National Workshop on Sustainable Rice Production : Re-visiting IPM

12-13 September 2012
Dewan Tun Abdullah Salleh, UKM

MANAGING RATS IN RICE FIELDS

MALAYSIAN AGRICULTURAL RESEARCH AND DEVELOPMENT INSTITUTE

Introduction

- Order : Rodensia , Family : Muridae
- Economically important : agricultural and domestic pests, and carriers of diseases
- The main vertebrate pest of rice
- The impact of rodents does not stop once the crop is harvested; they also consume and contaminate significant amounts of stored grain

- Losses were estimated at 5-10% of national crop per annum (RM43 million at the 5% crop damage level)
- The most common in Peninsular Malaysia are *Rattus argentiventer*, *R. rattus diardii*, *R. exulans*, *Bandicota indica* & *Mus caroli*
- However, *Rattus* is the most important genera in this country

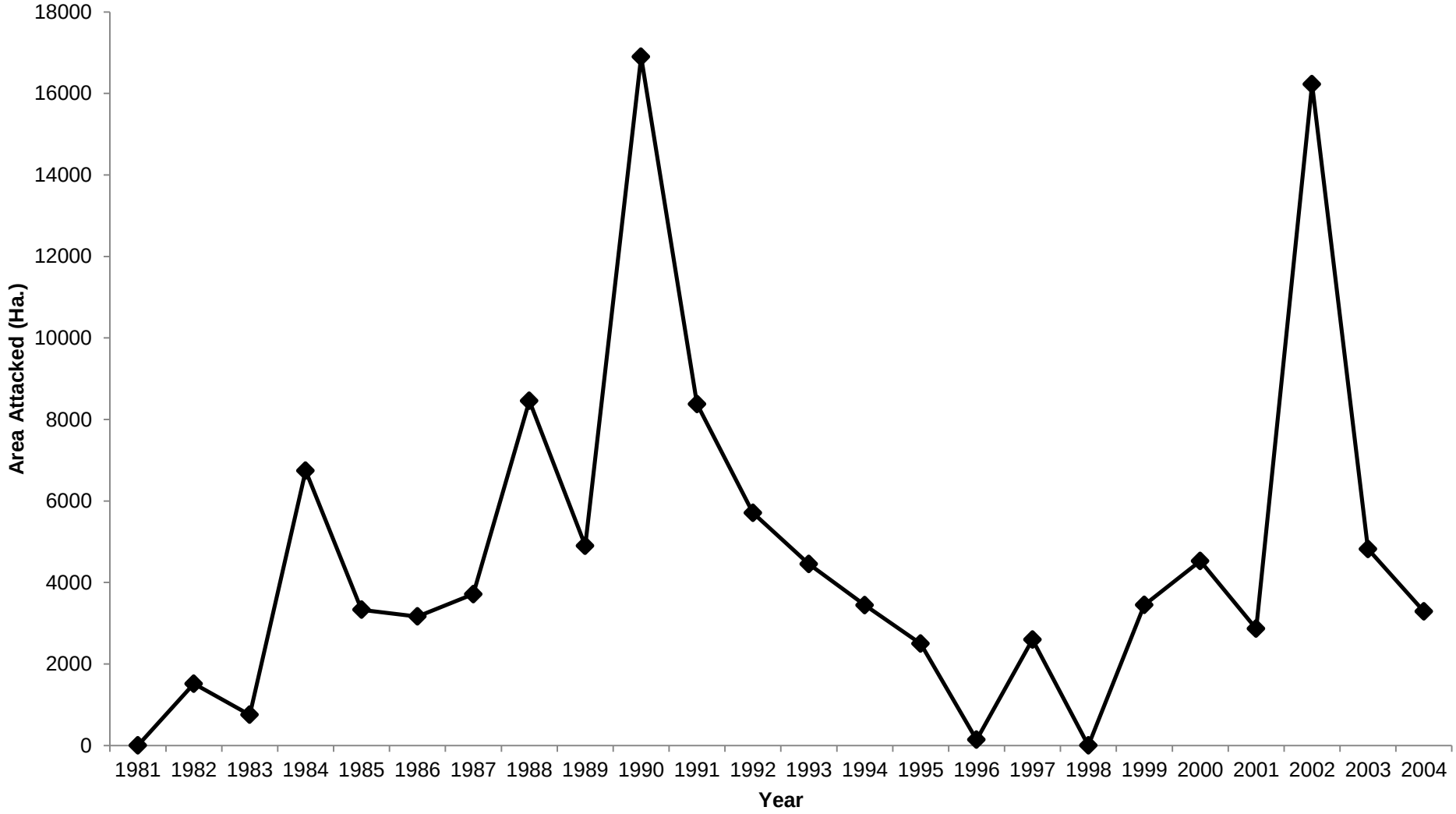
Important pest species of rats and mice in this country are:

