WEBINAR · LOCALLY-LED SOLUTIONS FOR FOOD SECURITY

Ecological Rodent Management Across Asia

Showcasing practical, inclusive and climate-resilient approaches

Wednesday 15 July

10:00 CET · 13:30 IST · 16:00 PHT
60 minutes · live online

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Speakers

Pratik Ranjan

Rodent pest challenges, community-level monitoring and implementation of Ecologically-Based Rodent Management (EBRM).

Shadi Indary

EBRM co-development and mixed-method implementation with farmer clusters in the mosaic agriculture system of Shouf, Lebanon.

Nyo Me Htwe

Climate-change impacts on rodent populations and outbreaks, and the implications for rodent management in South Asia.

GOPA MetaMeta

EBRM as effective approach for Food Security

- Forgotten pest species? Or are they just too clever for us?
- Enormous losses
- Climate change likely to aggravate & complicate matters
- Need to shift away from chemicals to agroecological approach

Put ecological rodent pest management higher on the food security agenda!

Find our recently published Position Paper on EBRM here →

The hidden impact of rodent pests*

FIELD LOSSES	STORAGE LOSSES	ECONOMIC LOSSES	HEALTH RISKS	CHEMICAL RISKS
9–57%	10–20%	200 million	147	Widespread
yield loss in rice fields	of post-harvest food lost	people could be fed	species are major pests	unsafe rodenticide use
In Southeast Asia, rice yield losses average 9%, with catastrophic losses up to 57% in some fields. [ii], [iii]	Post-harvest losses commonly reach 10–20% worldwide. In Africa, combined field and storage losses reach 24%. [iv], [v], [vi]	Rodents contaminate and destroy enough food each year to feed 200 million people — food already grown. [v]	147 rodent species are recognized as major agricultural and public health pests, transmitting zoonoses. [i]	Hazardous metal phosphides and anticoagulants are widely used, risking poisoning, contamination and resistance. [vii], [viii]

** Figures reflect ranges reported in the cited studies (see footnotes i–viii); actual losses vary by crop, region and season.*

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Ecologically Based Rodent Management in India

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EBRM (Why and What)

- In India, rodents have been estimated to cause 5 to 20% losses in rice.
- Across the globe, rodents cause 5-25% of damage to crops in the field and in store.
- In Jharkhand and MP, rodents have damaged 15-20% of the harvested crops kept at home.
- Rodents cause an average of 8.7% damage to vegetables in Rajasthan, with the extent of damage ranging from 4.1% to 19.9%.
- The estimate of foodgrains losses by rodents in India range from 2.4 million tons to 26 million tons per year.
- Rats multiply quickly. From one pair of rats, 1250 rats can be born in one year and can transmit 60 types of diseases.

What is EBRM ?

- A comprehensive approach focused on understanding and managing rodents in an environmentally responsible way.
- Focuses on rodent control populations without relying on excessive chemicals which can harm other wildlife and environment.
- Based on three key principles: Timing, Cooperation, Combing different methods

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Implementation Step by step

- FGD, Interview & Field Visit
- Problem Identification & Loss Estimation
- Mapping Current Practises
- Department Visit for collaboration
- Identification of Control & Treatment Area
- Planning activities (interventions to be implemented)
- Training & Trap Distribution
- Monitoring and Documentation (In Progress)

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EBRM interventions

At Jharkhand & Madhya Pradesh

at field level

1. Burrow mapping followed by fumigation, watering
2. Promotion of different agronomic practices narrowing the bund size
3. Bird Perches installation

at household Level

1. Store the grain where it is light
2. Consistent Rat trapping in the house through rat traps
3. Store the grain at height
4. Keep clean the storage house
5. Seal entry points, cover openings, plant prickly bushes.


Wide Bunds


Narrow Bunds


Steel Container


Raised Platform

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Burrow mapping exercise

Flooding + Fumigation

- conducted burrow mapping exercise across Jharkhand and MP at field as well as at HH level.
- awareness level towards this activity has increased.
- doing it by their own now especially at household.
- Impact clearly visible where this activity has been conducted **(collected video evidence)**







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Bird perches installation

from planning to execution




results

- Installed in 250+ fields
- High community ownership – farmers voluntarily preparing, transporting, and installing perches. ***(felt strongly in Madhya Pradesh)***

word from farmer's mouth

- Cost effective intervention as it doesn't require much input.
- Growing demand for more perches across neighboring fields


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Rat traps

from knowledge to action




how we did

- Conducted dual level capacity building before distributing
- Distributed across 250+ HHs in Jharkhand and 150+ HHs in Madhya Pradesh
- Farmers successfully captured rodents, confirming quick adoption.
- Community reporting early reduction in rodent presence, especially near storage areas.
- Quick Adoption.




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Cats & Rats

Impact they create

conducted **video documentation** to study impact of having cats at home

what we found

Numbers are limited but impact is significant

Around 2-5 families in each village use cats as a natural rodent-control method

Households reported visibly fewer rodent sightings and reduced crop storage losses.

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Facts & figures

Detailed analysis

729.41
Average Annual Damage per Household

91%
Identify EBRM as Most Effective

Paddy
89 beneficiaries (87.3%) • Avg damage: ₹733.15

0-2,000
Damage Range Across Beneficiaries

88.2%
Neighbouring Farmer Participation

Wheat
9 beneficiaries (8.8%) • Avg damage: ₹733.33

74,400
Total Damage Across Survey Area

82.4%
Environmental Awareness

Maize
4 beneficiaries (3.9%) • Avg damage: ₹637.50

Field & Households level activities

52
Burrow Mapping C Holes Sealing
51.0%

31
Rat Traps
30.4%

17
Fumigation
18.6%

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Thank you !

