# Development of Training Materials for Management and Control for APPLE SNAILS (*Pomacea* spp.)

**Group 2**



## GROUP 2

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## RATIONALE

GAS is one of the invasive species that significantly affect rice production in ASEAN countries. Almost all the countries have experienced its havoc since 1981. Many suffered outbreaks and until now some countries are still suffering from its damage while some are now threatened.

Since every country in ASEAN aims for rice sufficiency and the capacity to export is a plus factor in one's economy, every stakeholders must have access to training materials for them to learn the threat, the culprit and the management options for us to learn the impact and damage of GAS will bring

## OBJECTIVES

**Main Objective:**

To produce training materials for different groups of audience namely the trainers and farmers using various medium of communications.

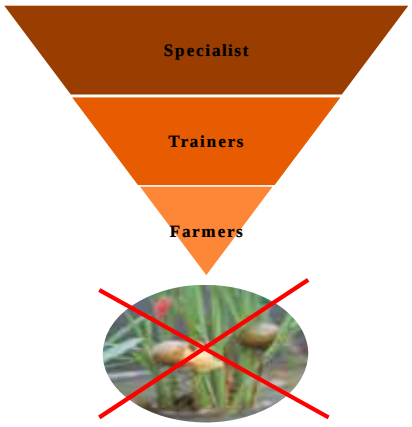
## OBJECTIVES

**Specific Objectives:**

- To control GAS
- To reduce cost of production
- To reduce pesticide pollution
- To promote new control measures
- To create awareness

## MEDIA

- Print- posters, flyers, pamphlet, manual (book)
- Radio
- TV
- Internet- Website
- Video




## SPECIALIST (RESEARCH OFFICER)

**Media : All**

- **History and Identification of GAS (Taxonomy)**
- **Biology and Ecology of GAS**
- **Damages**
- **Population Dynamic**
- **Control and management strategies**
- **Economic important**
- **Monitoring and Forecasting System**
- **Research and Development – new technology**
- **Data Analysis**
- **Rice Biology (Stages)**

## TRAINERS (AGRIC. EXTENSION OFFICER)

**Media : All**

- **History and Identification of GAS (Taxonomy)**
- **Biology and Ecology of GAS**
- **Damages**
- **Population Dynamic**
- **Control and management strategies**
- **Economic important**
- **Monitoring and Forecasting System**
- **Rice Biology (Stages)**

## FARMER

**Media : Print [Flyers, Poster, pamphlet, manual (book)], Radio, Internet (Website)**

- **History and Identification of GAS (Taxonomy)**
- **Biology and Ecology of GAS**
- **Damages**
- **Control and management strategies**
- **Economic important**
- **Rice Biology (Stages)**

## FLYERS / LEAFLET

## LEAFLET FOR TRAINING OF FARMERS



## BROADCAST ON LEAFLETS FOR FARMERS

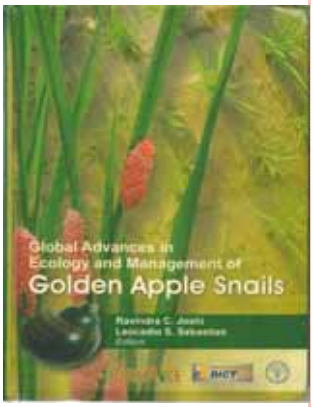


## FLYERS




## MANUAL (BOOK & BOOKLET)










## VIDEO



# TRAINING MODULE

## WHAT IS *GOLDEN APPLE SNAIL (GAS)*

**Scientifically known as *Pomacea canaliculata***

**Local Names**

- **Brunei : Languai**
- **Cambodia: Khchong Meas**
- **Indonesia : Keong Mas**
- **Laos : Hoi Pakkuang**
- **Malaysia : Siput Gondang**
- **Myanmar: Shwekhayu**
- **Philippines: Golden kuhol**
- **Thailand : Hoi Cherry**
- **Vietnam: Oc Buou Vang**

## WHERE DID *GAS* COME FROM?

- 1979 – 1980 – From Argentina to Chinese Taiwan
- 1980's – Indonesia from
- 1982 – Thailand from Japan
- 1985 – Philippines from Taiwan
- 1988 – Vietnam from Taiwan & Philippines
- 1990 – Myanmar from China
- 1991 – Laos from Thailand
- 1991 – Malaysia from Philippines & Thailand
- 1995 – Cambodia from .....
- 2008 – Brunei from .....

