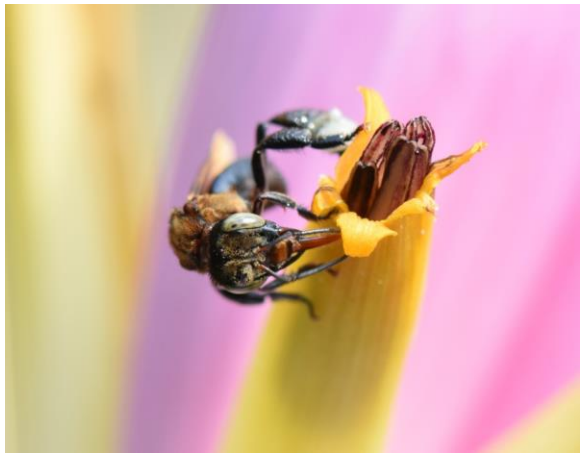
TETRIGONA MELANOLEUCA

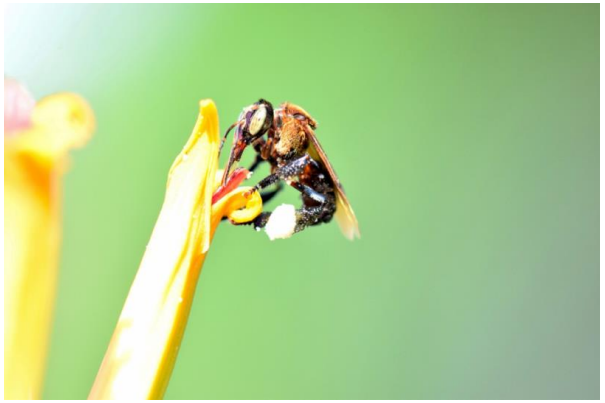
TETRIGONA PENINSULARIS

SPECIES SUITABLE FOR DOMESTICATION & REARING (MELIPONARY)

Heterotrigona itama

Geniotrigona thoracica





CHARACTERISTIC OF DOMESTICATED SPECIES

- Usually found in secondary forest and agricultural ecosystem
- Prefer agricultural crop/tree compared to forest species
- Use gum/resin from agricultural ecosystem to build nest

SPECIES NOT SUITABLE FOR CULTIVATION IN AGRICULTURAL AREA

- Species with crystal nest
- Source of food from forest
- Mostly with white wings

CURRENT SCENARIO

- Stingless bee rearing for stingless bee honey production
- Uncontrolled colonies acquisition/without permission from authority from natural resource/ forest (Dept. of Forestry 2016).
- Host plant threaten of extinction (Sidi 2016).
- Rising price of colonies/ log with colonies/hive
  - 2012 = RM 100
  - 2016 = RM 650

SOURCE OF STINGLESS BEE COLONIES

- Feral colonies (forest) or natural environment
- Multiplying colonies
- Pheromone traps during swarming season
- Queen rearing

ISSUES & PROBLEM

- Not sustainable
- Slow

RESEARCH ON STINGLESS BEE BREEDING AND REARING IN MARDI

ECONOMICS -COST OF BREEDING AND REARING

Conventional:

Price of colony: >RM600/colony (depend on type of species)- source of colony?

Multiplication of colony once/year only.

In vitro technology for queen rearing:

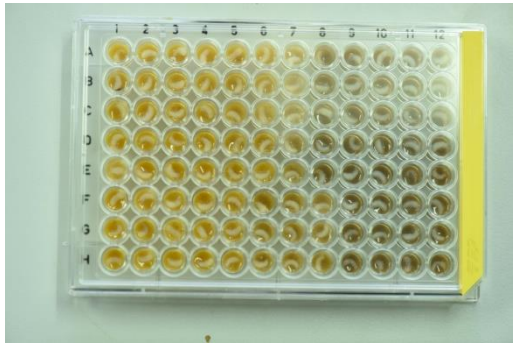
Queen rearing: Cost of colony could be reduce to RM300/colony

Capacity of production 300 colonies/month (will not harm the environment)

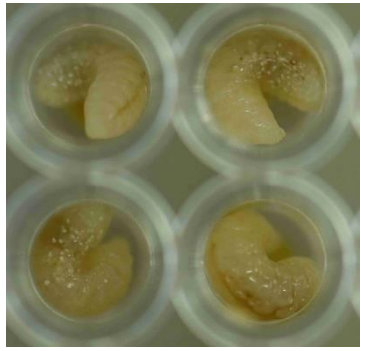
RESEARCH ON STINGLESS BEE QUEEN REARING

- Started in 2016
- Objective: To increased no of queen bee via technology compared to conventional method
- Decreased the price of colonies and
- Eco friendly approach to the environment.