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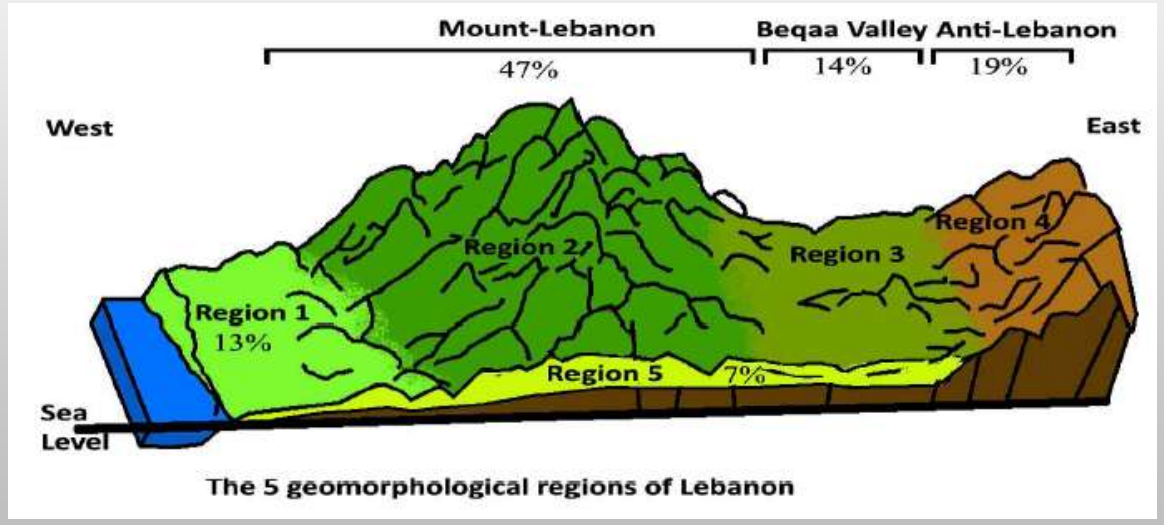
EBRM IN LEBANON

Shadi El Indary – July 2026

GENERAL INTRODUCTION



The 5 geomorphological regions of Lebanon

- LEBANON CONSISTS OF A MOSAIC OF NATURAL HABITATS AND AGRICULTURAL AND RESIDENTIAL AREAS.
- THE MULTIPLICITY OF HABITATS IN LEBANON CREATES A DIVERSITY OF SPECIES AND AGRICULTURAL PRACTICES.

AGRICULTURE IN LEBANON

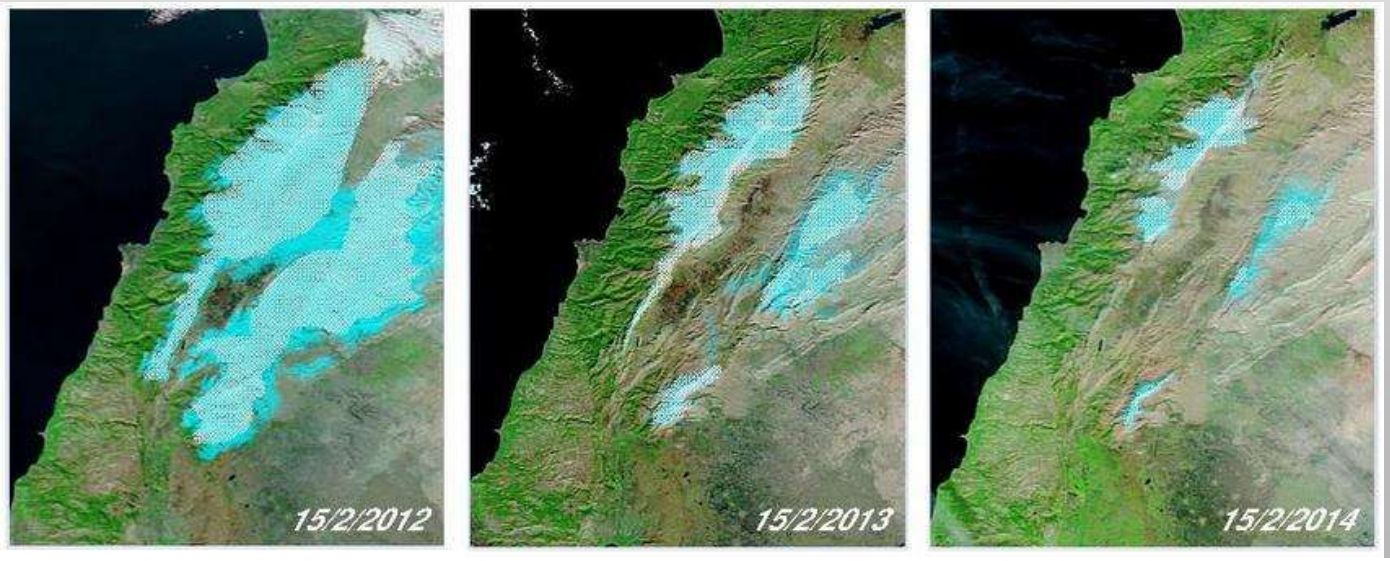
- CHARACTERIZED BY THE DIVERSITY OF ITS PRODUCTS DUE TO THE DIFFERENT CLIMATE AND TERRAIN.

- SUFFERS FROM STRUCTURAL PROBLEMS SUCH AS:
  - LACK OF ADEQUATE GOVERNMENT SUPPORT,
  - HIGH PRODUCTION COST,
  - WEAK MARKETING.

- CLIMATE CHANGE AFFECTS NEGATIVELY THE SECTOR AS A WHOLE.

CLIMATE CHANGE

- SNOW RESIDENCE TIME DECLINED FROM 110 DAYS TO 85 DAYS, WITH SNOW MELTING EARLIER IN SPRING (1967–2019).
- A WARMING OF 2°C IS PROJECTED TO:
  - REDUCE SNOW EXTENT BY ABOUT 40–50%
  - SHIFT SNOWLINE UPWARD.
- INCREASE IN AGRICULTURAL PESTS (E.G. RODENTS) BUT NO PREVIOUS POPULATION ASSESSMENT TO COMPARE WITH AS A BASELINE STUDY.