## GAS BACKGROUND

| | Cambod | Indonesi | Thailand | Vietnam | Phil. | Laos | Malaysia |
|---|---|---|---|---|---|---|---|
| **Historical Profile** | | | | | | | |
| Year Introduced | **1995** | **1986** | **1981** | **1982** | **1982** | **1989** | **1991?** |
| Year reported as rice pest | **2001** | **2002** | **2000** | **1988** | **1986** | **1993** | **1991** |
| **Purpose of Introduction** | | | | | | | |
| Pet | + | + | + | - | + | + | + |
| Food | + | - | + | + | + | + | + |
| Revenue | + | + | + | + | + | + | + |
| Other purposes | - | - | - | - | + | - | - |
| **Species Determination** | | | | | | | |
| *P. canaliculata* | + | + | + | ? | + | ? | + |
| *P. insularum* | + | + | + | ? | ? | ? | + |
| Other spp. (*Pila spp*) | + | + | ? | ? | + | ? | + |

## THE PATHWAY OF GAS SPREAD











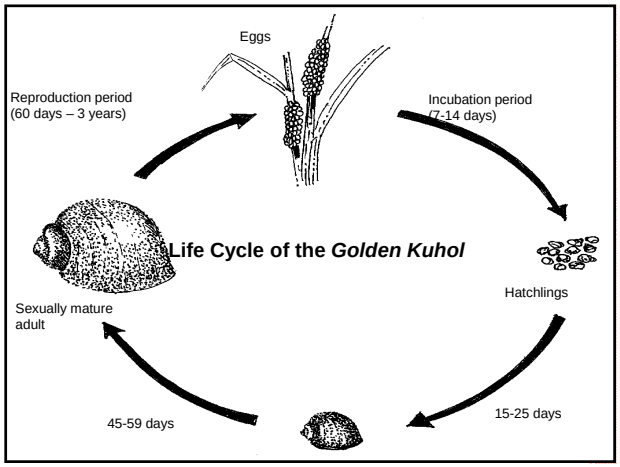
*Pila ampullacea*



*Pila scutata*

## EGG COLOR AND SHELL CHARACTERISTICS

| | Egg color | operculum | umbilicus | suture |
|---|---|---|---|---|
| *Pila ampullacea* | Light brown | calcified | Not pronounced | flat |
| *Pila scutata* | white | calcified | Not pronounced | flat |
| *Pomacea canaliculata* | pink | dark & glossy | Deep & large | <90º - deep |




## ECOLOGY OF GAS

- Ponds, swamps, irrigated fields, canals and water-logged areas.
- They bury them themselves in moist soil during the dry season and can aestivate for 6 months under the soil.
- They can survive harsh environmental conditions such as pollutants in the water or low oxygen levels.



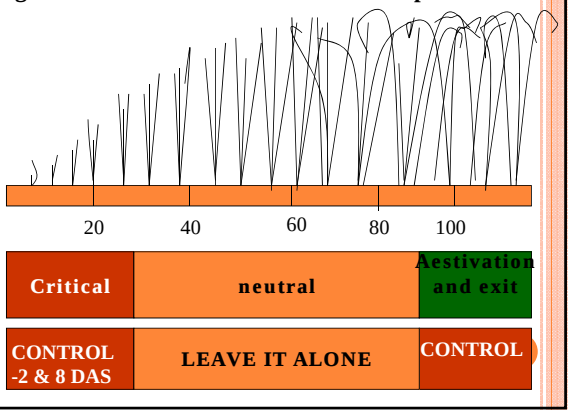


## Modes and signs of GAS damage

- GAS devour the base of young seedlings. They can even consume the young plants in a whole paddy overnight.
- Missing hills and floating cut leaves on the water surface.



## Stages of Snails Infestation of the Rice Crops

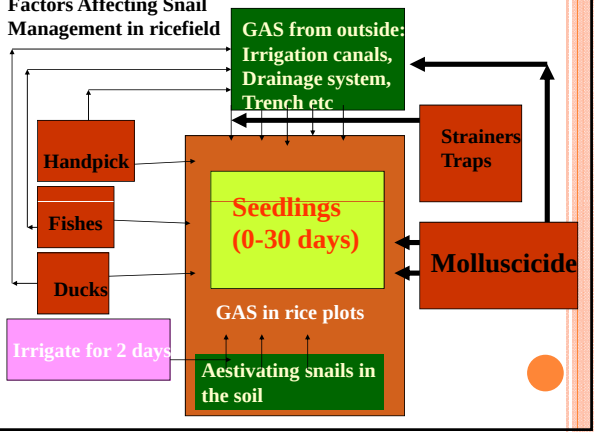



## Extent of GAS damage

- Extent of damage depends on snail size, population density and growth stage
  - ❖ GAS with shell height of 1.3 cm can feed on young plants up to 4 weeks while those with shell height of 6.5 cm can feed up to 9 week old plants
  - ❖ Density of 1 snail/m2 can reduce tillers by 19% and will increase up to 98% with 8 snails/m2 density