THIS IS HOW WE DO

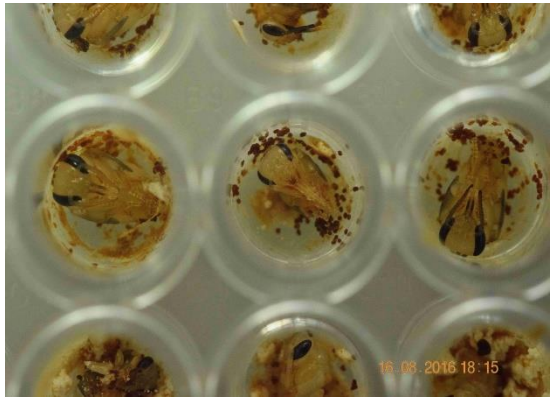


The egg and food has been placed on ELISA plate



The larva

The pupa



The queen

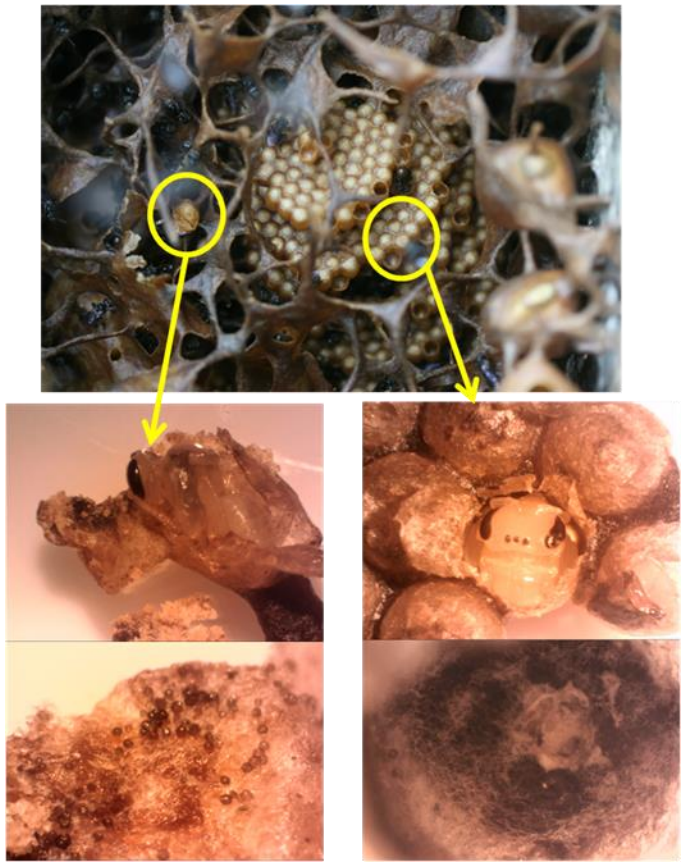
ISOLATION AND IDENTIFICATION OF FUNGUS FROM QUEEN AND WORKER BEE BROOD CELL

Objectives:

Isolate and identify fungus from queen and worker brood cells

Determination on the antimicrobial characteristic of fungus found in brood cells to pathogen