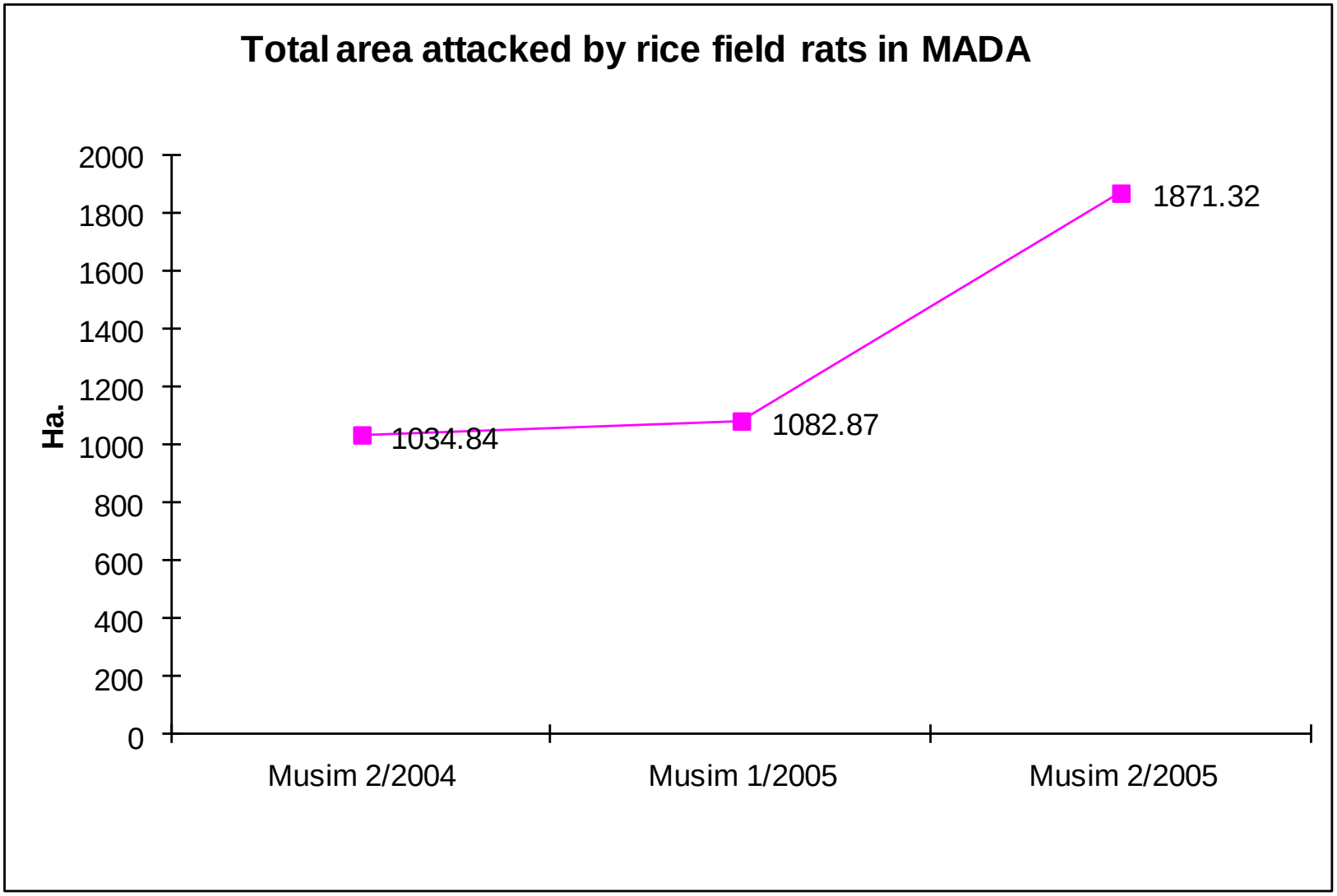
- Asian Ricefield rat (tikus sawah)- *Rattus argentiventer* Robinson & Kloss
- Pacific rat (tikus rumah kecil)- *Rattus exulans* Peale
- Lesser rice field rat (tikus sawah kecil)- *Rattus losea*
- Norway or Brown rat (tikus mondok)- *Rattus norvegicus* (Barkenhout)
- House or Black rat (tikus rumah)- *Rattus rattus diardii* Linnaeus
- Rice mouse or Ryukyu mouse (tikus terkecil)- *Mus caroli*
- House mouse (tikus rumah)- *Mus domesticus* Schwarz & Schwarz
- House mouse (tikus rumah)- *Mus musculus* Linnaeus
- Lesser bandicoot or Indian mole rat (tikus besar hitam ekor pendek)- *Bandicota bengalensis* (Gray)
- Great bandicoot (tikus besar hitam)- *Bandicota indica* (Bechstein)


Rattus argentiventer
Rice Field Rat
Tikus Sawah Padi

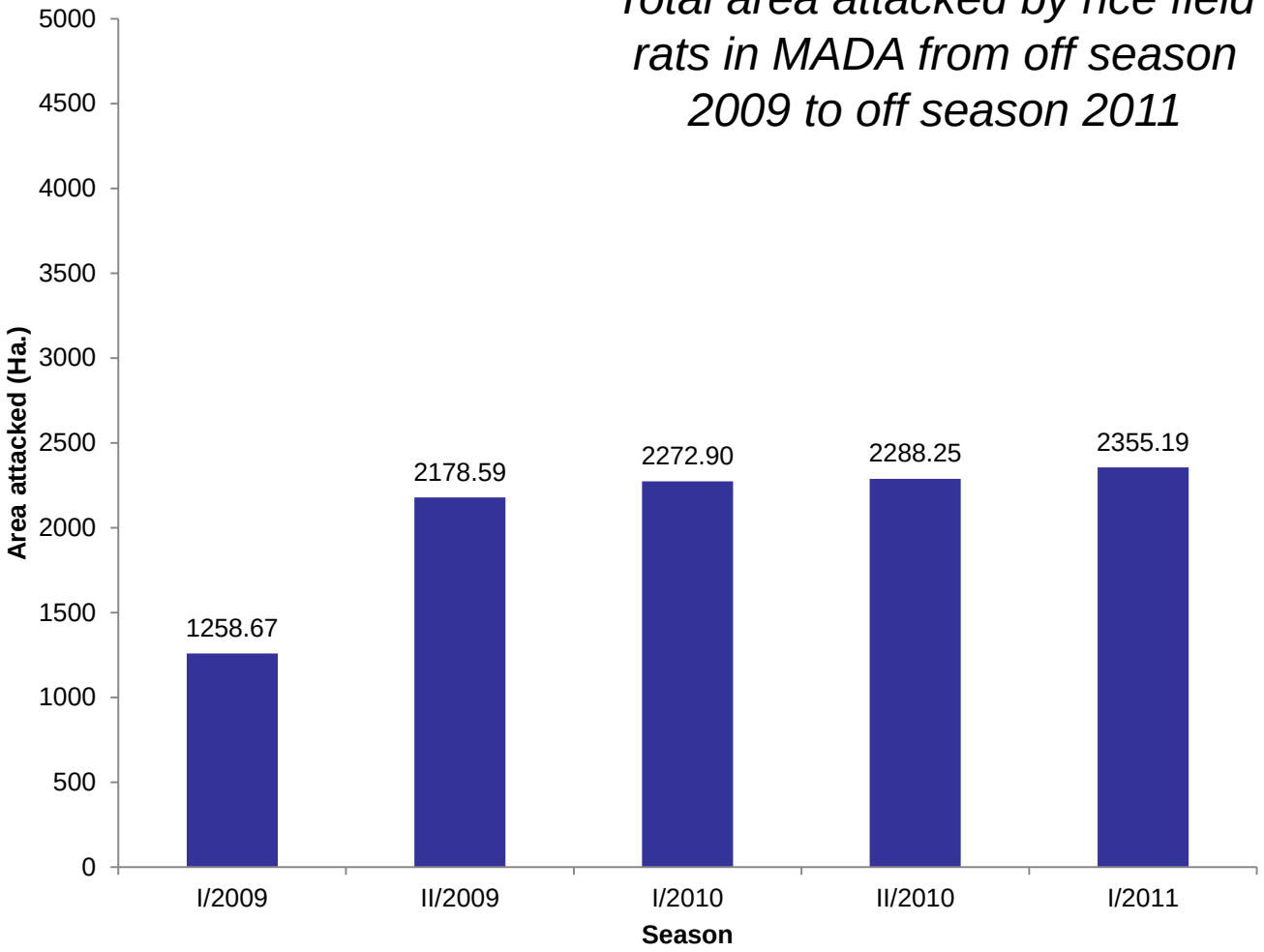

Females may reproduce
up to 4 times a year,
averaging 6 pups/litter

Total area attacked by rice field rats in Peninsular Malaysia (1981-2004)




