

Reducing Crop Losses with Ecologically-Based Rodent Management





History

Established 2004

Offices in six countries, 40 staff

Cutting edge products and approaches:

Programs

- Water management
- Micro-climate
- Green infrastructure
- Regenerative agriculture > Rodent management

Activities

- Research
- Implementation
- Capacity building

Outline

1. Why focus on rodents?
2. EBRM
3. Bio-rodenticide
4. Results
5. Cooperation





Why focus on rodents?

Overwhelming damage vs lack of action










Total (world)

(Excluding United States, Canada and Australia)

69 Million Ton
of of cereals gained (all types,
e.g. wheat, rice.)

278.8 Million of extra people nourished

34% of undernourished benefiting

	 Million t of cereals gained	 Million of extra nourished people	 % of undernourished benefiting
 Asia	53.32	217.3	39
 Latin America	7.84	31.3	60
 Africa	5.68	22.7	11
 Europe	1.89	7.5	-

Source: Meerburg et al (2008). Data derived from FAOSTAT

The rodent problem is hardly recognized

- Agriculture crop loss (Africa overall study) on field 16%, storage 8% = 24% combined.
- Rodents are major pest of **rice** throughout Southeast Asia, in Cambodia 90% of cultivated lands is for rice production. Mean rodent damage is 9%, but can go up to >50%.
- In **cotton**, rodents may eat the seeds after sowing. During boll formation and maturity stages rodent damage occurs due to the sweet oily seeds found inside cotton bolls. Also, rodents pick up the matured cotton and store it inside the burrow to make 'beds'.



Sr. No.	Name of the crop	Extent of loss (%)	Rodent pest species	Habitat of species
1.	Rice	1.1 to 44.5	<i>Bandicota bengalensis</i>	Irrigated fields
			<i>Millardia meltada</i>	Semi irrigated fields
			<i>Mus booduga</i>	Irrigated fields
2.	Wheat	2.7 to 21.3	<i>Bandicota bengalensis</i>	Irrigated fields
			<i>Millardia meltada</i>	Irrigated dry fields
			<i>Tatera indica</i>	Rain fed fields
3.	Sugarcane	2.1 to 31.0	<i>Bandicota bengalensis</i>	Irrigated fields
			<i>Nesokia indica</i>	Irrigated fields
4.	Groundnut	2.9 to 7.3	<i>Tatera indica</i>	Irrigated dry fields
			<i>Millardia meltada</i>	Irrigated dry fields
			<i>Bandicota bengalensis</i>	Irrigated fields
5.	Vegetables	1.4 to 30.6	<i>Bandicota bengalensis</i>	Irrigated fields
			<i>Millardia meltada</i>	Irrigated dry fields
			<i>Meriones hurrianae</i>	In Indian desert soils
			<i>Funambulus pennanti</i>	Northern India
6.	Storage	2.5	<i>Rattus rattus</i> <i>Mus musculus</i>	Residential premises and farm level storage

NIPHM, Hyderabad, 2013



60 Zoonoses
Local health issues
Loss to property
Very resource inefficient!

Why the urgency for EBRM including Bio-Rodenticides?



Ecological change > increase in rodent population



Individual efforts = insufficient



Rats' increased resistance against chemical rodenticides



Huge concerns on rodenticide side-effects
And lack of new product development



Reduce crop loss

Reduce use of harmful substances

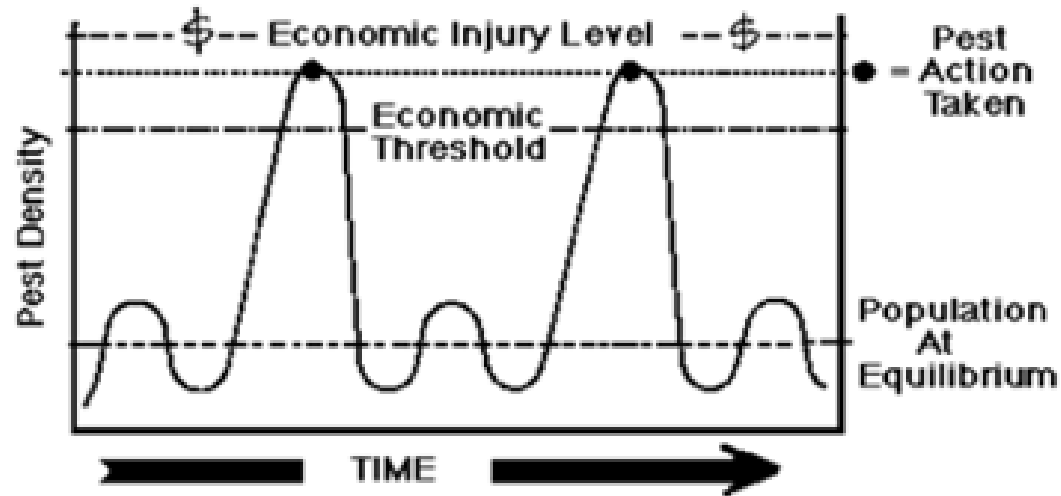
Improve health and well-being of staff and people