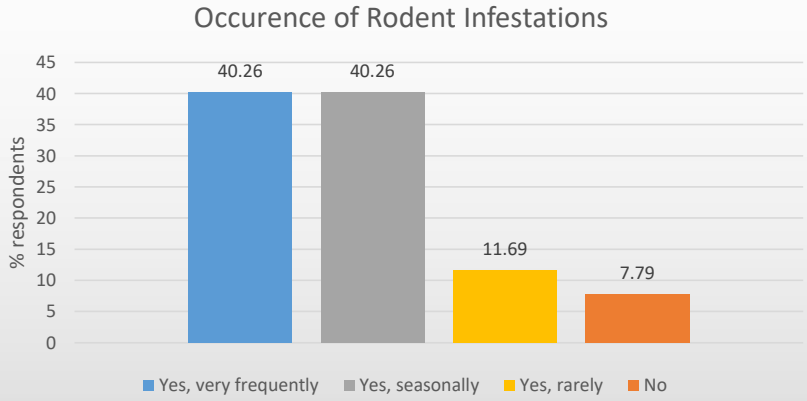


EBRM WORK IN LEBANON: FROM PILOTS TO WIDER ADOPTION

ONGOING WORK IN LEBANON

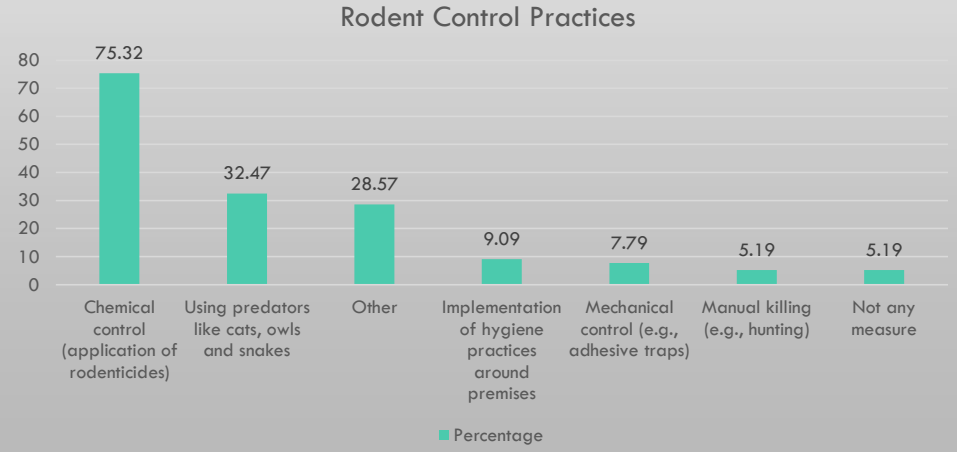
- STARTED WITH A SMALL NUMBER OF VILLAGES IN THE CHOUF / CENTRAL LEBANON, FOCUSING ON LEGUME VALUE CHAINS AND FARMER-PRIORITIZED RODENT HOTSPOTS; AIMING TO EXPAND TO ADDITIONAL VILLAGES.
- MAIN OBJECTIVE: ENHANCE FOOD SECURITY BY SUPPORTING LOCAL FOOD SYSTEMS THROUGH REGENERATIVE AND ECOLOGICAL AGRICULTURE.
- CORE ACTIVITIES:
  - **DEVELOPING ENVIRONMENTAL SOLUTIONS** FOR RODENT MANAGEMENT (EBRM) IN THE CHOUF (CENTRAL LEBANON) LEGUME VALUE CHAIN
  - **PRACTICAL EBRM DEMONSTRATIONS**: FIELD MONITORING, FARMER ADVISORY SERVICES, TRAININGS, AND COORDINATION WITH LOCAL INSTITUTIONS.

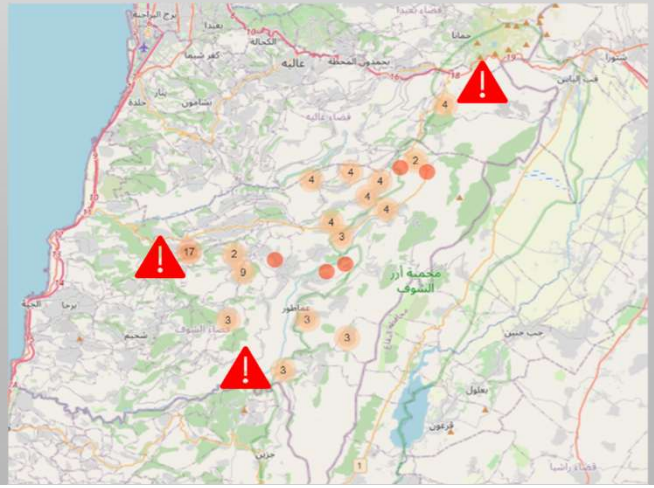
UNDERSTANDING FARMERS' EXPERIENCE AND RODENT HOTSPOTS



- A FARMER SURVEY ACROSS 23 VILLAGES HELPED IDENTIFIED THE MAGNITUDE OF RODENT PRESSURE, CURRENT CONTROL PRACTICES, AND PRIORITY HOTSPOTS FOR PILOTING EBRM.

- THE FINDINGS ALSO SHOWED A STRONG RELIANCE ON CHEMICAL RODENTICIDES, REINFORCING THE NEED FOR PRACTICAL, SAFER AND ECOSYSTEM-BASED ALTERNATIVES.





FIELD METHODOLOGY: ADAPTIVE EBRM PACKAGE

INTERVENTION TECHNIQUES

- LINEAR TRAP BARRIER SYSTEM (LTBS) WHERE LANDSCAPE AND CROP LAYOUT ALLOW.
- MIXED EBRM TECHNIQUES USING DIFFERENT TRAP TYPES AND PLACEMENT STRATEGIES.
- FARMER ADVICE ON HYGIENE, FIELD SANITATION, SAFE CONTROL, MONITORING AND PREVENTION.

