

AN IRRIGATION STRATEGY TO EXTERMINATE APPLE SNAILS (POMACEA CANALICULATA) EGGS IN TAIWAN PADDY FIELDS

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3rd World Irrigation Forum & 70th IEC Meeting

1-7 September 2019, Bali, Indonesia



1. INTRODUCTION

- This species of freshwater snail was either deliberately or accidentally spread into local aquatic habitats such as rivers, ponds, canals, or paddy fields, and it eats many crops, especially young rice shoots. It causes large amount of crop loss all over Asia and North and Central Americas.
- Current methods include draining or keeping water low while rice is young and susceptible to feeding, hand picking snails, and applying pesticides. However, these methods are impossible or ineffective when fields are poorly-drained or flooded.
- Biological control may have potential not only in paddy fields but also in canals and ponds. Ducks or carp have been released in paddy fields for snail control as well for as meat production. They are often effective in reducing snail density, but require a special care.

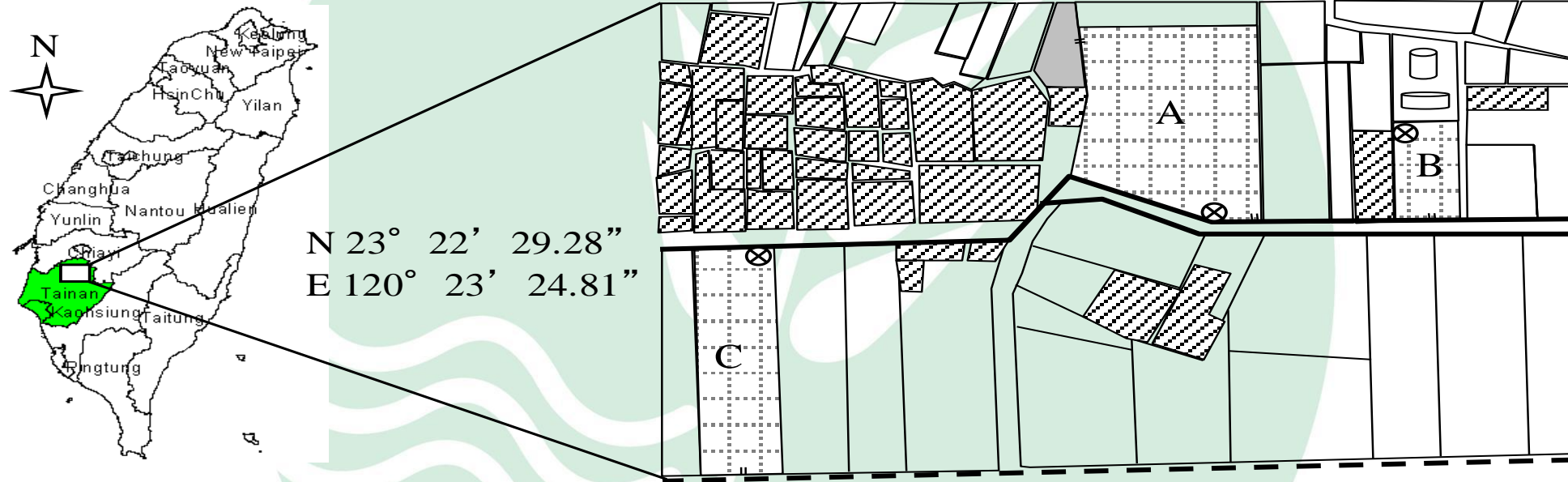













1. INTRODUCTION

- Water submersion is of particular importance because apple snails lay egg masses on trunks or stems of plants or on walls above the water 150 mm-200 mm not only to avoid aquatic predators, but also to avoid negative effects of the water itself on hatching success of their eggs. These negative effects on hatching success may include altering the permeability of egg capsules, reducing oxygen availability due to low level of dissolved oxygen, and lower incubation temperature in water compared to air temperatures.
- In paddy fields, ponding water management raises water level quickly and keep high water level for hours to days. Therefore, eggs which were laid above the water level on a stationary object such as bunds or stems could be submerged. In this study, we applied the different duration of water submersion on the various ages of snail eggs. Base on a field survey, an irrigation strategy was introduced to decrease the hatching rate of apple snail eggs in paddy fields.