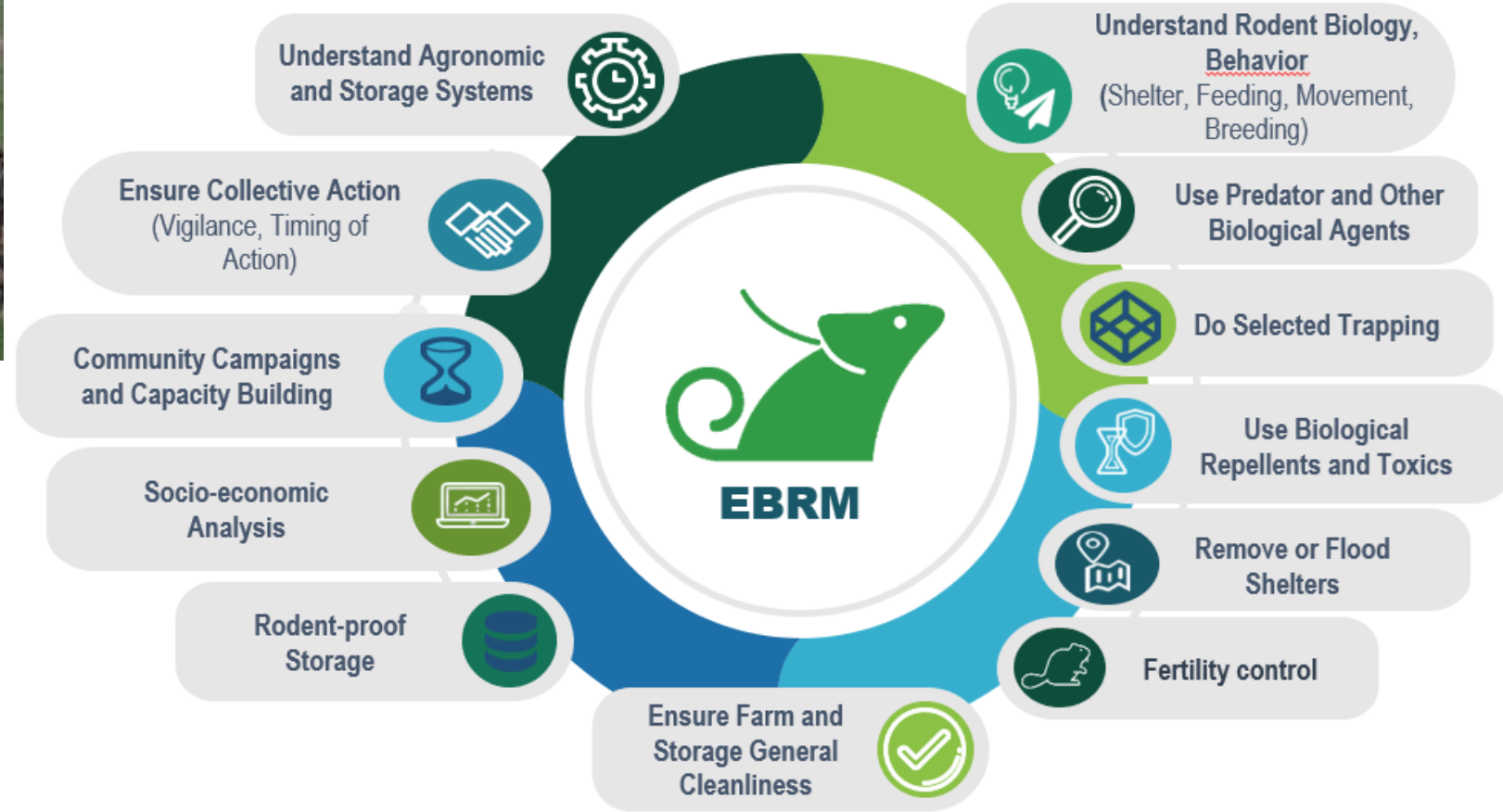
Ecologically based rodent management



EBRM approach

- Solid knowledge of rodent behaviour
- Focuses on habitat management and access to food
- Based on combination of methods