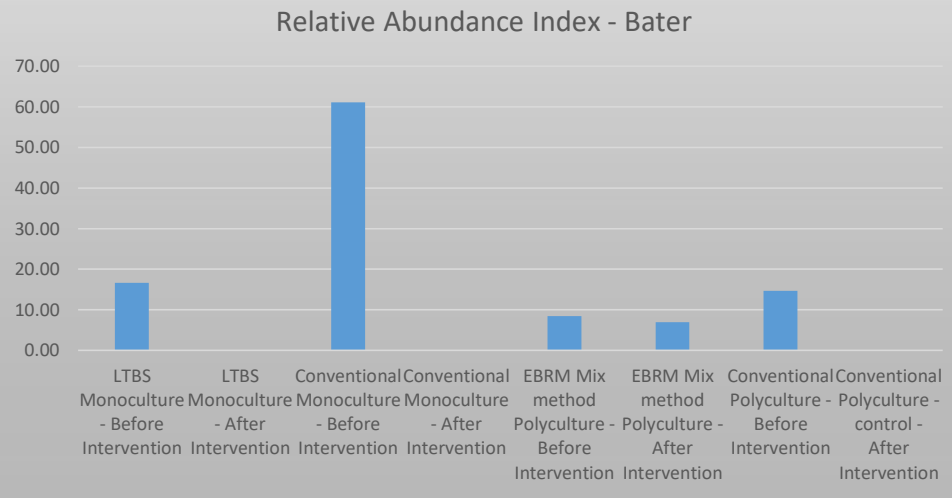
CO-MONITORING AND ASSESSMENT

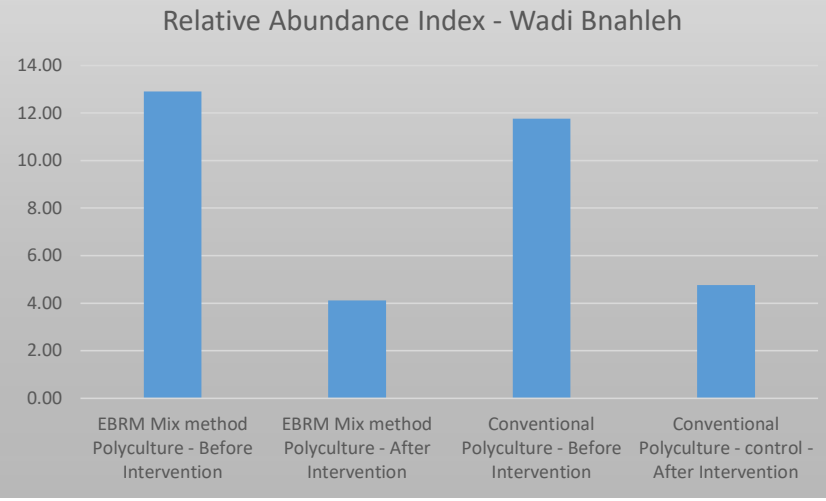
- RELATIVE ABUNDANCE INDEX OF RODENTS COMPARED BEFORE AND AFTER INTERVENTION.
- DAMAGE ASSESSMENT ON LIMA BEANS AND FIELD OBSERVATIONS TO ADAPT THE APPROACH.

RESULTS FIRST SEASON EBRM (2025)

- LTBS TECHNIQUE APPLIED IN MONOCULTURE PLAINS, PROVIDED 100% CONTROL OVER RODENT POPULATIONS.

- POLYCULTURE SYSTEMS WAS CHALLENGING FOR RODENT CONTROL: NEED FOR TAILORED AND ADAPTIVE EBRM STRATEGIES IN COMPLEX CROPPING ENVIRONMENTS.





SCALING UP EBRM AND ADVISORY SERVICES

- BUILDING ON THE FIRST VILLAGE-LEVEL PILOTS, EBRM IS BEING EXPANDED TO ADDITIONAL VILLAGES AND FARMING SYSTEMS.

- MAIN OBJECTIVE: APPLYING ECOLOGICAL AGRICULTURAL PRACTICES AT BOTH THE FIELD AND INSTITUTIONAL LEVELS.

- INCLUDING T.O.T SESSIONS WITH AGRICULTURAL EXTENSION SERVICES AND INPUT PROVIDERS – AVAILING EBRM TOOLKIT TO COMMERCIAL SECTOR.

METHODOLOGY – APPLIED RESEARCH

❖INTERVENTION TECHNIQUES IN 3 VILLAGES

- THE LINEAR TRAP BARRIER SYSTEM (LTBS).
- MIX EBRM TECHNIQUES (DIFFERENT TYPES OF TRAPS).
- ADVICE ON PREVENTION, SANITATION, MONITORING AND SAFER RODENT MANAGEMENT PRACTICES.

❖ MONITORING AND LEARNING

- RELATIVE ABUNDANCE INDEX OF RODENTS (PRE AND POST INTERVENTION).
- CROP DAMAGE ASSESSMENT.
- TRAININGS AND FOCUSED DISCUSSIONS WITH STAKEHOLDERS TO UNDERSTAND THE PROBLEM AND DEVELOP SHARED SOLUTIONS.

CAPACITY BUILDING, DEMONSTRATION AND ADVISORY SUPPORT

❖ LTBS INSTALLATION AND TRAPS DISTRIBUTION

❖ TRAINING STAFF FROM THE MINISTRY OF AGRICULTURE ON EBRM

EBRM LONG-TERM APPROACH

CONSERVATION OF AVIAN AND MAMMALIAN CARNIVORES

❖IMPLEMENTED IN THE VICINITY OF TANNOURINE CEDAR FOREST NATURE RESERVE (TCFNR) – NORTH LEBANON.

❖ACTIVITIES

- BASELINE ASSESSMENT OF RODENT POPULATION
- ASSESSMENT OF RODENT NATURAL ENEMIES (MAMMALS AND RAPTORS), SPECIES, DENSITY, AND DIET.
- RELEASE OF REHABILITATED INJURED RAPTORS (9 INDIVIDUALS) AND 12 AWARENESS SESSIONS.
- REHABILITATION OF CORRIDORS:
  - PLANTING 1000 NATIVE TREES AND SHRUBS
  - CREATING OF TWO WATERERS FOR GOAT HERDS AND WILDLIFE
- MAPPING OF THE SURROUNDING HABITAT.
- PROVIDING THE TCFNR WITH NEEDED TOOLS (CAMERA TRAPS, RODENT TRAPS, WEATHER STATION, BINOCULARS, STEREOSCOPES, GPS, FIRE FIGHTING BALLS, ETC.)


Weasel (Source Bachar Bouka)

NEXT STEPS

- ❖ CONTINUE JOINT EFFORTS WITH NATIONAL STAKEHOLDERS AND LOCAL AUTHORITIES.
- ❖ EXPAND ADVISORY SERVICES, FARMER TRAININGS AND FIELD DEMONSTRATIONS.
- ❖ STRENGTHEN COLLABORATION WITH UNIVERSITIES ON SAFER ALTERNATIVES, INCLUDING BIO-RODENTICIDES.
- ❖ MERGE SHORT-TERM FIELD CONTROL AND LONG-TERM ECOSYSTEM APPROACHES IN PILOT AREAS.
- ❖ DOCUMENT RESULTS AND TRANSLATE THEM INTO SCALABLE GUIDANCE FOR LEBANON.

THANK YOU!

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Why Rodents Matter for Food Security

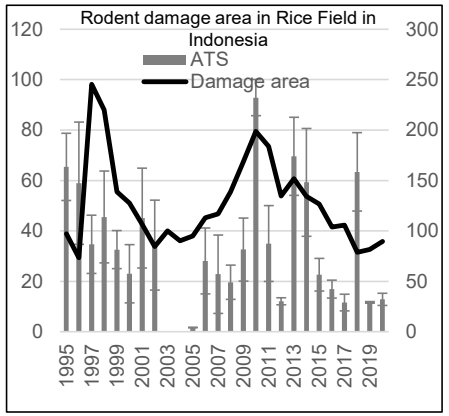
-Rodents cause 5–10% chronic pre-harvest losses in rice.