2. METHODS



-  Field observation block
 -  Paddy fields
 -  Residential area
 -  Farm pond
 -  Well and flow gauge
 -  Drainage weir
 -  Irrigation ditch
 -  Drainage ditch
 -  Rain gauge
 -  A Pan
-  80 m

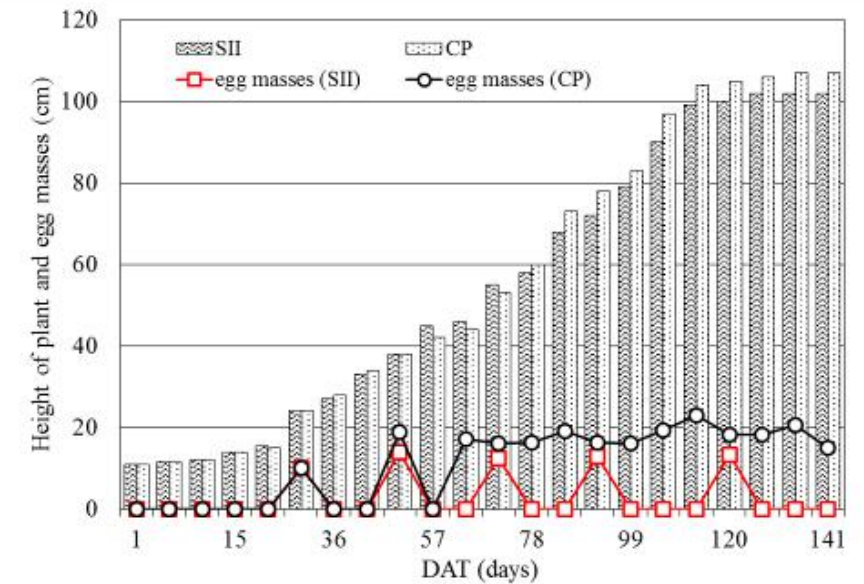
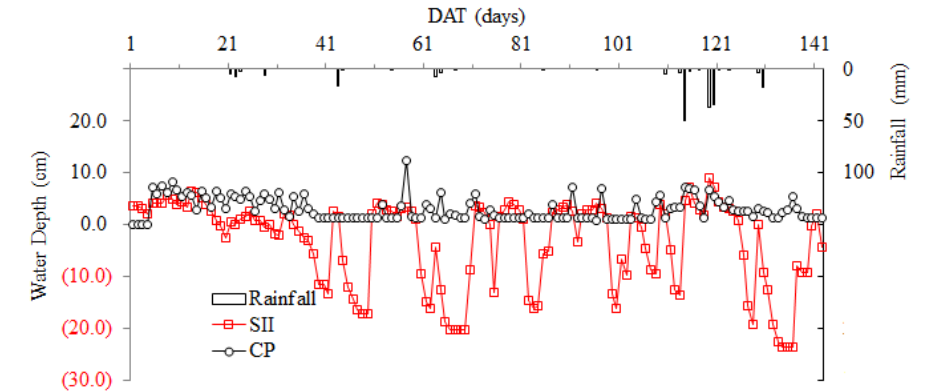
2. METHODS



Duration Egg age	A1(0h)	A2(1h)	A3(6h)	A4(12h)	A5(24h)	A6(48h)
B1(12h)	A1B1	A2B1	A3B1	A4B1	A5B1	A6B1
B2(24h)	A1B2	A2B2	A3B2	A4B2	A5B2	A6B2
B3(48h)	A1B3	A2B3	A3B3	A4B3	A5B3	A6B3
B4(70h)	A1B4	A2B4	A3B4	A4B4	A5B4	A6B4
B5(144h)	A1B5	A2B5	A3B5	A4B5	A5B5	A6B5
B6(192h)	A1B6	A2B6	A3B6	A4B6	A5B6	A6B6

