Spread Prevention & Control of Golden Apple Snail (GAS) In Malaysia





Presented by

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Introduction

- GAS was sighted in 1991 in the waterways of old tin mines in Puchong, Selangor
- The first GAS infestation in rice was reported in 1991 in Kuala Muda in the state of Kedah.
- The GAS is now a major pest in most rice areas in Peninsular Malaysia.
- GAS has become a major threat to the rice crop. Currently, there are 517,555 ha of wetland rice in Peninsular Malaysia which are mainly located in the 8 rice granary areas.

Total rice grain production in 2011 is 2,311,978 ton.

- In some areas , GAS has spread very rapidly and beyond control causing severe damages to the rice crop especially during the early establishment of the crop. More rice areas are have now been found to be infested by this pest in the country.

DEVASTATING OCCURRENCE ON RICE CROP BY GAS INVASION



12/12/2012

- The main impact of GAS infestations are reduction in rice yield and increase in cost of production
- The Department of Agriculture Malaysia and the rice growers carrying many activities to curb the GAS menace.

RICE GROWING AREAS IN PENINSULAR MALAYSIA



AREA AND RICE PRODUCTION IN MALAYSIA

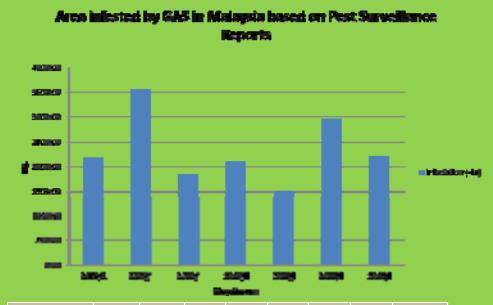
State	Year 2011	
	Cultivated(Ha)	Production (MT)
Johor	2,689	10,673
Kedah	213,809	1,001,774
Kelantan	74,397	266,884
Melaka	2,334	8,144
Negeri Sembilan	1,956	8,877
Pahang	,6891	25,017
Perak	82,899	330,498
Perlis	52,040	247,689
Pulau Pinang	25,564	134,682
Selangor	37,508	205,940
Terengganu	17,468	71,801
Pen. Malaysia	*517,555*	*2,311,978*
Sabah	42,526	145,194
Sarawak	123,596	207,925
MALAYSIA	683,677	2,665,098

Eight Rice Granary Areas in Peninsular Malaysia

Granary	Area (ha)
1. MADA	96,547
2. KADA	28,137
3. IADA Kerian Sungai Manik	26,846
4. IADA Barat Laut Selangor	18,729
5. IADA P.Pinang	10,305
6. IADA Seberang Perak	7,272
7. IADA Ketara	4,923
8. IADA Kemasin Semerak	4,520
Total	197, 279

Area infested by GAS

The GAS has almost infested all rice areas in Malaysia with varying degree of damage to crop plant. From the rice pest surveillance report, it is shown that GAS infestation is increasing from year to year.



Crop Season	2009/1	2009/II	2010/I	2010/II	2011/I	2011/II	2012/I	
Infestation (Ha)	2184.53	3542.08	1831.8	2114.2	1507.08	2946.47	2204.92	

Status of major rice pest infestations in Pen. Malaysia (2009-2012)

