

Rodents that stalk food security

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Agriculture Minister Matia Chowdhury told Parliament recently that food grains, including paddy, rice and wheat, worth around Tk 7.23 billion (723.72 crore) were damaged by rats in the fiscal year 2014-15. The Renewable Natural Resources Research Strategy (RNRRS) research has showed that 5-10 per cent of stored grains were lost to rodents in every three months of the storage period (each household losing 200kg/yr). Contamination with urine and faeces was also severe.

As common in most of Asia, Bangladeshi farmers routinely plant two rows of rice for the rats in every eight rows sown (pre-harvest losses ranging from 5-17 per cent). Farmers' damage assessments highlighted some of the more overlooked impacts of rodents, namely physical damage to houses, personal possessions, roads and fields. This damage requires extensive repair of houses and fields and also involves significant financial expenditure, when clothes, blankets, fishing nets, baskets, utensils etc are damaged. Ecologically Based Rodent Management (EBRM) strategies were shown to reduce the impact of rodents by 60-80 per cent for different measurable indicators. This was established through comparing intervention villages with non-intervention villages. Similarly, farmers' assessments showed Ecologically-Based Rodent Management (EBRM) strategies roughly cost the same (financial and time) as the previous practice, but with a much higher benefit (rat population reduced by >80 per cent).

DAMAGES CAUSED BY RODENTS: Information about the losses caused by rodents has been collected through controlled trials and through discussions with farmers. Through individual and group discussions farmers generally agreed that rodents caused multiple problems. The problems mentioned by the four communities surveyed are as follows:

n Damage to crops, especially rice: The amount of damage was not routinely assessed by farmers. However, rodents caused damage to rice at transplanting, tilling and ripening stages. Farmers' estimates of rodent damage in rice fields ranged wildly from 0 to 100 per cent with farmers indicating that it varied from one year to another and it was impossible to predict a bad year.

Damage to other crops: Guava, jackfruit, mango, coconut, bean, potato, chilli, pumpkin and gourd are also damaged. No crop was considered to be immune to rodent damage. The damage to different vegetables often happened at the flowering and fruiting stages and key growth stages. Particularly important with vegetables were farmers' remarks that far more rodent-caused damage than consumption occurred, which directly impacts on product sale.

Storage loss: All farmers agreed that rodents were a problem for stored rice. Farmers' estimates of post-harvest loss ranged from 5.0 to 40 per cent with an average of 13 per cent. Despite these remarks on loss, few people went through much trouble to protect their stored rice from rodent attack. Their perception is that rodents can chew through anything and gain access, no matter what they do to prevent it. Controlled store loss trials implemented by the project indicate that real losses from rodents are between 10 and 20 per cent of a farmer's store, varying with store volume and structure.

Dirty environment: Rodents were considered to be a major problem in and around households, particularly by women who agreed that rodents can spread general dirt around. However, awareness about specific disease problems and the role of rodents in disease transmission are generally very low. Rodents did occasionally bite people during the night, but reports were low and not considered to be a major problem. Rodents nibbling at and cutting human hair was cited by many women.

Damage to property: Rodents were cited to damage furniture, clothes, utensils, foundations of buildings, granaries, electrical cables and other personal items such as medicine and fishing nets. The cost of this damage was clearly identified by most farmers, e.g. a damaged shirt that cost Tk 300.

Damage to livestock: Chickens and eggs were damaged as well as livestock feed.

POST-HARVEST LOSSES DUE TO RODENTS: A research project titled Assessment of Rodenticide Use and Rodenticide Resistance is being implemented in Bangladesh in order to reduce post-harvest losses with the financial support from NWO/WOTRO Netherlands Organisation for Scientific Research. The main purpose of the research project is as follows:

In developing countries, rodents have an enormous economic impact on stored produce. In India it was reported that 6.0-9.0 per cent of the stored paddy rice was consumed by rodents. Recently it was postulated that 280 million undernourished people could be fed, if post-harvest losses by rodents were reduced by 5.0 per cent. On top of these losses, rodents contaminate much more produce with their droppings which may harbour pathogens. Rodents also cause major damage to storage facilities, which in turn leads to losses by insects and moulds or mycotoxins. Remarkably, quantitative and qualitative losses caused by rodents are rarely taken into account within the food chain in developing

countries. For many small-scale farmers, high levels of rodent damage to grain stocks severely limit the potential to sell surplus grain for family income. Medium to large scale farmers may sell significant portions of their harvest through cooperatives or directly to local or regional market traders. The stockpiling of grain at the local market level is also exposed to high levels of rodent damage as small warehousing facilities are rarely rodent-proof.

An additional pay-off of effective rodent management is a reduction in rodent-borne diseases that can be catastrophic to the livelihoods of the poorest of the poor. Information that is acquired in this project (Assessment of Rodenticide Use and Rodenticide Resistance) will also be useful in other parts of Asia, a region that contains about two-thirds of the world's poor - 1.8 billion people who live on less than \$2 a day with 903 million struggling on less than \$1.25 a day (United Nations, 2010).

OBJECTIVES OF THE RESEARCH: This project aims to help Bangladesh develop strategies for prevention of post-harvest losses by rodents. The main focus is ensuring that stakeholders throughout the food chain, policy makers and specialists are provided with appropriate tools and information to manage post-harvest losses caused by rodents using cost-effective, sustainable and ecologically-based strategies, thus leading to less contamination and loss of stored food. In this way, the project contributes directly to two areas: increasing sustainable agricultural production, and ensuring equitable access to better nutrition.

RESEARCH QUESTIONS AND METHODS: Direct loss to stored grain stocks in Bangladesh has been estimated to be 5-15 per cent depending on granary size and proofing level, with much greater percentages of grain contaminated by rodent faeces, hairs and urine. Moreover, rodents form a specific health threat in terms of food safety: their excrements can carry viruses that cause haemorrhagic fevers, several enteric bacterial species, helminthic eggs and protozoan cysts. Rodents living on harvested produce in or near human dwellings are also a source for vector-borne infections of humans. Rodenticides in Bangladesh are often used inappropriately and have detrimental effects on non-target species, including humans.

In order to understand rodent damage, it is necessary to understand the ecology and behaviour of the involved rodent species. We have to identify the rodent species causing qualitative and quantitative post-harvest losses in the household and small market trader storage facilities. Currently we have only basic knowledge of inter-annual rodent dynamics and habitat in Bangladesh. Therefore, we would like to determine rodent breeding and migration capacity across seasons (before, during and after harvest) and characterise post-harvest losses through quantifying rodent loss, damage and contamination rates for different traditional storage structures. Moreover, we aim to improve rodent management and control strategies. Currently, there is little regional awareness and availability of "new" technologies such as innovative storage (e.g. IRRI superbag and grain cocoons), and trap designs that increase efficacy and reduce development of avoidance behaviour. New storage technologies should be assessed in field conditions in Bangladesh to develop best practices for rodent management, trapping regimes and rodenticide application.

Our last research question is how we can gain more attention to the post-harvest losses by rodents. Therefore, we have to ascertain human perceptions and attitudes in Bangladesh towards rodents, post-harvest losses, the costs and benefits of their current rodent management methods. We have to carry out research to develop culturally appropriate communication pathways for knowledge on preventing post-harvest losses caused by rodents, provide research assistance to SMEs (small and medium enterprises) to develop their own promotional materials and monitor and analyse impact of publicity campaigns on knowledge uptake and behavioral change.

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