Total area attacked by rice field rats in MADA
Ha.
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1034.84
1082.87
1871.32
Musim 2/2004
Musim 1/2005
Musim 2/2005

Total area attacked by rice field rats in MADA from off season 2009 to off season 2011



Control & Management Options

- **Monitoring & surveillance**
- **Cultural practices**
- **Mechanical/physical**
- **Biological**
- **Chemical**

Field monitoring

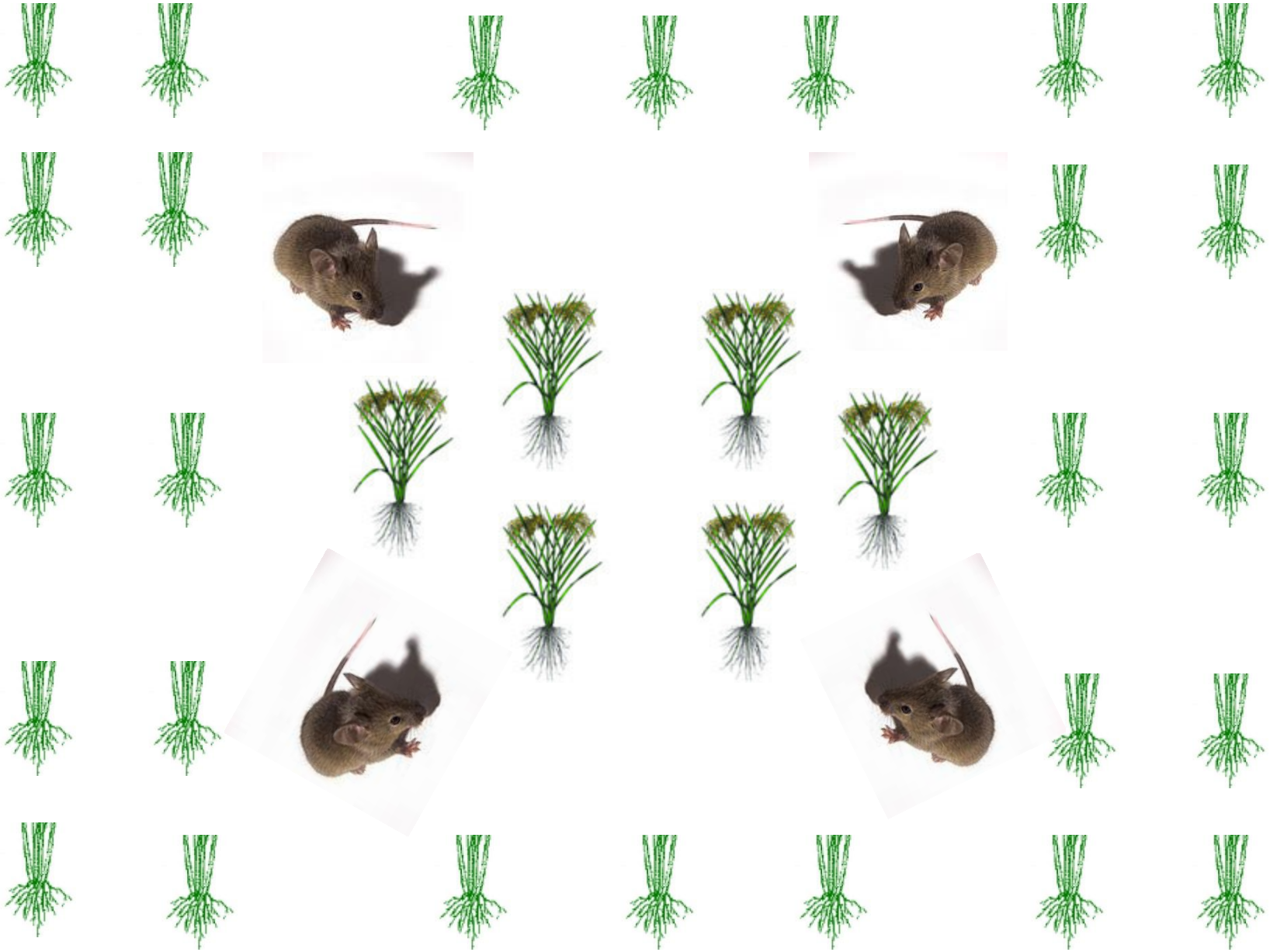

Damage assessment

Good sanitary practices by removing weeds on bund – destroy breeding ground for rice field rat & decrease the carrying capacity of the rice field during fallow period

Reduce bund sizes to reduce rice field rat burrow numbers – increase intraspecific competition for breeding space – cause the population to decline naturally

Nesting patterns of the rice field rat, *Rattus argentiventer* (Lam, 1980)

Parameter	Dimension	% of burrows (n = 4800)
Height of bund	< 15 cm	3.1
	15-30 cm	68.3
	> 30 cm	28.6
Width of bund	< 30 cm	0.6
	30-60 cm	34.9
	> 60 cm	64.5