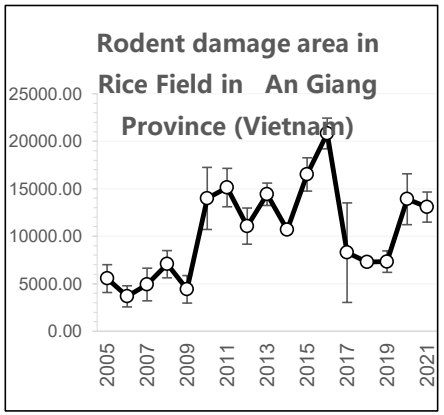
-Reducing losses by just 5% = enough rice for 280 million people.

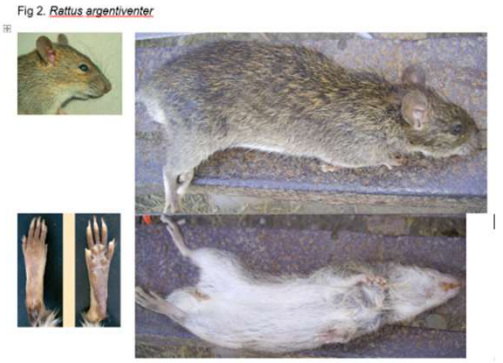
-Outbreaks can severely impact national food security, especially in Asia.

-Rodent outbreaks are not random — they follow ecological and climate patterns.

-High rodent population growth had negative impacts on the food security in Asia



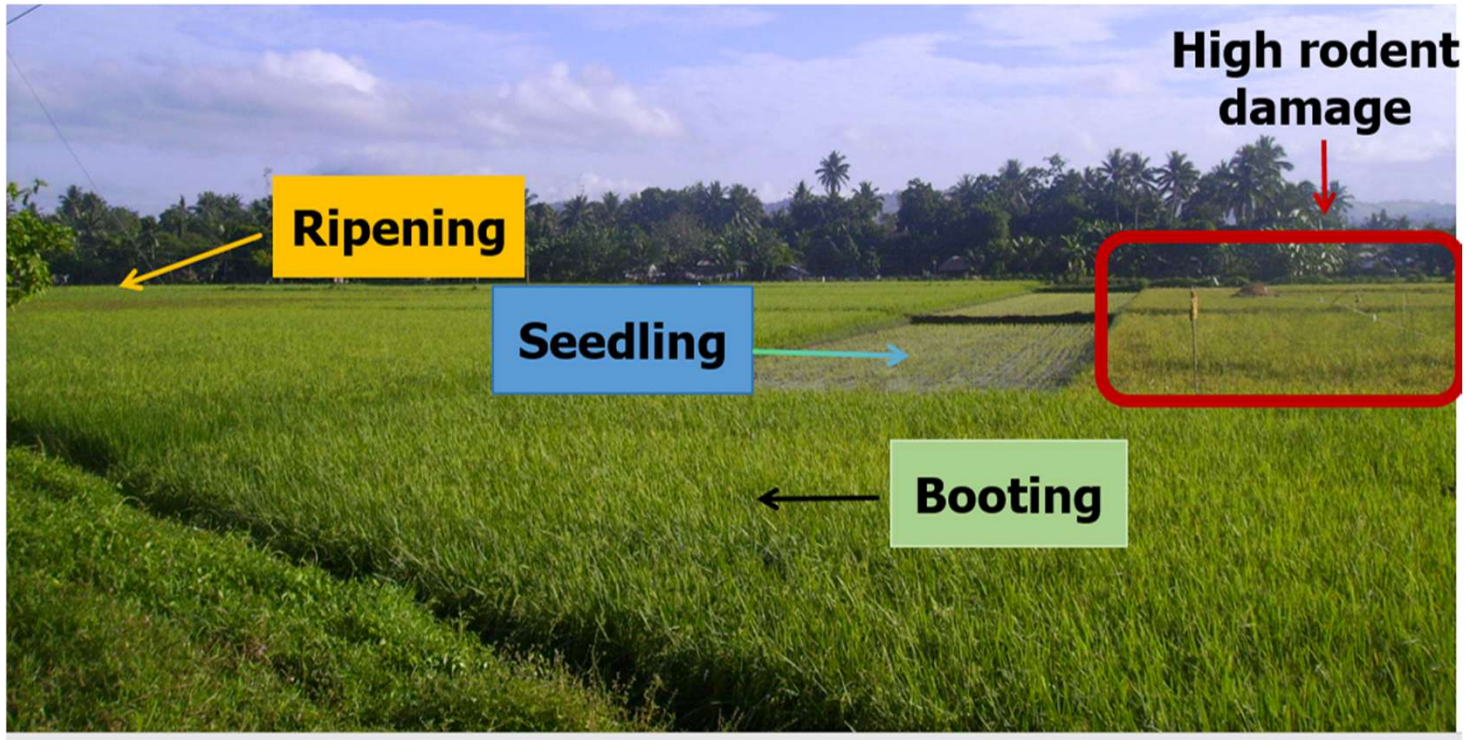




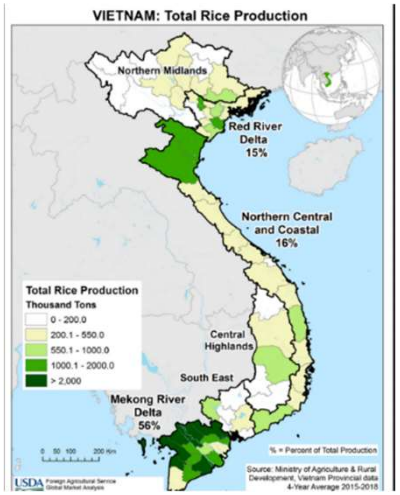
- Food sources;
  - Asynchronous planting
    - Extreme weather event (drought/flood)
    - Irregular irrigation scheme
  - Alternative food source
    - Weed seeds??
  - Long extent of high quality food
    - increasing cropping intensity (from 2-3 crops/yr)
    - ratoon cropping
    - Poor postharvest handing practices
  - Bamboo flowering
- Refuge Habitat (ie. breeding sites)
  - Abandoned land
  - Weedy fields

More detail in Singleton et al., 2010

Typical rice field with different rice crop stages indicating asynchronus planting in response to the rainfall changes



