

Ecological Networks for Pest Control Services (Insect Networks)

Native Plant Resources for Natural Enemies of Oil Palm Herbivores in Malaysia



In collaboration with:

FERRERO

 **CABI**



UPM
UNIVERSITI PUTRA MALAYSIA
BERILMU BERBAKTI



Ecological Networks for Pest Control Services (Insect Networks)

Insect networks are ecological networks for pest control services. They describe the interaction between host plants of beneficial insects that provide the service of biological control for pest herbivore insects of agriculture crops. This nature-based solution is a powerful approach that supports pest control, reduction of chemical input use and soil health by actively adding local plants that provide a diversity of resources all year round to natural enemies, predators, and parasitoids that would otherwise not find them in monocropping systems. Strips of local plants provide refuge, pollen, nectar, and extrafloral nectaries to assassin bugs, parasitic flies, and parasitoid wasps that control bagworms, slug moths or rhinoceros beetles on Malaysian oil palm farms.

With funding from Ferrero, SAN has worked over four years with its Malaysian partners CABI, UPM and Wild Asia to select six native plant species for its Nature-Based Solutions program and has studied them to prove that they provide a variety of resources to a high diversity of beneficial insects, such as assassin bugs, parasitic flies, and parasitoid wasps.

Senna tora

Foetid Cassia

Refuge | Pollen | Nectar | Extrafloral nectaries



Associated beneficial insects

Parasitoid (Braconidae)



Diolcogaster sp. Dolichogenidae metase



Parasitoid (Ichneumonidae)



Goryphus sp. *Buysmania* oxymora



Goryphus bunoh

Parasitoid (Eulophidae)



Sympiesis sp.

Parasitoid (Eupelmidae)



Eupelmus sp.

Parasitoid (Chalcididae)



Brachymeria sp.

Assassin Bug Reduviidae



Cosmolestes picticeps

Suppressed oil palm pests

Bagworm (Psychidae)



Mahasena corbetti



Metisa plana



Dappula tertia

Slug Moth (Limacodidae)



Setora nitens



Birthosea bisura

Clerodendrum paniculatum

Pagoda Flower



Refuge | Pollen | Nectar | Extrafloral nectaries

Associated beneficial insects

Parasitoid (Ichneumonidae)



Goryphus sp.



Buysmania
oxymora

Parasitoid (Eulophidae)



Pediobius sp.



Sympiesis sp.



Tetrastichus sp.

Parasitoid
(Chalcididae)



Brachymeria sp.

Assassin Bug
Reduviidae



Cosmolestes
picticeps

Parasitoid
(Braconidae)



Cotesia sp.

Suppressed oil palm pests

Bagworm (Psychidae)



Mahasena corbetti



Pteroma pendula



Eumeta variegata



Metisa plana

Slug Moth (Limacodidae)



Setothosea asigna



Parasa lepida



Birthosea bisura

Coleus monostachyus

Monkey's Potato

Refuge | Pollen | Nectar



Associated beneficial insects

Parasitoid (Braconidae)



Apanteles sp.

Diolcogaster sp.

Dolichogenidae
metasae

Parasitoid (Ichneumonidae)



Goryphus
tricolor

Parasitoid
(Chalcididae)



Brachymeria sp.

Parasitoid
(Ceraphronidae)



Aphanoogmus sp.

Parasitic fly (Tachanidae)



Austraphorocera *grandis*



Chaetexorista
javana



Exorista
sorbillans

Suppressed oil palm pests

Bagworm (Psychidae)



Mahasena *corbetti*

Slug Moth (Limacodidae)



Darna *diducta*



Darna *trima*



Metisa *plana*



Dappula *tertia*



Setora *nitens*



Setothosea *asigma*

Melastoma malabathricum

Straits Rhododendron

Refuge | Pollen | Nectar | Extrafloral nectaries

Associated beneficial insects

Parasitoid (Braconidae)



Cotesia sp.



Apanteles sp.



Dolichogenidae
metase



Diolcogaster sp.

Parasitoid (Eulophidae)



Pediobius sp.



Tetrastichus sp.

Parasitoid
(Eupelmidae)



Eupelmus sp.

Parasitoid (Ichneumonidae)



Goryphus sp.



Buysmania
oxymora



Goryphus
bunoh



Chlorocryptus sp.

Wasp (Scoliidae)



Scolia sp.

Assassin Bug
Reduviidae



Cosmolestes
picticeps

Suppressed oil palm pests

Bagworm (Psychidae)



Metisa plana



Pteroma pendula



Mahasena corbetti



Eumeta variegata



Dappula tertia

Slug Moth (Limacodidae)



Birthosea bisura



Setora nitens



Setothosea asigna



Parasa lepida

Rhinoceros Beetle
(Scarabaeidae)



Oryctes rhinocerus

Urena lobata

Caesarweed

Refuge | Pollen | Nectar | Extrafloral nectaries



Associated beneficial insects

Parasitoid (Braconidae)



Cotesia sp.



Apanteles sp.

| Parasitoid (Ichneumonidae)



Buysmania oxymora



Goryphus bunoh



Goryphus sp.

Parasitoid (Eupelmidae)



Eupelmus sp.

| Parasitoid (Eulophidae)



Pediobus sp.



Sympiesis sp.



Tetrastichus sp.

Assassin Bug
Reduviidae



Cosmolestes picticeps

Parasitoid (Chalcididae)



Brachymeria sp.

Suppressed oil palm pests

Bagworm (Psychidae)



Mahasena corbetti



Metisa plana

Slug Moth (Limacodidae)



Birthosea bisura



Setora nitens



Eumeta variegata



Pteroma pendula



Dappula tertia



Setothosea asigna



Parasa lepida

Vitex negundo

Chinese Chaste Tree



Refuge | Pollen | Nectar |

Associated beneficial insects

Parasitoid
(Eupelmidae)



Eupelmus sp.

F Parasitoid (Ichneumonidae)



Goryphus sp.

Parasitoid
(Diapriidae)



Trichopria sp.

Buysmania oxymora



Goryphus bunoh

Suppressed oil palm pests

Bagworm (Psychidae)



Mahasena corbetti



Metisa plana



Dappula tertia

Slug Moth (Limacodidae)



Setora nitens



Birthosea bisura