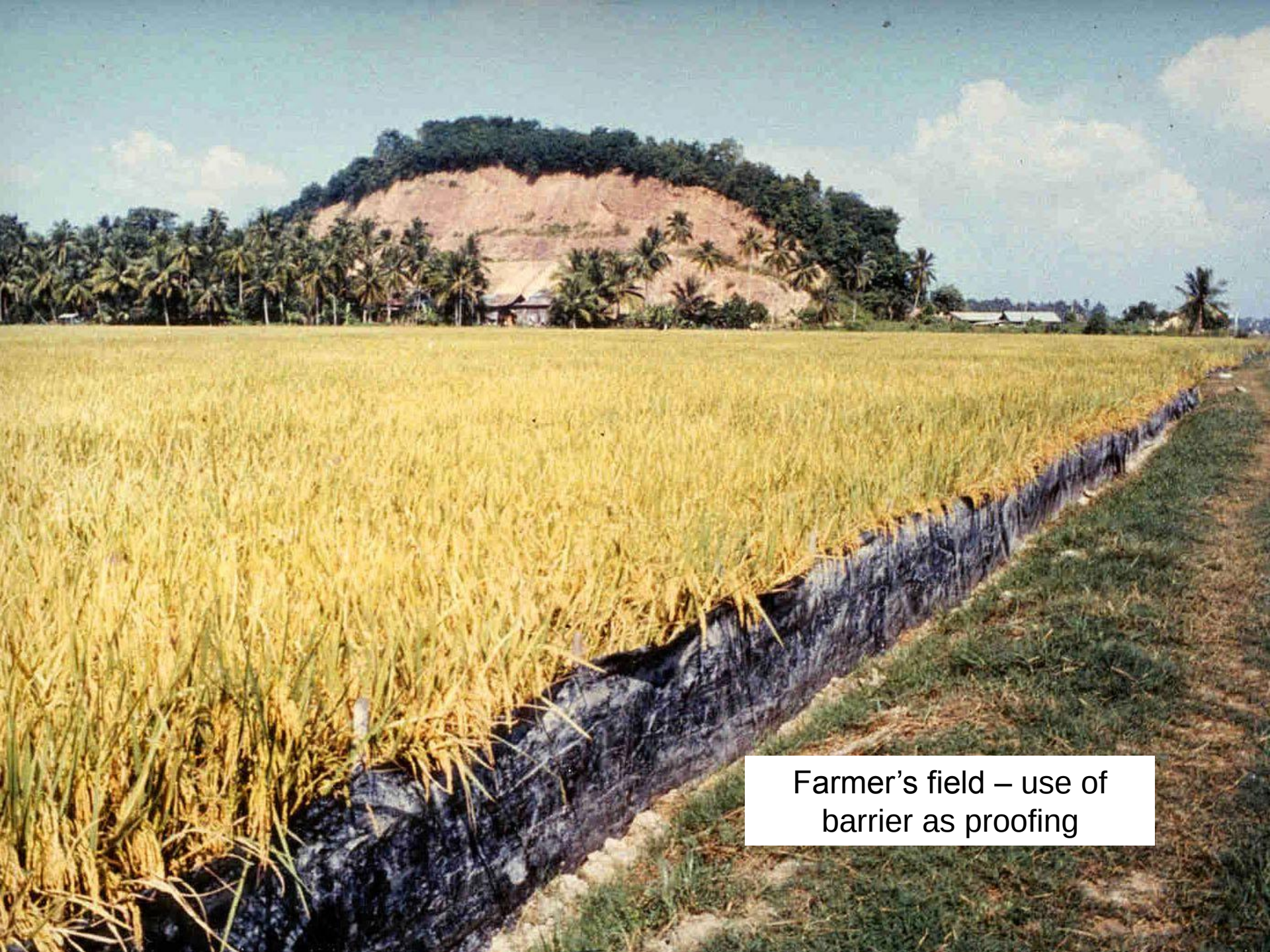


Avoid staggered planting to reduce risk of been attacked

Barrier to prevent rat attack – proofing

Small plots e.g. experimental areas

Rat proofing – nurseries



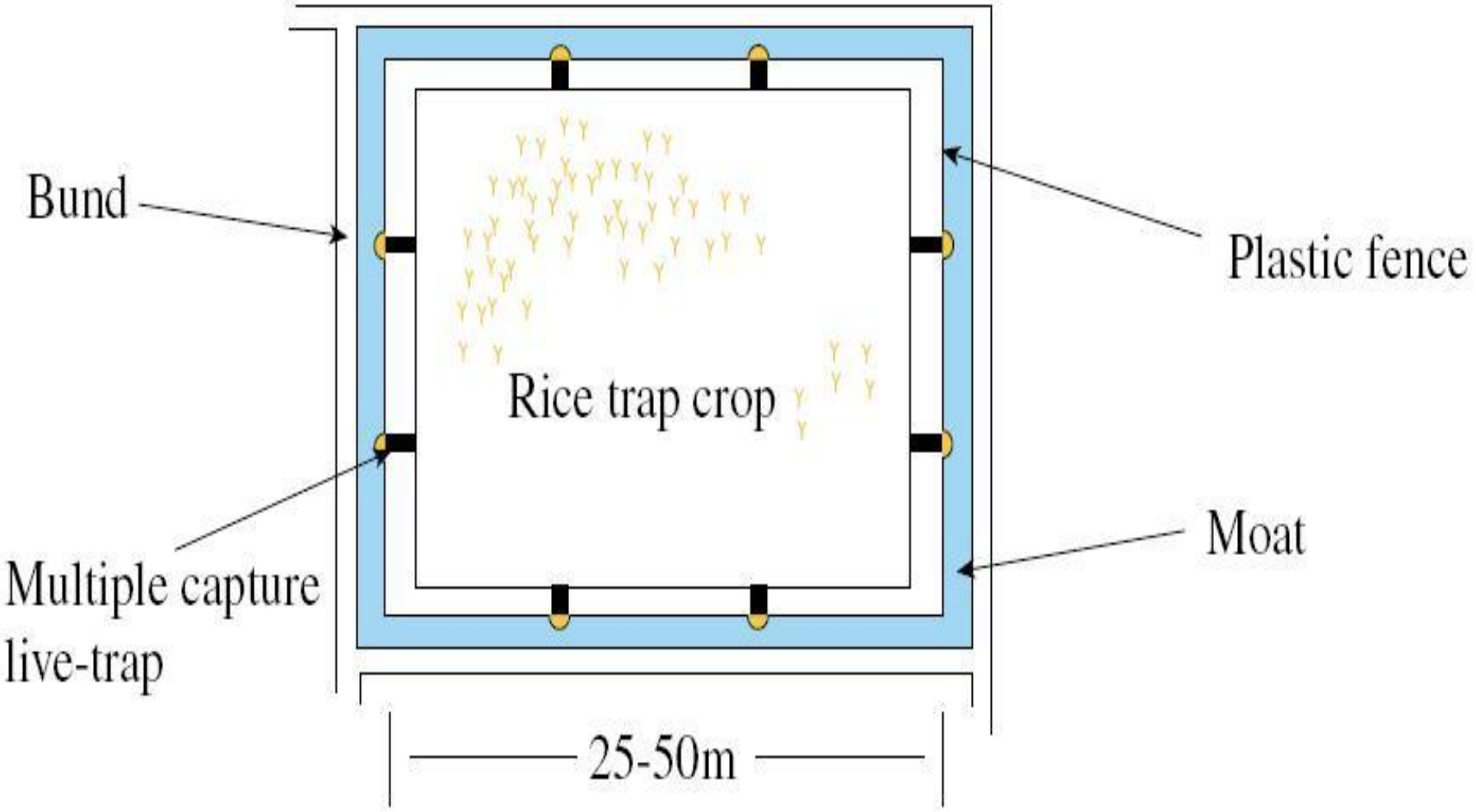
Farmer’s field – use of barrier as proofing