PESTS	2009/1	2009/II	2010/I	2010/II	2011/I	2011/II	2012/I
	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
Plant hopper	1,020	925.57	3,955	1,943.	464.8	1,498.37	1,061.20
W.B. P.H	67.11	79.49	476.43	810.8	21.15	81.20	78.95
G. Hopper	9.02	3.72		168.0	14.00	3.00	78.95
Ulat Daun	146.05	137.44	535.90	79.34	65.10	1,948.91	46.48
Ulat Lipat Daun	1,703.01	2,450.74	6,128.	3,133.	545.8	202.25	1,459.56
Ulat Layar	137.40	360.00	585.80	831.6	295.0	427.22	235.30
Ulat Ratus	125.66	111.49	724.90	396.3	65.00	416.60	307.30
Stem borer	418.84	471.56	1,495.38	1,721.	208.7	1,006.92	1,939.51
Kutu Beruang	131.23	57.72	65.33	52.81	94.62	284.42	1.00
Kesing	123.64	115.86	498.25	422.5	94.99	147.35	137.48
Thrips	246.23	366.71	369.80	667.1	398.1	140.42	462.00
Roden	1,648.18	3,104.38	2,795.09	3,276.	1,173.	2,342.08	3,638.38
GAS	2,184.53	3,542.08	1,831.79	2,114.	1,507.	2,946.47	2,204.92
JUMLAH	7,961.61	11,726.76	19,462.	15,617	4,947	11,445.21	11,651.03

Pest surveillance report (DOA)

Losses due to GAS infestation

- GAS infestation causes poor crop establishment and low yield can be anticipated .
- By capturing the total coverage of GAS infested areas, the yield losses can be estimated for the whole country.
- In 2009, yield losses due to GAS infestation is estimated to be RM82.5 million from two crop seasonsin rice granary areas .

Estimated yield losses caused by GAS in rice granary areas in main season 2009

Granary Area	Cultivated area (ha)	Yield losses (ton)	Value (RM)
MADA	96,547	10,977	11,807,185
KADA	28,137	18,178	19,995,910
IADA Kerian Sungai Manik	26,846	918	1,009,470
IADA Barat Laut Selangor	18,729	376	526,540
IADA P.Pinang	10,305	1,029	1,142,190
IADA Seberang Perak	7,272	5,148	6,692,400
IADA Ketara	4,923	0	0
IADA Kemasin Semerak	4,520	56	56,000
Total	**197, 279**	**36,682**	**41,229,695**

Estimated yield losses caused by GAS in rice outside granary areas in main season 2009

AREA	CULTIVATED AREA (ha)	YIELD LOSSES (tan)	VALUE (RM)
KEDAH	30,488	2,747	1,442,043
JOHOR	1,228	0	0
KELANTAN	10,164	19	19,200
MELAKA	943	3	3,300
N.SEMBILAN	298	8	6,160
PAHANG	4,404	3	3,300
PERAK	6,178	328	360,800
PERLIS	7,403	262	288,200
PULAU PINANG	2,477	236	259,600
*SELANGOR	0	0	0
TERENGGANU	3,842	0	0
TOTAL	**67,425**	**3,606**	**2,382,603**

Policy maker perception on the problems

Since the first incursion of GAS in Kuala Muda Kedah, the authority (DOA) has taken measures to curb the pest from spreading. The authorities realized that GAS would be a major threat to rice industry ,just like, what other countries experienced.

Measures taken included:
- Sending alerts to farmers through campaign and promotion
- Highlighted the issues concerning the pests through electronic and printed media
- GAS has been gazette as a dangerous pest and must be treated as quarantine pest where pest containment program for the whole country will be carried out.

Farmers perception on the problems

- In the beginning of the incursion, farmers were not so responsive to take urgent steps in controlling, until they had a bad experience with the impact of infestation.
- Most farmers depended on chemical controls, but due to some factors, they did not succeed to curb the pest.
- Prohibited and illegal pesticides are commonly used. As farmers claimed, these pesticides are cheap and effective in controlling the GAS without realizing the bad consequences.
- Farmers in certain areas are willing to adopt compromised options which are recommended for the highly infested areas. They are advised to use the transplanting methods and water management methods.