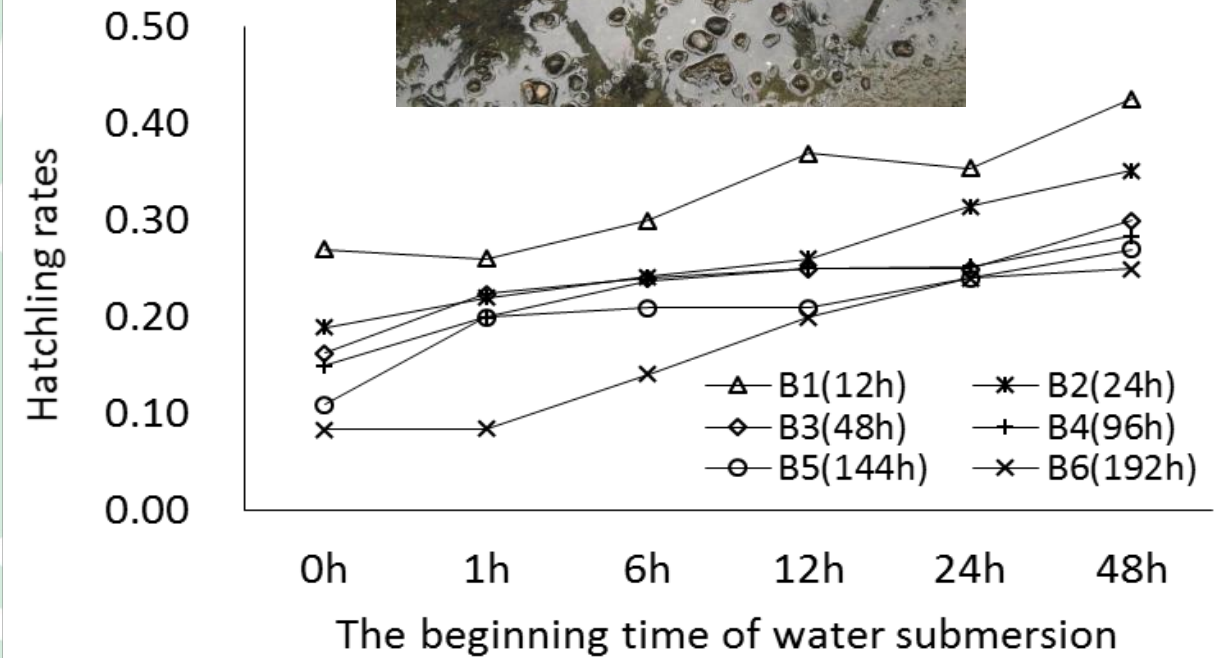
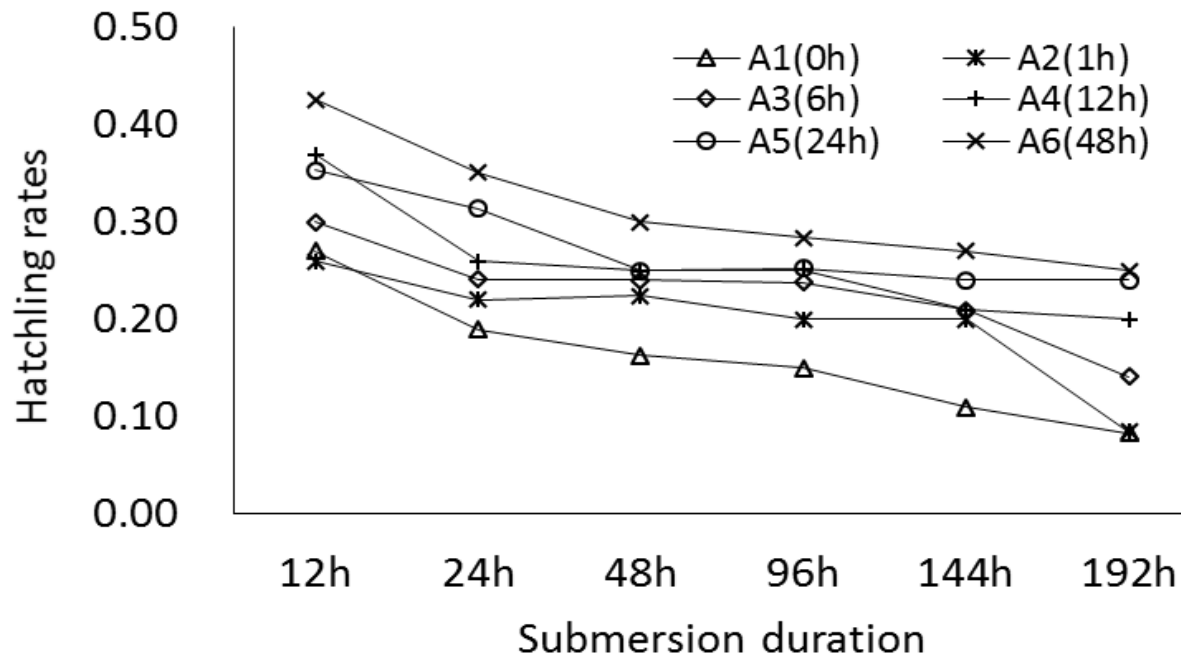
3. RESULTS AND DISCUSSION