Determination on survival rate of stingless bee in vitro queen feed with fungus

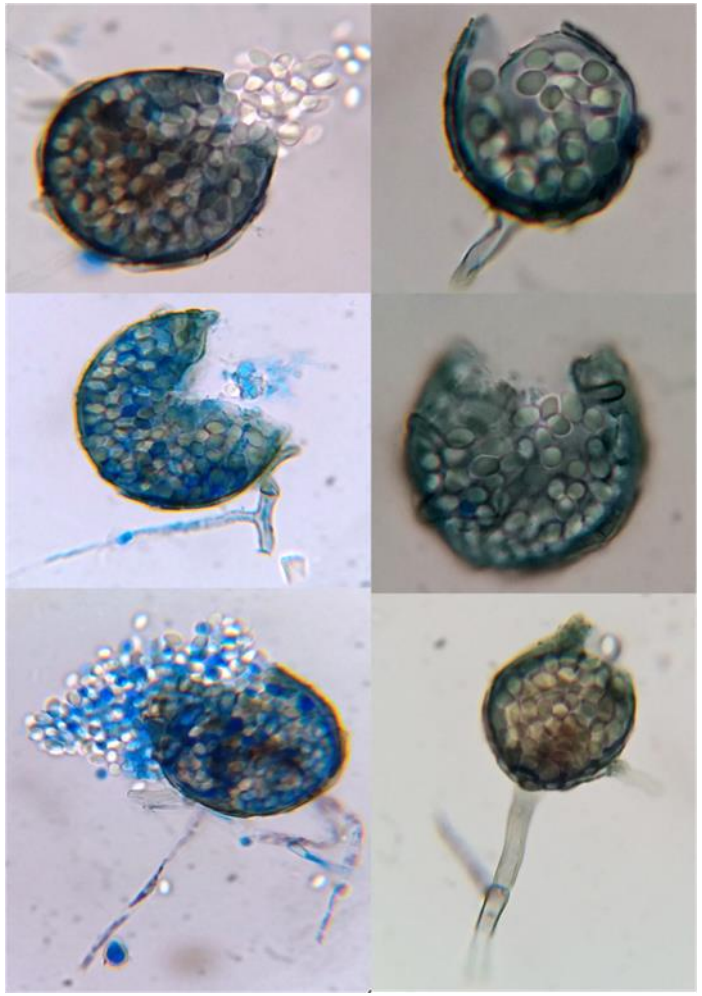


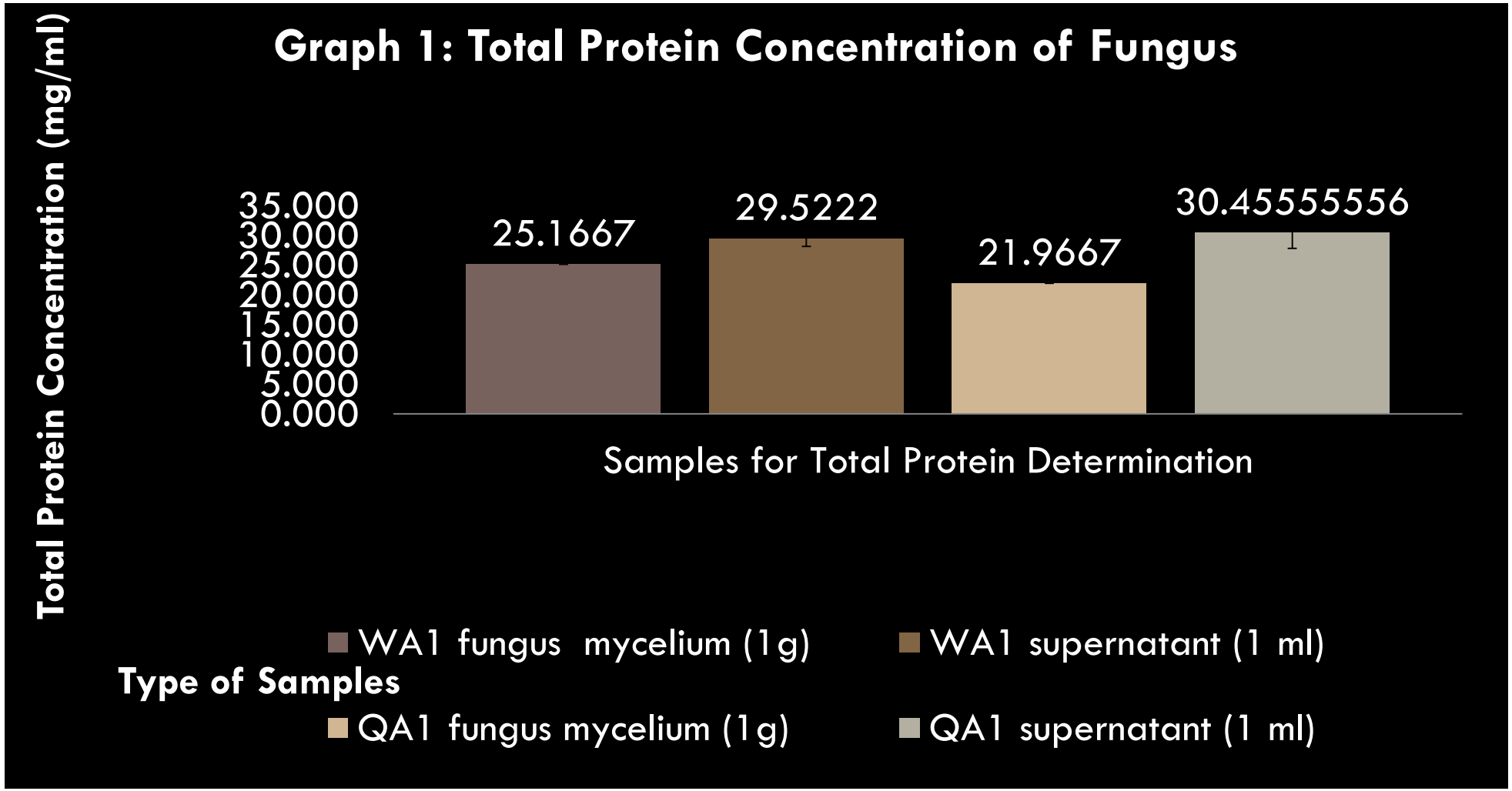
MORPHOLOGY & MOLECULAR ID

Monascus ruber

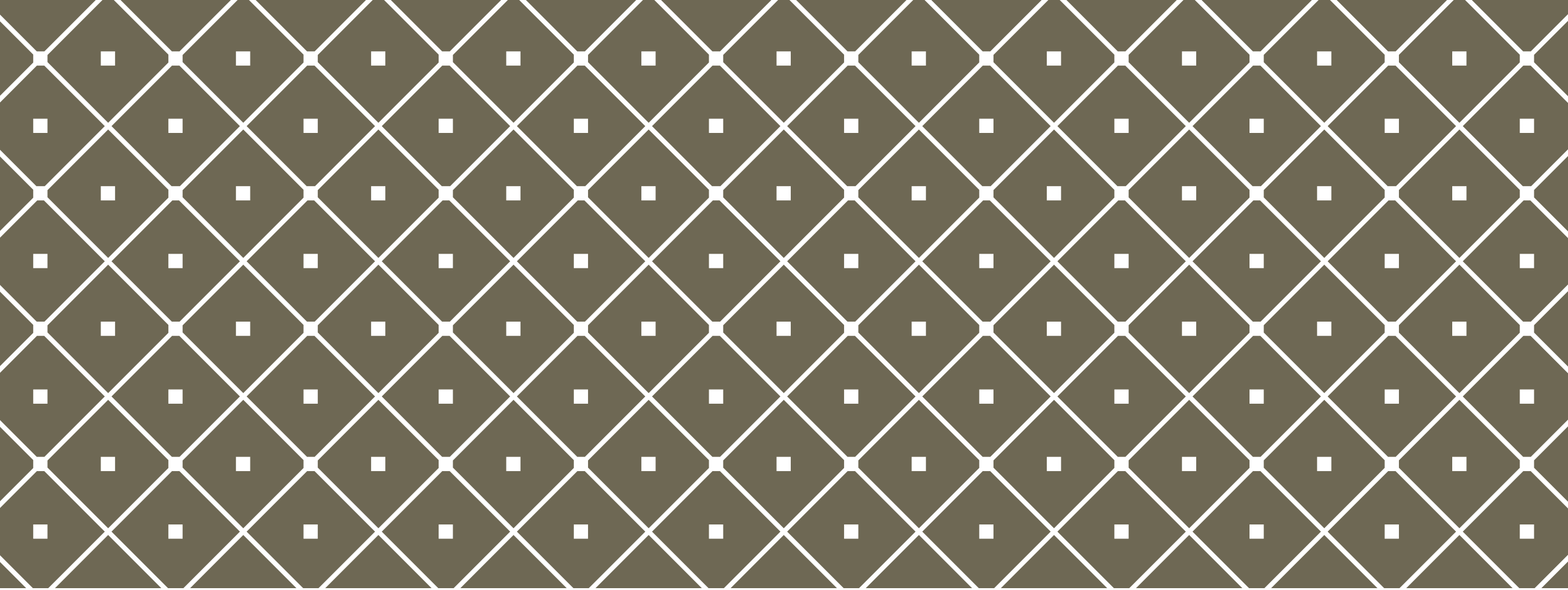
Internal Transcribed Spacer (ITS)

Isolate	Strain sp	%	Accession No
QA1	*Monascus ruber*	100 %	LN482460.1
WA1	*Monascus ruber*	99%	LN482460.1




Graph 1: Total Protein Concentration of Fungus
Total Protein Concentration (mg/ml)
35.000
30.000
25.000
20.000
15.000
10.000
5.000
0.000
25.1667
29.5222
21.9667
30.45555556
Samples for Total Protein Determination
WA1 fungus mycelium (1g)
WA1 supernatant (1 ml)
Type of Samples
QA1 fungus mycelium (1g)
QA1 supernatant (1 ml)