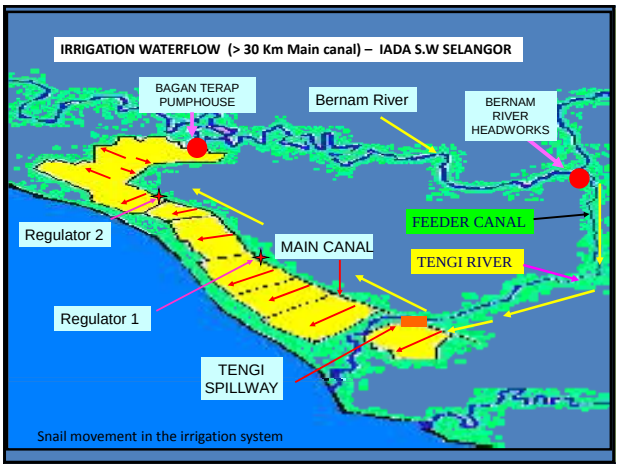
Patterns of Spread of GAS

- Internal spread
  1. By farm machinery
     - Machines such as tractors and combine harvesters carry soil contaminated with the snails and their eggs.
     - Most activities such as land preparation, planting and harvesting done are carried out by machines.
  2. Snail spread via irrigation and drainage canal.
  3. In-situ snail population build up

1. Spread of GAS by contaminated farm machinery.





THE INVASION OF GOLDEN APPLE SNAIL IN PADDY AREA IN SELANGOR
(SOUTH - WEST INTEGRATED AGRICULTURE DEVELOPMENT AREA OF SELANGOR)

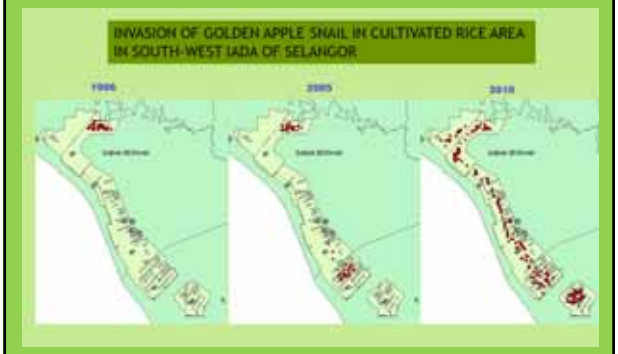
- PATTERN OF SPREADING OVER THE YEARS
(1996 - 2010)

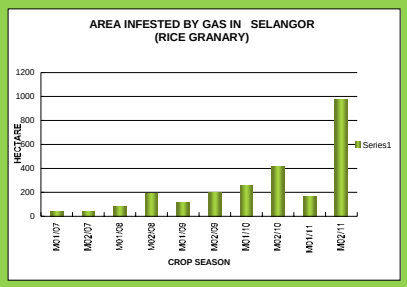
IADA OF SOUTH WEST SELANGOR



STATE OF SELANGOR







M01/07	M02/07	M01/08	M02/08	M01/09	M02/09	M01/10	M02/10	M01/11	M02/11
39	43.6	82.8	193.8	119.07	200.32	254.4	415.1	163.91	972.94

Pest surveillance report (DOA)

Other factors that contribute to the spread of GAS

•Combine harvesters are deployed from one state to another state and they are one of the major source of spread of GA. Most the these combine harvesters originated from state of Kedah where GAS infestation is most serious.

•Floods also contribute to the spread of GAS.

An example is the flood – prone rice area in Krian Perak that often experience flood and inadvertently spreads the GAS.

Drainage maintenance such as cleaning the drain and waterways may transfer items (soil, weed, debris) that carry GAS and eggs to levee.

Invasion pathways of GAS

Interception list if any

There have been no reports of GAS intercepted at any of the legal entry point of the country.

Introduction pathways

There are no proper records of GAS introduction to Malaysia. There is not enough data to relate the early discovery of GAS in Kedah and Selangor in 1990s to the GAS problem in the country. Possibly GAS had been introduced through illegal import, because the snails were bred for commercial purposes , namely as an exotic source of food. This exotic food started initially for local consumption but later exported abroad, just as what happened in other countries.



Saturday November 21, 2009

Farmers facing new threat from snails

By WINNIE YEOH

ALOR SETAR: Although flood had subsided over the last couple of days, rice farmers here are facing a new threat from the golden apple snails, locally known as siput gondang emas.