Post-harvest loss prevention

1. Install regular rodent inspection scheme - look for signs of rodents

2. Deploy rodent exclusion actions

- Immediately repair openings
- Instal disruptors, collars and rodent baffle to stop climbing up
- Install linear-TBS to intercept rodent movement between storage areas
- Improve storage floor, ceilings, stands,
- Improve storage materials (e.g., bags)
- Sanitation, proper garbage disposal

3. Take population reduction actions

- Trapping, fumigation, flooding burrows
- Maintain/add shelters of natural predators



Bio-rodenticide development



Developing bio-rodenticides

- Palatability
- Efficacy
- Lethal dose
- Shelf-life
- Effect on non-target species



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አድራሻ፡
ባንታምላክ ወንድሙ
0934629102
bantamlak2000@gmail.com

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ክርር የአይጥ ማጥፊያ



አረንጓዴ የአይጥ መቆጣጠሪያ (TM)

100% ተፈጥሮዊ አይጥን መቆጣጠሪያ አማራጭ ምርት። ውጤታማነቱ በጥናት የተረጋገጠ ፣ ለአካባቢ ተስማሚ እና ለአጠቃቀም ቀላል ነው። በወረዳዎ ውስጥ በሚገኙ አነስተኛ እና ጥቃቅን ድርጅቶች የተመረተ።
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Advantages

- Volatile, non persistent
- No food chain effect
- No harm to non-target species
- Locally sourced and low-cost
- Easy application



Results





Results from Amhara Campaign (Ethiopia)

- EBRM introduced to >16.900 people
- Improved village hygiene
- Severe reduction in use of spurious synthetic rodenticide
- Local business opportunities created
- New rodent-proof storage structure made by local carpenters
- Hermetic bags introduced to reduce rodent damage to stored grain

EBRM + BR community campaign

Region	Amhara
Report Weredas	Farta, Wadla and Guna Begiemider
No. of watersheds	12
No. of households	3380 (average of 5 per household, equivalent to 16,900 people)
35% of households	Keep houses and compound clean, use improved storage, no open food nor garbage, and plugging of entry holes or hiding places for rats with solid material
1,259 cats	Kept domestic cats, widely used against rats
147 hermetic bags	Used by farmers, while another 1,200 are requested
On 389 ha	Rat shelters destroyed by digging, deep ploughing, flooding, ...
191 km	Stone bunds devoid of grasses and vegetation aiming to expose rats to predators
100 birr/day	Penalty when missing community campaigns, and 10 Birr for late comers: community bylaw
15,285	Estimated to have been eliminated individually and collectively