Examples of Outbreak Impacts



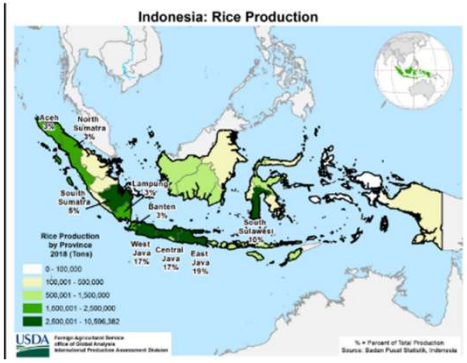
BGY	San Isidro (Libon, Albay)	West Carisac (Libon, Albay)	San Augustin (Libon, Albay)	Marayag (Libon, Albay)
Level of asynchrony	60	70	20	10
Damage%	49.41±5.03%	37.45±4.01%	9%	12.8

Philippines (Bicol)

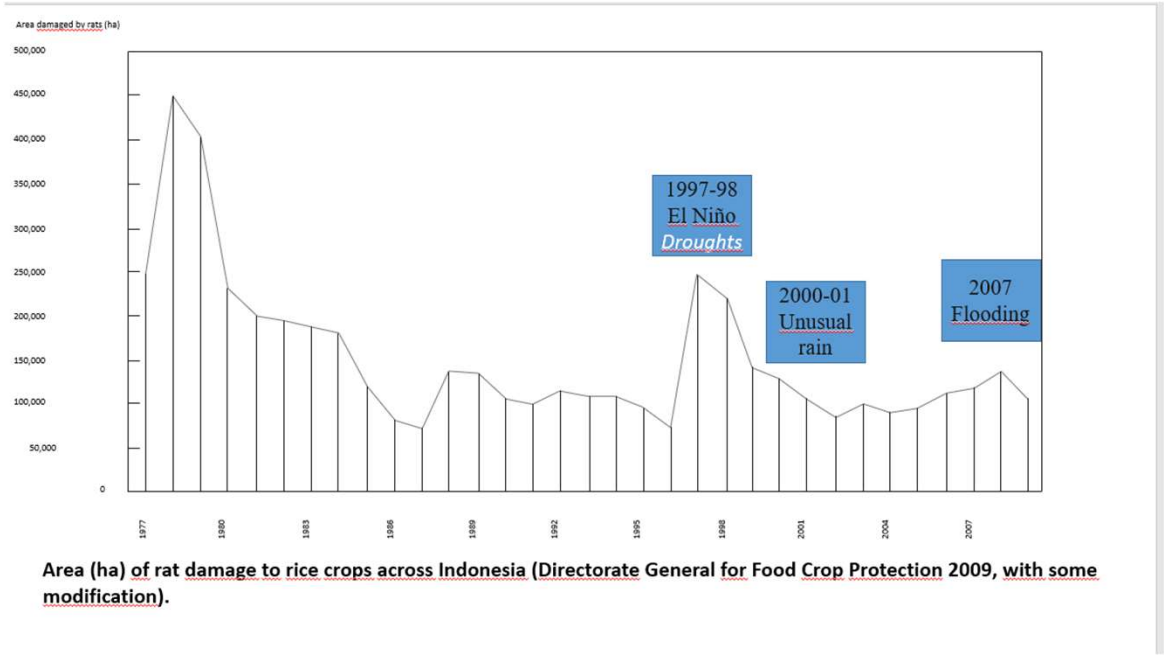
Dealyed onset of rainfall (2009)

- Villages with highly asynchronous planting had much higher damage rainfall on
- 60–70% asynchrony → 37–49% damage
- 10–20% asynchrony → 9–12% damage

Htwe et al., unpublished data



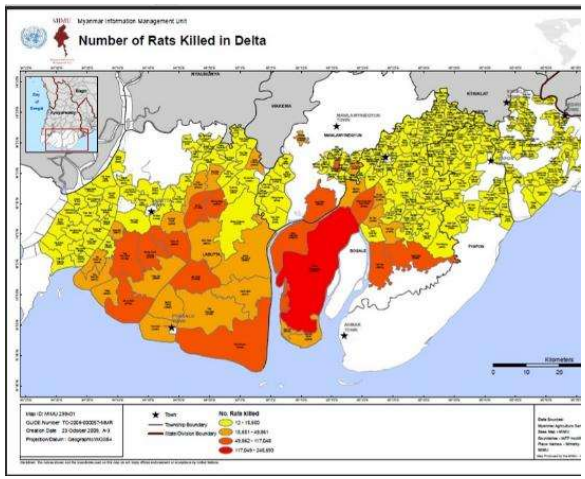
- Droughts (El Niño 1997–98) created ideal conditions for rodent population growth.
- Unusual heavy rains (2000–01) expanded rice areas, increasing food for rodents.
- Flooding (2007) disrupted planting and created uneven crop stages, leading to outbreaks.

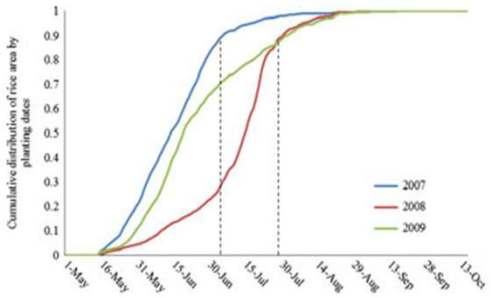


Area (ha) of rat damage to rice crops across Indonesia (Directorate General for Food Crop Protection 2009, with some modification).

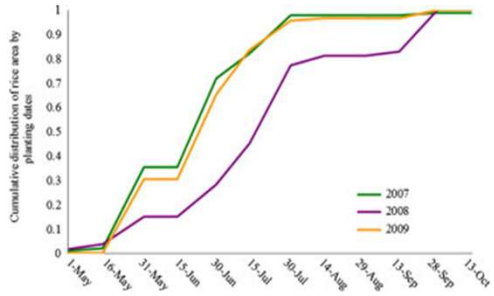
Sudamaji et al., 2010

Impact of rodent outbreaks in Ayeyarwaddy, Myanmar after **Cyclone Nargis May 2008**





Cumulative distribution of the planting period of rice for the monsoon season for the Bogale Township (2007, 2008 and 2009), based on TIMESAT analysis of MODIS imagery. The red vertical broken lines indicate 50% of rice planting complete; the grey vertical broken lines indicate 90% of rice planting complete.