The snails are breeding fast and the pinkish eggs can be seen in weeds in the padi fields.

Farmer Marzuki Saad, 56, said the pests were brought in by water overflowing from rivers.
New threat: Marzuki showing the golden apple snails (left) and its eggs at his flooded padi field yesterday.

He said although the rain had stopped, the water which was released from the Pedu Dam was accumulating in the fields.

"The seedlings will be destroyed if submerged in water for 12 days. The water in my field cannot flow out as the water levels at nearby streams and rivers are still high.

"The snails will die in three days if I spray pesticide but the water flowing in will bring in more snails," he said when met at his rice field at Kampung Teluk Binasa at Gunung Keriang yesterday.

Muda Agricultural Development Authority (Mada) general manager Datuk Abdul Rahim Saleh said the snails were not a big issue.

He said Mada was conducting an ongoing campaign to educate farmers on how to eradicate the snails.

"As the snails will eat young shoots, we advise farmers to use transplanter machines which plant older shoots. It will also ensure better weed management," he said.

Meanwhile, six of the seven relief centres in the state have been closed except the Bandar Baru centre which is housing 239 flood victims.

He said a total of 3,097 food evacuees from 798 families had returned to their homes.

Invasion pathways of GAS

Approve import for food

There had been approval by DOA (Plant Quarantine) the importation of GAS for breeding purposes in Pahang in 1990s.
DOA (Plant Quarantine) made regular checking at the breeding premise to ensure no snails escaped from the breeding place .

What commodities it enter such as ornamental fish importation
DOA (Plant Quarantine) has no information

Impacts of GAS infestation

LEVELS	IMPACTS
Agricultural Ecosystem Levels	Cropping system has changed drastically in the production in recent years, such as from direct seeded to transplant method. The change involved alteration of water requirement during early stage of planting. The change resulted in water delivery mood in irrigation system.
Community level	More farm activities are involved to solve the problem – need integrated affords in the community.
Species level	Degradation the natural habitat of organisms , such as fish, frog and bird in crop areas.

Impacts of GAS infestation

LEVELS	IMPACTS
Farm workers & health hazards	The increase use of pesticides to control GAS bring more health hazards to farmers by way of acute and chronic poisoning.
Environmental Level	Degradation of water quality in irrigation areas due to extensive use of pesticides.
Economic losses	In 2009, estimated rice yield losses was RM82.2 million due to GAS infestation.

Utilization of GAS

- Use of GAS as food
  In 1980s , a few breeders tried to produce GAS on a commercial scale as a source of food, but somehow, the effort was abandoned due to lack of respond from local community
- Handicraft
  There is no information so far of any effort towards handicraft purposes.
- Domestic purposes
  There is no information so far of any effort to make use of GAS as pets (aquarium)

Public Education

Various methods have been carried out by the DOA and regional development authorities (e.g MADA , KADA and IADA) to promote public awareness as well as to educate them about GAS namely ;

- Formal training
- Posters
- Banners
- Flyers
- Campaigns
- Media

POSTERS **FLYER/LEAFLET**



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3-7 December 2012 Kuala Lumpur, Malaysia

Leaflet : Biological of Golden Apple Snail



Leaflet : Chemical control method (Bayluscide)



12/12/2012

Future Threats Of GAS

How the spread still continue to new areas

1. The present machinery services are still insufficient , thus more machineries need to be imported.

The movement of the machines between states is actually a cause of GAS infestation to existing and the new areas.

2. The water flow in the irrigation drainage systems also play an important role in dissemination of GAS to existing and new areas.

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Future Threats Of GAS

Is the infestation level increase ?

From the DOA rice pest surveillance records, the GAS infestation level keeps on increasing

Does present control effective

No , the control measures are not really helpful , but the problems are manageable

Suggestion to prevent spreading

Integrated control measures are being practised in small scales, but will be done in larger scale throughout the country once enough fund is available.