3.1 Field investigation



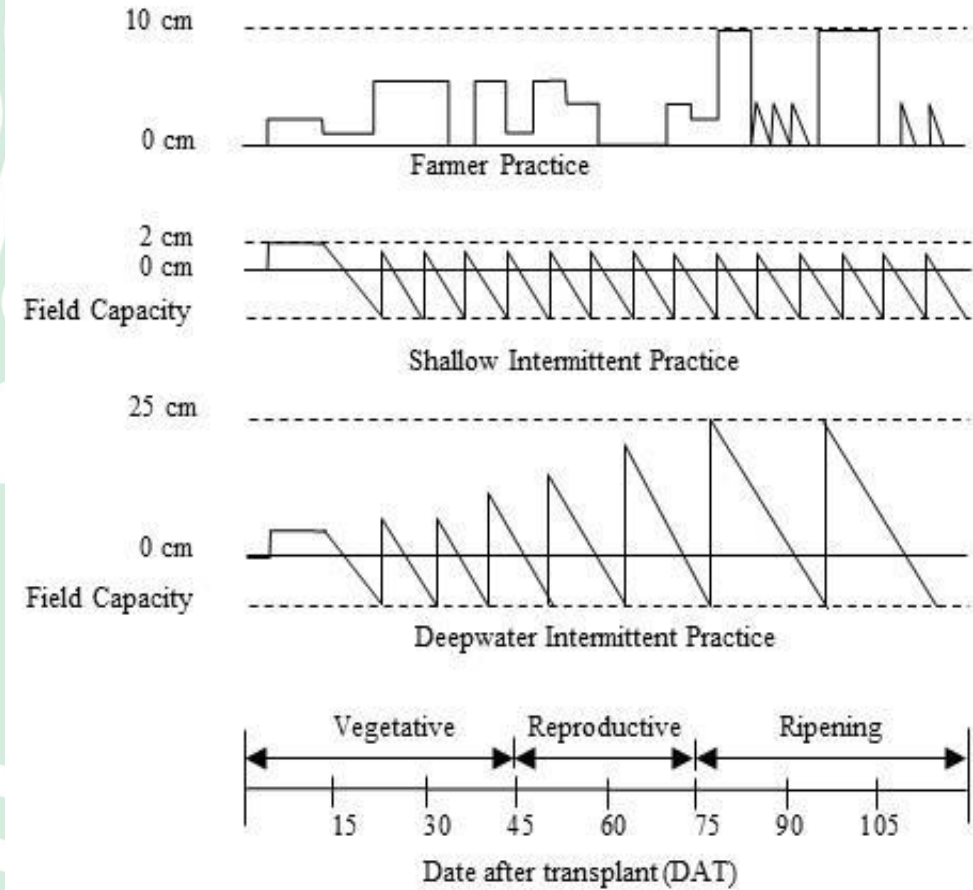
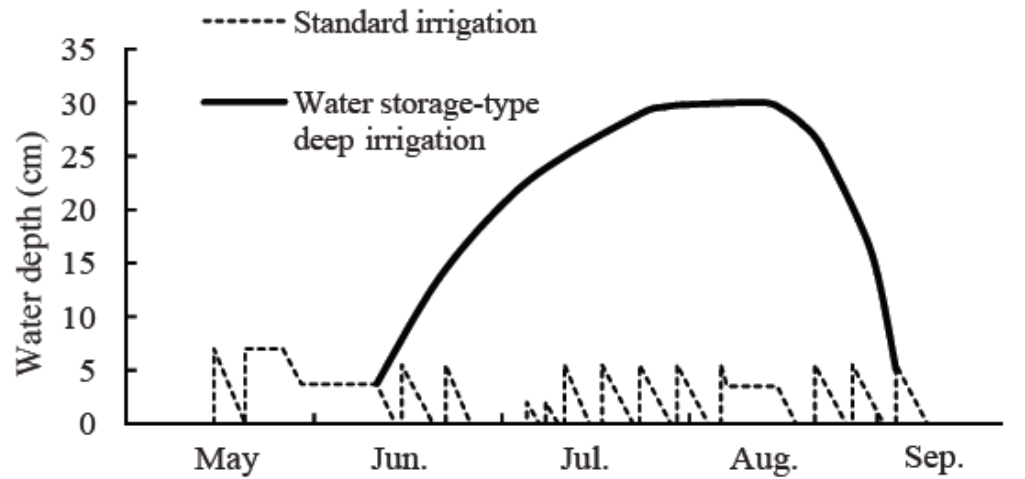
3. RESULTS AND DISCUSSION

3.2 The influences of the water submersion



3. RESULTS AND DISCUSSION

3.3 Discussions



Side ditch
Furrow ditch

$$Dry\ days = \frac{(SC - FC) \times A_s \times d}{100 \times (ET_{crop} + P)}$$

4. CONCLUSIONS

- After months of field investigation and group discussion, we find out the shallow intermittent irrigation is very likely to be the critical point in decreasing frequency and position of egg masses. Meanwhile, the number of egg and egg masses were inhibited in the paddy field. However, in our indoor rearing observation, the water submersion can significantly affect the development of snail eggs. Our results demonstrated that the hatching rate of eggs can be controlled to below 25% by submerging for 24 hours after eggs were laid within 6 hours.



4. CONCLUSIONS

- In paddy fields, ponding water management may raise water levels quickly and keep high water level for hours to days. Therefore, eggs which were laid above water level on a stationary object such as bunds or stems may be submerged. Based on field survey and indoor rearing observation, a suitable ponding water depth developing from deep-water irrigation regime and intermittent irrigation which may cause a non-significant yield response to ponding water was proposed to control the apple snails.
- It is recommended that a study should be conducted in the open field by upward ponding depths management and observes its impact on snail population and rice yield.