Results to crop growth



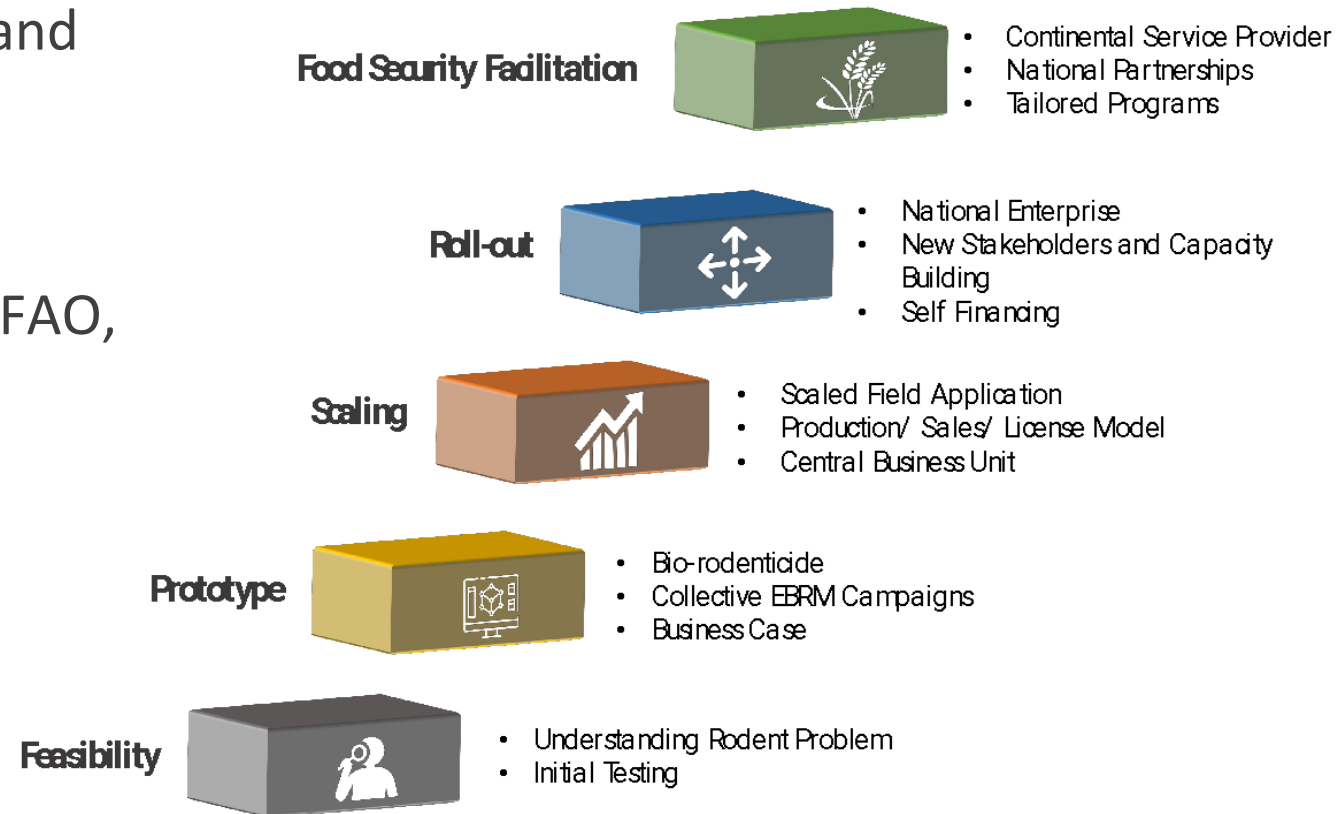
- Claim that damage due to rodents is reduced by ~50% (barley)
 - ✓ For example area A: Damage reduced from >20% to ~ 10%
 - ✓ In area B: Damage reduced from >15% to ~ 9%
- Patches hit hard by rodent damage before have revived
- Initiation of tillers and crop stand has greatly improved (barley)
- Grazing lands have greatly improved
- Towards cost-efficient farming and better food security



Cooperation

Business strategy

- Introduce ecologically based rodent management globally – work with small and large customers
- Centre of practical learning and working methods
- Work with international partners (WHO, FAO, WFP, Olam, national and regional governments)
- Building up the sector
 - Effective and safe control
 - Jobs and employment
 - Conducive regulation
 - Capacity building



West-Africa and Madagascar:

- Data on urban rodent incidence/ health
- Working groups to fine-tune urban EBRM
- Exploration into local bio-based rodenticides
- Working with WHO and FAO on standards

Ethiopia:

- 100% bio-based rodenticide developed
- On-going campaigns
- Training women producer enterprises
- Surveys on health/damage in urban areas

Global:

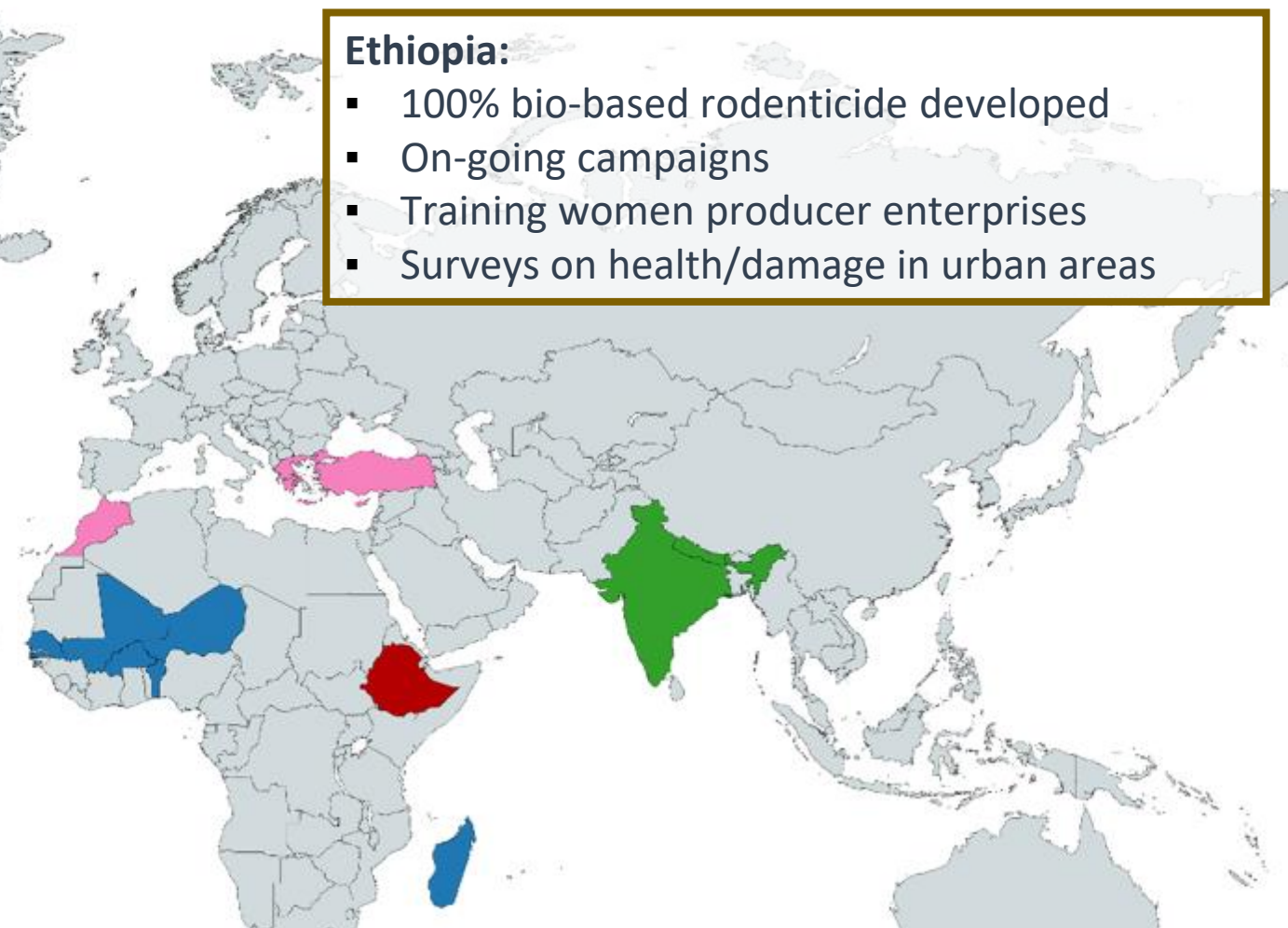
- Scope to explore large scale commercial agricultural operations

India and Nepal

- Surveying rodent damage to crops in field/storage
- EBRM approach tailored to local agroecology
- Trainings on effective rodent management methods conducted

Mediterranean:

- EBRM approach tailored to regional agroecology
- Novel plant-based bio-rodenticide R&D.
- New sensors and software systems for inspection





Field inspection of rodent footprints following treatment


INSPECTION, SURVEY AND MONITORING

1. DIRECT AND INDIRECT RODENT ASSESSMENT APPROACHES

1.1 Direct inspection methods

a. Capture-Mark-Release (CMR) method

To establish old knowledge of locally occurring rodent species, population dynamics,



These bio-rodenticides are based on the natural products of the microorganisms

INTRODUCING BIO-RODENTICIDES

ADVANTAGES OF BIO-RODENTICIDE OVER CHEMICAL RODENTICIDES

- Made from botanical material
- Non-persistent: quick biodegradability and decomposition; the toxins do not build up in the environment
- Developed so as not to harm non-target population environments



Rodent Green Management, service provider in:

- Surveys and inspection
- EBRM campaigns
- Bio-rodenticide development
- Training, awareness and plan development

Business model

- commercial clients
- small farmers/ local public health services



How can we help to reduce crop losses by 50%?

Develop EBRM/ BR trajectories around:

- Storage and aggregators
- Large and small producers

Develop plans, provide training and set-up innovation pathways

Work with smaller groups on specific value chains/geographies



Reach out to:

Luwieke – Lbosma@metameta.nl

Meheretu - yonas.meheretu@slu.se

Find us online:

www.rodentgreen.com

www.metameta.nl