Treatment	EC	PA	ST	BS	BC
T1: Fungus QA1	-	-	-	-	-
T2: Fungus WA1	-	-	-	-	-
T3: SB Food	++	+	++	++	++
T4: SB Food(sterile)	-	-	-	-	-
T5: Antibiotic Penicillin G (positive control)	+++	-	++	++	+
T6: Antibiotic Streptomycin (positive control)	-	+++	+++	+++	+++
T7: Air suling (negative control)	-	-	-	-	-



WAY FORWARD

MAINSTREAMING POLLINATION SERVICES

- Conservation and Utilization (R&D)
- Awareness
- Incentives
- Policy

CONSERVATION

- MyGenebank MARDI- Fascilities- Insect museum, insectari, pollinator house
- Bee Sanctuary
- Model Farm (MARDI station Saratok)
- Mini Farm (Laman Kelulut @MAEPS)

MARDI

R&D&C

Consultancy / Services

Training/ courses

NBOS project with various Department/ Agencies

Developing Malaysian Standard/Specification for stingless bee honey/ MyGAP Stingless Bee Rearing

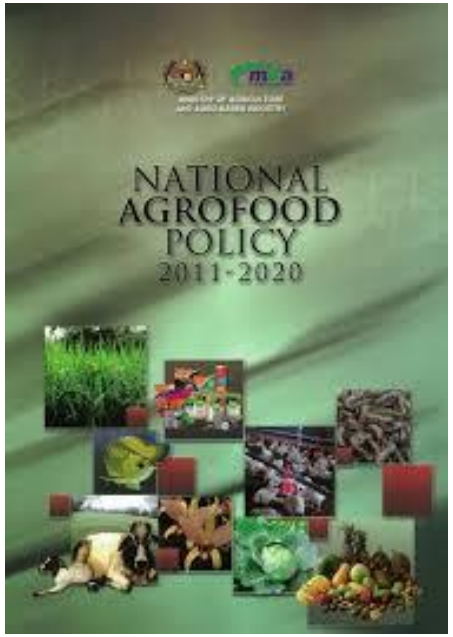
Model farm

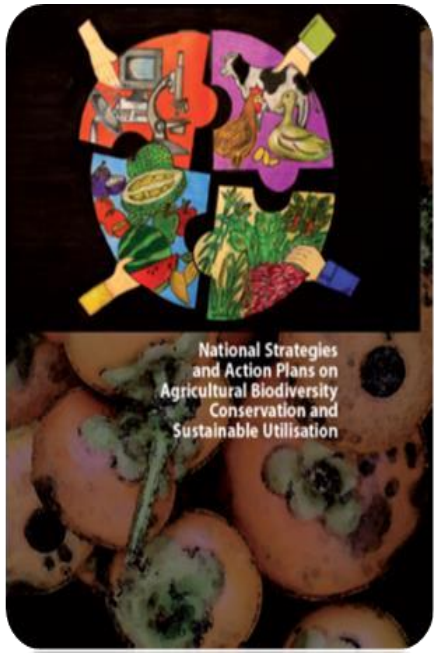
INCENTIVES

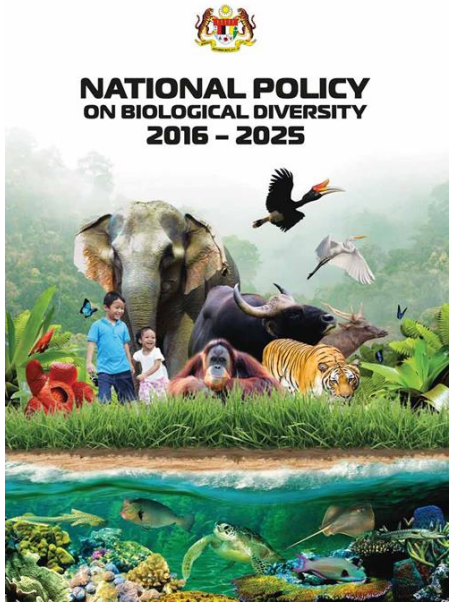
- AGROPRENEUR MUDA MOA
- PINJAMAN PERTANIAN (TEKUN @ AGROBANK)

POLICY

- National Agrofood Policy
- National strategies and action plans on agricultural biodiversity conservation and sustainable utilization (NSAP) 2012-2020
- National Policy on Biological Diversity 2016-2025







THANK YOU