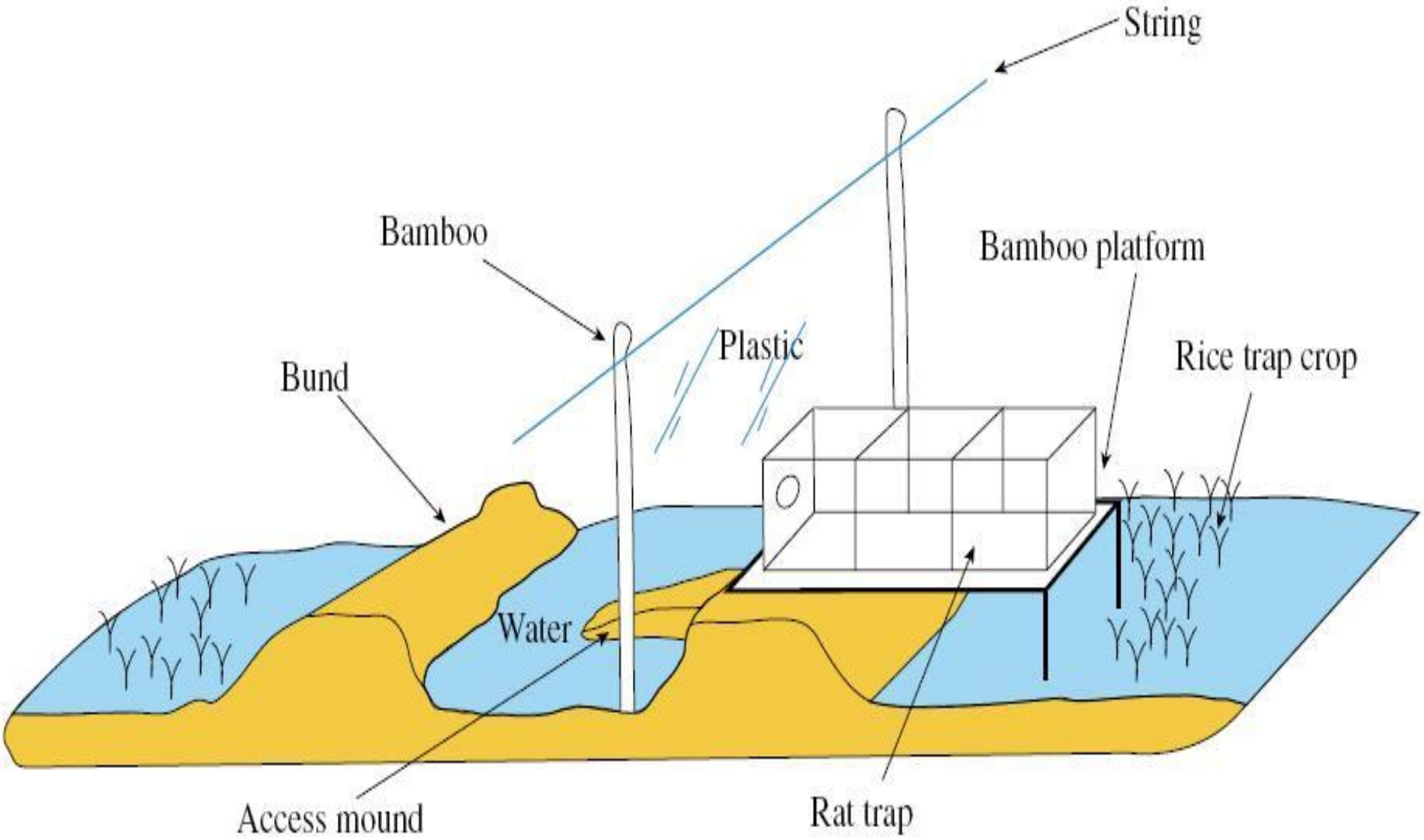
Trap barrier system (Barrier + multiple-catch trap) to control rat population

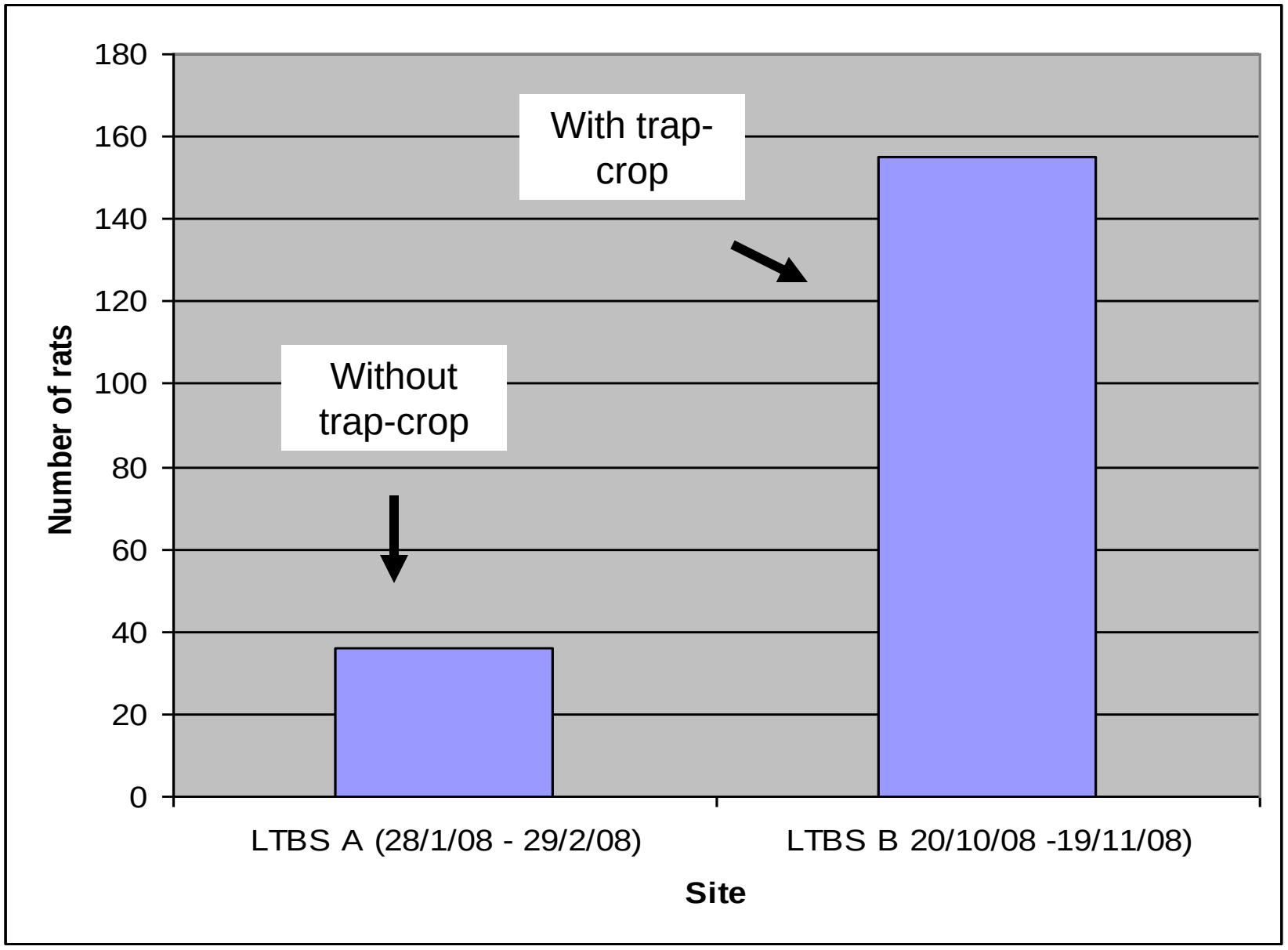
Location	No. of Rats
Penang	**79,447**
Kelantan	**32,041**
Perak	**75,073**
Selangor	**44,101**
Total	**230,662**