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CAMPAIGN : CONTROLLING METHOD BY HANDPICKING SNAIL



Management guidelines

MARDI has produced a manual " Management of Golden Apple Snails in Rice (2011)". This manual is used as a reference material for training and implementing control program. The manual covered many aspects in managing rice crop from the GAS threat.

New Paradigms

New research on GAS

In Malaysia all researches are carried out only by research bodies and universities. Collaboration work between DOA and University Putra Malaysia is on going : *Trial on non-chemical control of GAS in rice.*

Innovative lesson learn

DOA of Malaysia has carried out several observations as well as promoting methodologies in controlling GAS , for instance,

i. **herding ducks to control GAS (2008)**
ii. **observations of the susceptibility stages of paddy to GAS (1999)**

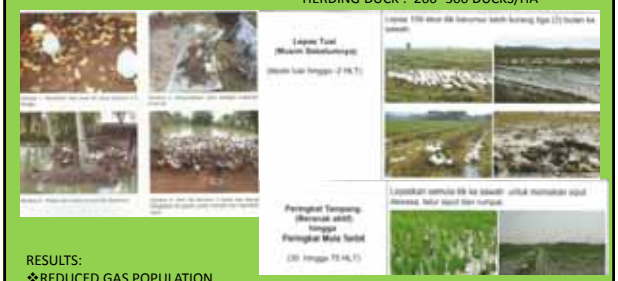
PROMOTION : BIOLOGICAL CONTROL



Season 1/2008



HERDING DUCK : 200 -300 DUCKS/HA



RESULTS:
- ❖REDUCED GAS POPULATION
- ❖SIDE INCOME
- ❖EFFECTIVE TO CONTROL GAS
- ❖NO PESTICIDE USED TO CONTROL GAS

Observation on susceptibility of paddy stages to GAS



RESULTS

- **New germinated seeds and young seedlings (1-4 weeks) are susceptible to GAS**
- **GAS infestation causes patches in the field.**
- **1 GAS potentially damage one square meter of new seedlings within a week.**

12/12/2012

Knowledge Gaps

Technical - biology and ecology

Farmers' knowledge on ecology and biology are at the very minimum level based on their ability to comprehend and their education level. Thus both ecology and biology knowledge are given to them through training programmes, especially on ways of controlling and prevention of GAS.

Knowledge Gaps

Control management

Eradication programmes will be carried out on the GAS infested areas. The farmers are given hands-on training of how to control and to prevent GAS from further spreading. They are also provided with the necessary pesticides and tools.

Knowledge Gaps

Policy

The authorities are responsible to take actions on how to curb the spreading of GAS not only through legislation (Act), but they also are responsible to instil the awareness and to upgrade the skills to curb GAS infestation to the farmers

Lessons Learned

The most effective method of control

Various choice of controlling procedures are recommended to the farmers to practise. But in order to be more effective , an integrated concept should be applied on infested areas. The integrated approach used in controlling GAS consists of legislative, physical, mechanical, cultural, biological and chemical methods.

Lessons Learned

1. Cultural Method :

- **Transplanting**

Now transplanting is commonly used in some areas due to its cost- effectiveness to combat GAS as well as weedy rice problem. Seedlings at the age of 14 – 20 days that were transferred to the field manually or by transplanter are more tolerant to the pest.

TRANSPLANTING



❑Water level management

Before sowing, the field is drained to saturated condition and water level is regulated to about 5- 7 cm deep, in the first week of crop establishment.
In this condition the snails become less mobile to feed on germinated seeds or young crops. Most farmers adopted this method because it is more applicable and effective, provided there is no constraint of water supply in the area. The water supply is required more for the next vegetative and productive stages.