## Factors Affecting Snail Management in ricefield




## Control Strategies

- Physical Control
- Cultural Control
- Biological Molluscicide
- Habitat Modification
- Biological Control
- Chemical Control

## PHYSICAL CONTROL

- Handpicking of egg masses and adult snails
- Use traps @ strainers at all water inlets into the field
- Baits – all kind of herbage baits such as water convolvulus, manihot leaves or grasses etc.
- Put up sticks or bamboo for snail to lay eggs
- Community efforts





- Traps (all kinds) can be placed at water inlets to prevent snail entry into the rice field



Strainers or nets installed at irrigation canals gates to prevent snail entry into the rice field.





Nets installed at the inlet hose when pumping water from snail contaminated drainage canals.





- Baits can be used to concentrate snails for physical removal or confining pesticide application to specific area
- Installing bamboo stakes or sticks to facilitate collection of egg masses





- All kind of baits can be used to attract and concentrate GAS for easy handpicking/physical removal.





Public awareness campaign by organizing competition and collection of adult snails and egg masses.





## CULTURAL CONTROL

- Land leveling – ensure field is flat with no puddles. Serious damage normally occurred in puddles and water standing areas after seeding.
- Water level after land smoothing should not be less than 3 cm. At water level less than 3 cm, snails will bury itself into the soil esp. on hot sunny days.
- Practice wet seeding – could reduce infestation. Water reintroduced into the field after 7-10 days after seeding.
- Proper and complete burning of rice stubbles after harvest could help in reducing snail population in the field.
- Revert to mechanical transplanting/transplanting

Land Preparation

- Proper plough and land leveling could reduce snails population in the soil
- Avoid creating puddles in the rice field





Control GAS by reverting to transplanting either manually or using mechanical transplanter





Transplanting will not be effective if

- Water in rice field is not drained off before transplanting
- Snails are not controlled before transplanting

## HABITAT MODIFICATION

- Construct perimeter drains (25cm X 5cm ) to concentrate snails after water is drained out.
  - Water is drained off before pre-germinated seeds are broadcasted and before harvesting (at 90 DAP).
    - Facilitate physical removal of snails or spot spraying of molluscicides inside the drain only.
- Construct a drain between two lots of land for irrigation/drainage and facilitate snail management by installing nets or trap at each point of water inlet into the rice field



Constructing a drain in between two lots of land that will facilitate irrigation or drainage as well as facilitating snail control.

Perimeter drain will facilitate molluscicide application or physical removal of snail by concentrating the snails in the drains when water is drained out of the rice field



## BIOLOGICAL MOLLUSCICIDES

- Tea seed cake: 0.5 gm TSC /L water (100kg/ha)
- Tobacco: leaves, stems or roots?
- *Peltosporum pterocarpum* – leaves
- *Furcrea selloa* & neem extract
- Commercial formulation of biological molluscicides
- Most biological molluscicides are also toxic to fishes and other aquatic organisms.

## TEA-SEED CAKE

- Active principal: saponin
- Very effective for controlling apple snails.
- Very toxic to all aquatic organisms.
- Rice field should be flooded ( 2-3 cm deep) before treatment
- Application rate: 50 kg/ha soaked in water overnight before applying into the ricefield
- Never being registered for snail control in Malaysia



Furcraea selloa



*Pisonia alba* – attractant






## NEEM EXTRACTS

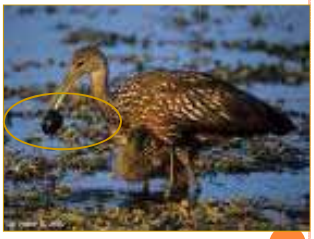
- Field trials using Neemix (Neem oil) showed that it is efficacious on GAS.
- Very expansive

## BIOLOGICAL CONTROL

- Duck pasturing before sowing or transplanting & 35 days after sowing.
- Ducks are driven out of the rice field 80 days after sowing
- Fish farming in the rice fields as well as in the irrigation canals

## Naturally occurring biological control agents

- Birds feed on eggs and newly hatched snails
- Field rats bite on the shell and eat the flesh







Ducks feeding on GAS

- Farmer feeding catfish with GAS



Wild birds feeding on GAS

## Biological control agents





- **(a) Red ants and (b) grasshopper feed on the eggs**

## CHEMICAL CONTROL

Metaldehyde and Niclosamide are registered Molluscicides in most Asian country

- Bayluscide (niclosamide ethanolamide) – Specific for controlling aquatic snails: 315g racun/ha at volume of spray of 180L/ha.
- Rate used for granulated Metaldehyde (5%)- 4.5kg/ha at snail density less than 5/meter square. Higher rates of 14 kg/ha is recommended at snail density of more than 5/meter square.
- After treatment with both molluscicides, water need to be retained in the ricefield for 2 – 3 days before being drained off.