Cumulative distribution of the planting period of rice for the monsoon season across six villages in the Bogale Township (2007, 2008 and 2009), based on household survey data. The red vertical broken lines indicate 50% of rice planting complete; the grey vertical broken lines indicate 90% of rice planting complete.

Cyclone Nargis (2008) → major landscape change

Rodent outbreak occurred 15 months later, matching biological recovery time

"Outbreak 15 months after cyclone is consistent with the biological response time."

Htwe, Singleton & Nelson ***Pest Manag Sci*** **2013; 69**

Rainfall Changes Are a Major Driver

Rainfall affects:

- Timing of planting
- Crop growth stages
- Food quantity & quality
- Habitat availability
- Expansion or contraction of rice area

"Rainfall effects indicate bottom-up regulation of rodent pest species as a result of rain-dependent crops."

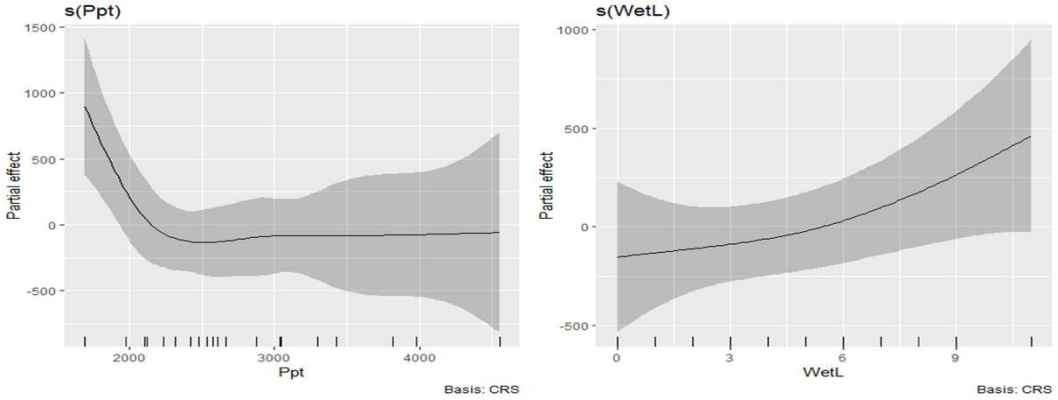
- Extreme weather event (drought/flood)
- Irregular irrigation scheme

How Rainfall Shapes Rodent Outbreaks in SEA Rice Systems and Australia Wheat Systems; Insights from long-term Population and Weather

📈 What We Analyzed

- We examined how rodent populations respond to:
- Current year rainfall
- Total rainfall
- Number of wet months
- Number of dry months
- Rainfall anomalies (deviation from long-term average)
- One-year lag rainfall
- Same parameters, but from the previous year (This helps understand both immediate and delayed ecological responses).

Rodent bundance and weather (Indonesia)
Rodent species- *Rattus argentiventer*



Rodent abundance decreases when rainfall is high

•Significant negative relationship with total rainfall
•More dry months → higher rodent abundance
•More wet months in previous year → higher abundance

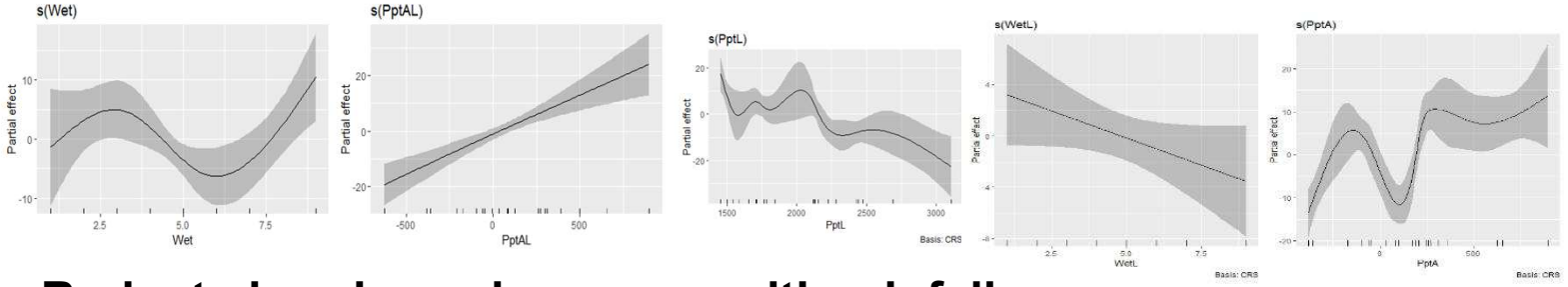
-Significant ´**negative**‘ relationship with rainfall

-No significant influence of rainfall anomaly

Take Home Message

•Less rain = more food availability (better rice growth, more weeds)
•Dry conditions favor breeding and survival
•Previous-year wet conditions may improve habitat structure

Rodent bundance and weather(Philippines)
Rodent species- *Rattus tanezumi*



Rodent abundance increases with rainfall and rainfall anomalies

- Positive relationship with:
  - Rainfall anomaly (current year)
  - Rainfall anomaly (previous year)
  - Number of wet months
  - Lagged rainfall (previous year)

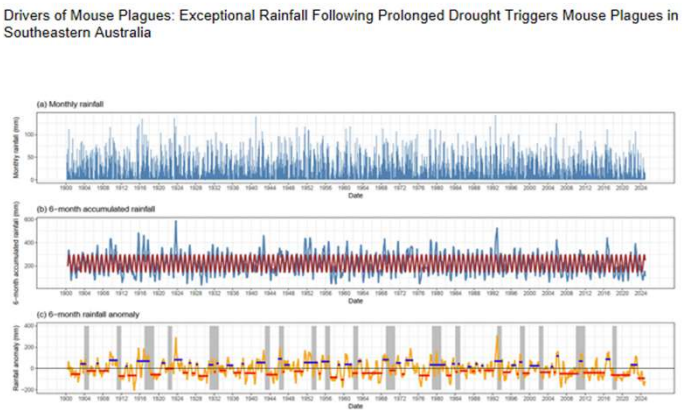
Take Home Message

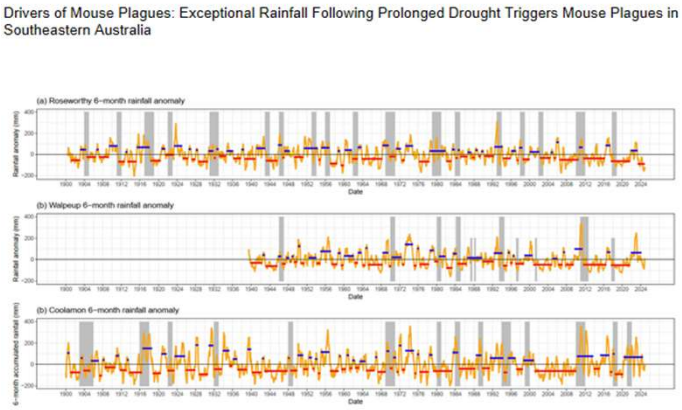
- Wetter conditions → more rice area, more food
- Lagged effects show populations build up slowly after favorable years