SOWING SEEDS ON SATURATED CONDITION



❑Handpicking,

Handpicking is carried out occasionally throughout the crop season. For better result, papaya, sweet potato, banana and tapioca leaves are used as snail attractants. The bundle of leaves are placed in some spots in the field and snails are attracted to them after several hours. Some stakes are placed in the drain around the field to lure snails to deposit eggs. The adult snails and eggs are then collected and destroyed.

CONSTRUCT SMALL CANAL OR DEEP STRIPS



STAKING FOR GAS DEPOSITING EGG





JACKFRUIT USE AS SNAIL ATTRACTANT



12/12/2012

Trapping

Wire mesh or net is placed on the irrigation water inlet and outlet to prevent the entry of hatchlings and adults. This also facilitates collection of trapped golden apple snails.

WIRE MESH CAGE FOR TRAPPING



2. Biological Control :

Herding Ducks

Farmers are encouraged to rear ducks as a biological control for GAS.
Herding ducks in the paddy fields is done immediately after harvesting until the time for the last harrowing of the succeeding crops. The ducks are herded again at 30-45 days after transplanting .
DOA has recommended a farmer to rear 100 – 200 ducks , which is a feasible number that can generate side income as well for controlling GAS.

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HERDING DUCKS IN PADDY FIELD



3. Chemical Control

The common chemicals used are niclosamide and metaldehyde
The usage of those chemicals are normally included in the IPM package once the GAS density is considerably high.
Farmers are advised to use pesticides only as a last resort because they maybe injurious to the farmer and hazardous to the environment.

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Metaldehyde 5% w/w



Niclosamide

How the control measures are implemented

Control components are integrated, based on the crop development stages.

- **Pre-establishment**
  Herding ducks, handpicking, molluscicide,the use of plant attractants and destruction of egg masses.
- **Crop establishment**
  Molluscicide**,**handpicking, herding ducks, screen trapping, staking, water management, use of plant attractants, and destruction of adults and eggs masses
- **Post production**
  Herding ducks, complete burning of paddy straws, dry land preparation (rotor)

Government Policies & Regulations

Cross-border Collaborations

•A mechanism is been developed to control the movement of agriculture machinery from one state to another , under the Legislation of Plant Quarantine Act 1978

•The SOP for GAS management has been drafted, and will be ready for use soon.

Action Plan in Mitigating GAS Spread & Infestation

An integrated GAS eradication programfor the national level has been proposed to the government. This program is for a period of 2012 – 2014 and requires RM61,952,300 for Implementation.

- Program will be implemented by the regional development agencies under the MOA namely IADA, MADA and KADA.
- DOA will initiate the program by contributing technical guidance on GAS control measures.

Proposed Budget For GAS Eradication Program for Rice Granary Areas in Peninsular Malaysia (2012 – 2014)

No	Activities	Year			Total (RM)
		2012	2013	2014	
1	Operational cost	28,266,219	14,158,110	4,856,037	47,280,366
2	Surveillance	300,000	300,000	300,000	900,000
3	Training	648,720	324,360	108,120	1,081,200
4	Promotion	1,710,000	855,000	285,000	2,850,000
5	Publication	786,315	393,158	131,053	1,310,525
6	Campaign	3,652,800	1,726,400	708,800	6,088,000
7	Miscellaneous	1,465,344	732,672	244,224	2,442,240
	Total (RM)	36,829,398	18,489,700	6,633,234	61,952,331

List of action plans that have been implemented or planned by Malaysia

- Awareness campaigns
- Motivate farmers to participate in the control operation
- Educate famers on how to control GAS
- Formulate control programmes
- Providing materials to help famers in controlling GAS
- Set up the Pest Surveillance Committee
- Monitoring the effectiveness of the programmes
- Use mass media, flyers, posters and signboard to caution public not to spread the snail.

Conclusion

- GAS infestation has continued to increase from year to year and become widespread throughout the country. This has resulted in tremendous rice yield losses as well as lead to environment and social problems.
- A nation-wide integrated effort is needed to overcome the GAS problem so that the infestation can be successfully controlled in rice in the country.

THANK YOU

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