Source :- Lam *et al*., 1990

Location	Yield before (t/ha)	Yield after (t/ha)	% increase
Permatang Berah	1.1	4.2	282
Bkt Jelutong	0.8	4.3	438


Bund
Plastic fence
Rice trap crop
Moat
Multiple capture
live-trap
25-50m

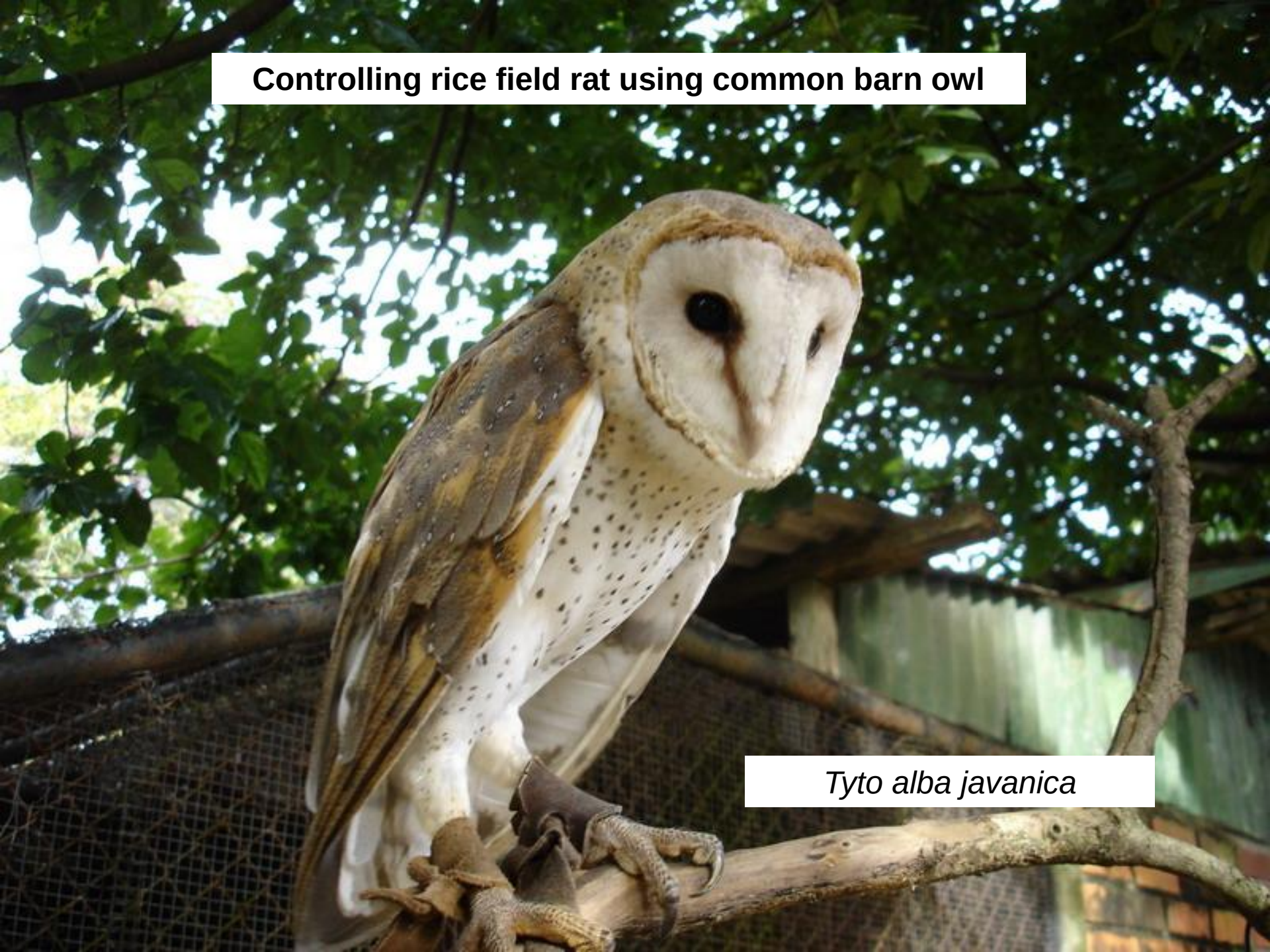

String
Bamboo
Bamboo platform
Plastic
Rice trap crop
Bund
Water
Access mound
Rat trap


180
160
140
120
100
80
60
40
20
0
Number of rats
With trap-crop
Without trap-crop
LTBS A (28/1/08 - 29/2/08)
LTBS B 20/10/08 -19/11/08)
Site

Using of single catch trap

- Physical killing
  - during post-harvest period
  - prevent rat damage during subsequent cropping season
- Destruction of nests & burrows
  - by digging
  - during flowering stage

Controlling rice field rat using common barn owl



Tyto alba javanica

Establishment & monitoring of nesting boxes

‘T’ pole


Lang Merah
(Brahminy kite)


Cerpelai/jebon
(mongoose)

Highly effective

Relatively cheap

Chemical methods
RODENTICIDES

The most popular method!!