Significant ´**positive**‘ relationship with rainfall and rainfall anomaly from one-year lag on rodent abundance

Htwe et al., 2024

Rodent bundance and weather(Australia)
Rodent species- *Mus musculus*
Source: Brown, P.R. (2026). Integrative Zoology





Key Insight: Mouse plagues occur only when two climate extremes happen in sequence:

1. Prolonged drought (25–31 months)
    - Very low 6-month rainfall anomaly (−45 to −65 mm)
    - "Resets" the ecosystem: low mouse numbers, reduced predators
2. Exceptional rainfall (17–20 months)
    - Very high 6-month rainfall anomaly (+55 to +90 mm)
    - Produces abundant food → rapid mouse population growth

Why this matters:
- Plagues are not random
- They require a specific drought → rainfall pattern
- Monitoring rainfall anomalies can help predict future outbreaks
- Supports climate-based early warning systems for pest management

🌱 Integrated Insight Across Regions

Despite different species and farming systems, the core ecological mechanism is the same:

Rodent outbreaks are triggered by rainfall-driven changes in food and habitat.

- In Southeast Asia, rainfall anomalies shift rice growth patterns, planting synchrony, and food availability.
- In Australia, extreme drought followed by extreme rain creates boom-and-bust food cycles that drive mouse plagues.

Why this matters for agriculture

- Rodent outbreaks are predictable when rainfall anomalies are monitored.
- Climate extremes (droughts, floods, unusual rains) are becoming more frequent.
- Early warning systems can be built using rainfall anomaly indicators.

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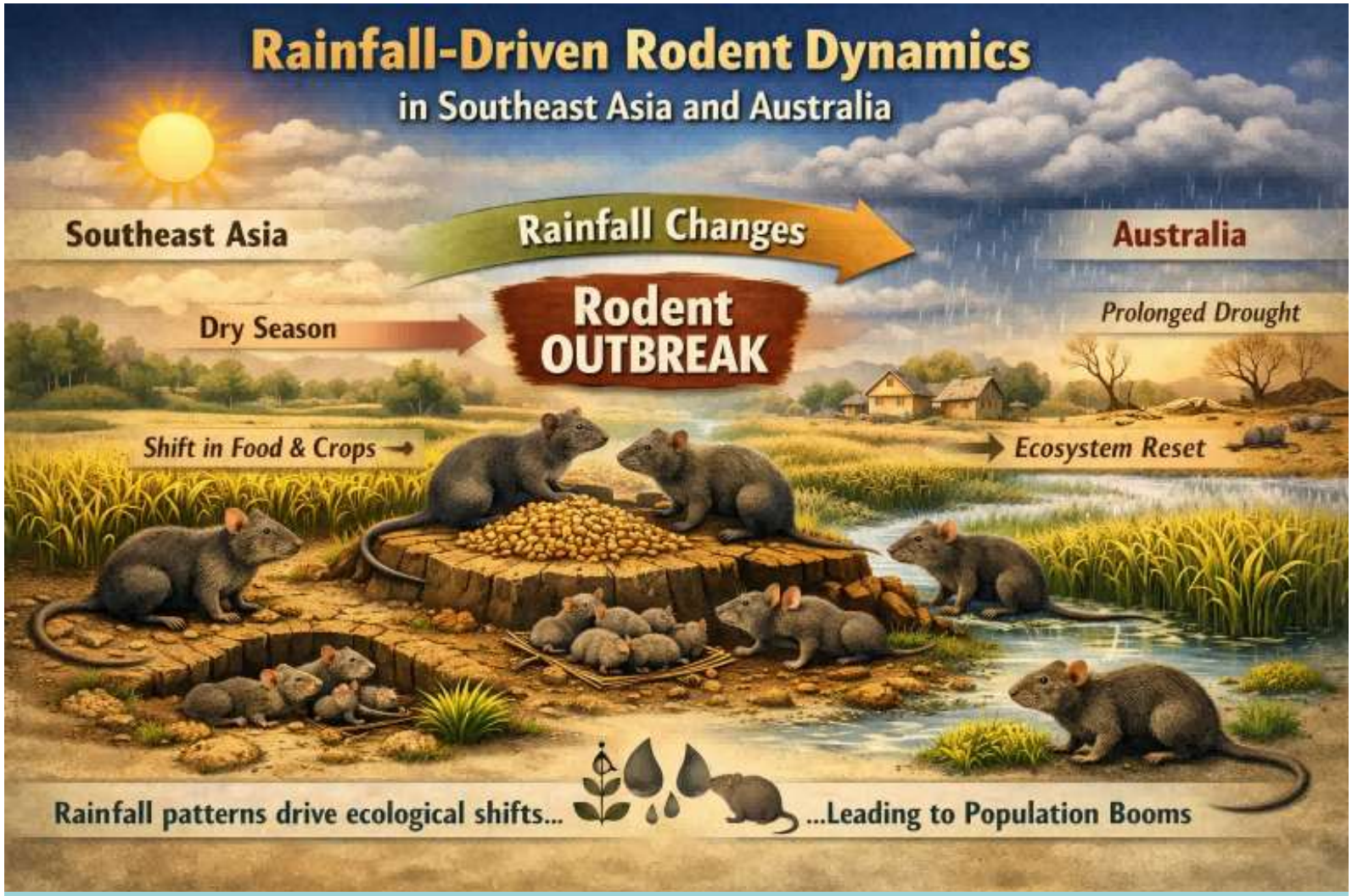
Rainfall-Driven Rodent Dynamics
in Southeast Asia and Australia
Southeast Asia
Rainfall Changes
Australia
Dry Season
Rodent
OUTBREAK
Prolonged Drought
Shift in Food & Crops
Ecosystem Reset
Rainfall patterns drive ecological shifts...
...Leading to Population Booms

Thank you!!!