## FIELD OPERATION FOR DIRECT WET SEEDED RICE

| Days after sowing | Activity | Comments |
|---|---|---|
| (-30) - (-3) | Collect and destroy snails and egg masses or herd ducks into rice field. | Conducted in rice fields and irrigation system. Collection of snails can be facilitated with use of herbage attractants |
| | Put up strainers at all water inlets into the rice field | Nets or traps will prevent snails in irrigation canals from entering the rice field |
| | Flooding the field 2-3 days before molluscicides are applied | Stimulate snails aestivating in the soil to surface |
| -2 | Recommended molluscicide such as niclosamide (315g/ha) or metaldehyde (14kg/ha) applied and water in ricefield retained for 2 days before being drained out. Water level maintained at 2-5 cm deep Construct perimeter or side drains after draining the water out. | Mollucicide is sprayed or broadcast evenly to obtain optimum control<br>Perimeter drains should be about 25cm wide and 10 cm deep to trap snails after water is drained out. |
| 0 - 7 | Apply recommended molluscicide in drains and puddles if snails are detected. | Spot applications to control snails not killed from previous treatments. |

| | | |
|---|---|---|
| 7 - 10 | Check that strainers and traps are working properly | Prevent snails entry from outside |
| > 40 | Control measures are not necessary even if snails are detected in the rice field | Snails presence after the fourth or sixth week after sowing did not pose threat to the seedlings |
| > 90 | Collect and destroy all snails and egg masses collected in the rice field especially in the perimeter drain | After water is drained out, snails will collect in the perimeter drain |
| At harvest | Ensure harvesters are snail free | Prevent spread and dispersal of snails |
| After harvest | Herd ducks into the rice field | Ducks will reduce snail population in the rice field |

## FIELD OPERATION FOR TRANSPLANTED SEEDLINGS

| Days after transplanting | Activity | Comments |
|---|---|---|
| (-30) – (-3) | Survey for the presence of GAS in rice Field and surrounding area | Determine snail density & make decision to take control action |
| | Herbage attractant were placed inside the rice field along the bund at 10 m apart. Bamboo or wooden stakes were installed at 10 m apart | Continuous collection & destruction of snail and egg masses |
| | Strainers or traps install at water inlets/outlets. | Preventing snail entry from outside. |
| | Flood the rice field for 2 days before molluscicide applied | Aestivating snails encouraged to |
| -2 | Perimeter drains constructed after harrowing. Water level maintained at 2-5 cm deep. Apply recommended molluscicide at specified rates. Drain water out before transplanting | Perimeter drain: 25 cm wide X 10 cm deep. Molluscicides applied along the bund |

| Days after transplanting | Activity | Remarks |
|---|---|---|
| 1-7 | Spot application of molluscicide in perimeter drain if snails are detected | Strainers and traps installed to prevent snail entry into rice field |
| >30 | No molluscicide application is necessary even if snails are detected | The ability of GAS to cause damage to crops after the 4th or 6th weeks diminishes. |
| >90 | Collect all snails and egg masses in the perimeter drain or on rice crops | Prevent spread to next season crops |
| At harvest | Make sure combine harvester is snail free before moving to other areas | Prevent spread to other areas |
| Post harvest | Herd ducks into the rice field | Reduce snail population. |

## REFERENCES

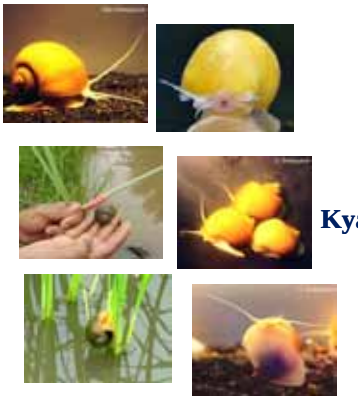
**Regional Workshop on Spread Prevention and Control of Apple Snails (*Pomacea* spp.) in Rice, 3-7 December 2012, Kuala Lumpur, Malaysia**

**1. Country Reports**

- **Brunei**
- **Cambodia**
- **Laos**
- **Myanmar**
- **Malaysia**
- **Philippines**
- **Thailand**
- **Vietnam**

## REFERENCES

2. Management of Golden Apple Snails, Mr Yahya Hussain (Consultant)



**Thank You**
**Terima Kasih**
**Salamat Po**
**Kyae Zuu Tin Par Tae**
**Kob Chai**
**Kob Kun**
**Xin Cam On**
**Orkun**