Readily employed

Immediate effect

Acute poison

- Applied in a single dose for killing in the shortest time
- Highly toxic
- Examples :-

  Zinc phosphide, scilliroside,

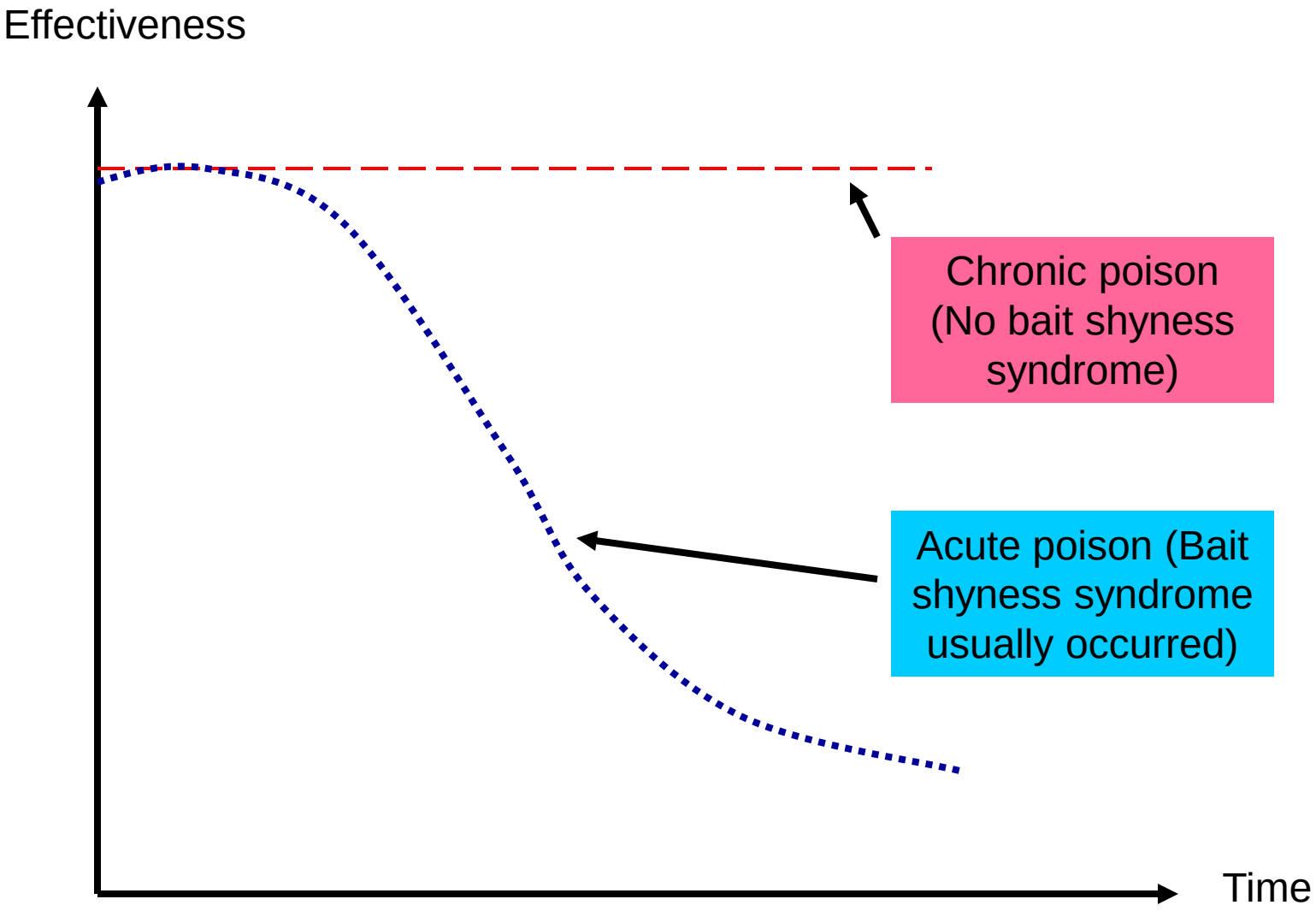
- Zinc phosphide is the most widely used
- Lack of antidote
- However, rats develop "poison aversion" or "bait shyness" for acute rodenticides

Pre-baiting is essential

One day after sowing or transplanting and at 2 weeks before booting

Chronic poisons or anticoagulants

- Slow acting
- Die due to internal or external bleeding
- Bait shyness does not develop
- Categorized as multiple-dose and single- dose anticoagulants
- Vitamin K as an antidote
- Warfarin, coumachlor, coumatetralyl, and chlorophacinone are multiple feed anticoagulants
- Flocoumafen, brodifacoum, and bromadiolone are single-dose anticoagulants

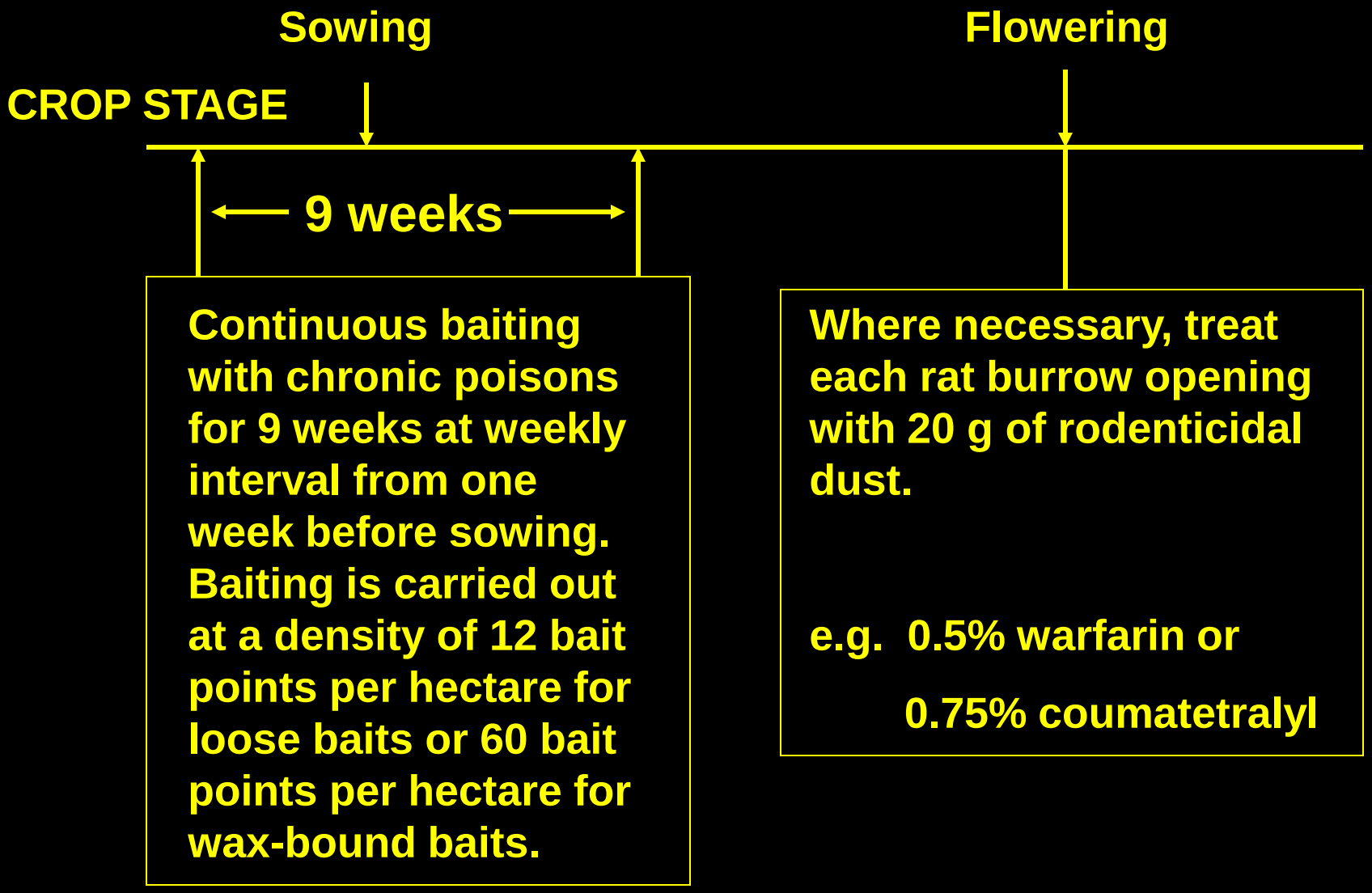

Effectiveness
Chronic poison (No bait shyness syndrome)
Acute poison (Bait shyness syndrome usually occurred)
Time


Pre-baiting is carried out before applying acute rodenticide in controlling rice field rat

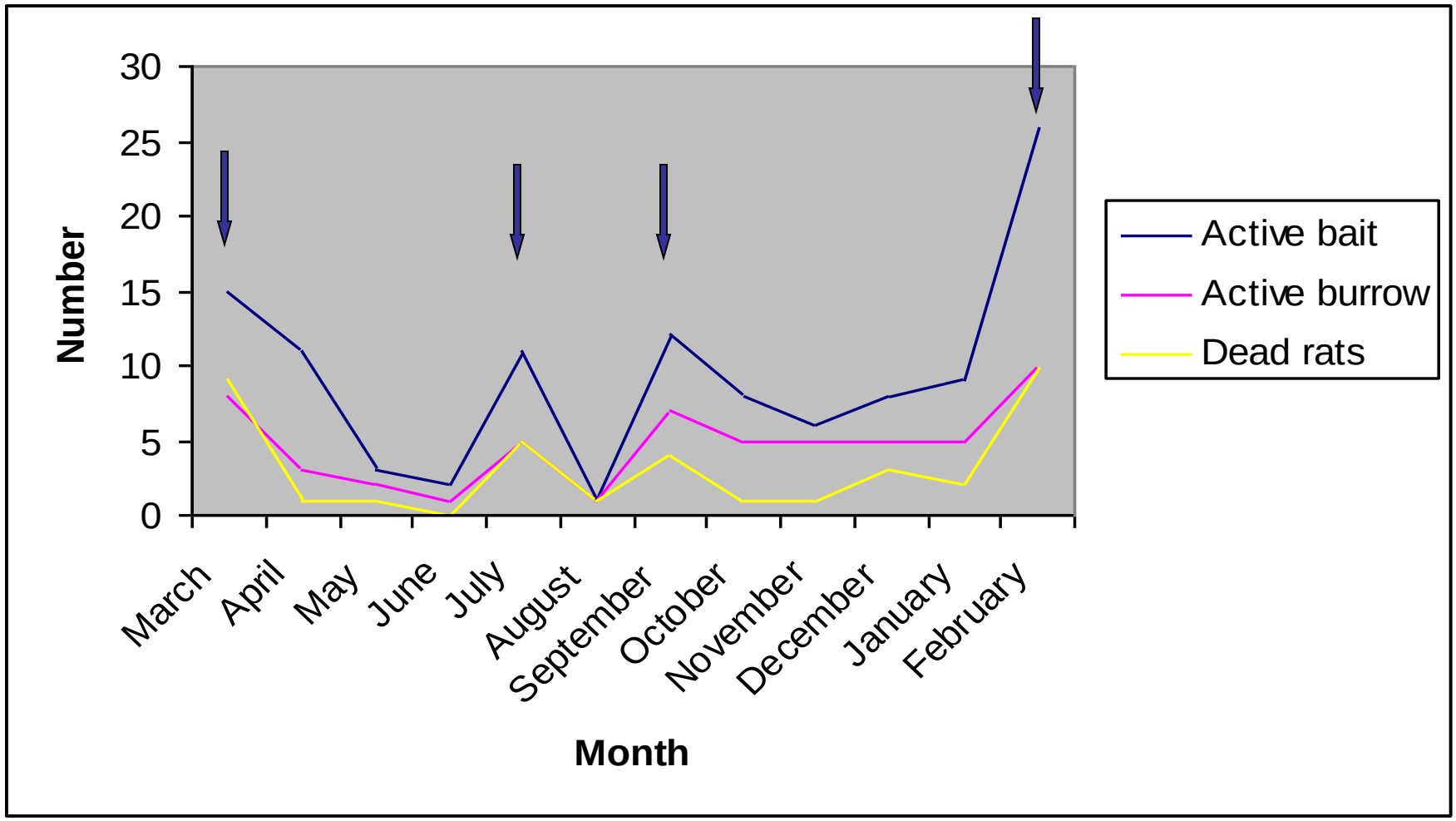
Pre-bait for 3 days before baiting with poison


Rodenticide mixed with loose paddy
bait to kill rice field rat


Wax-bound bait



Baiting schedule for controlling rats with chronic rodenticide in direct-seeded rice.



Notes :

March & September - Land Preparation
April & October - Tillering stage
May & November - Tillering stage (active)
June & December - Max tillering
July & January - Milky stage
August & February - Ripening stage

- Rodenticidal dusts
  - Innate grooming behaviour of the rats
  - Applied at burrow entrance
- Fumigants
  - calcium cyanide, methyl bromide, aluminium phosphide, carbon bisulphide
  - calcium cyanide is widely used
  - Useful during the heading & ripening stages
  - Only kills rats present in the burrows
- Repellents – endrin, malathion
  - For seed protection

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