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CHAPTER 4

PRINCIPLES AND STRATEGIES FOR RODENT MANAGEMENT

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Integrated Pest Control

Compared with many other rice growing countries, the Philippines is fortunate in having rodent pest species with similar biology and behavior. An approach based on one species, the Philippine riceland rat *R. r. mindanensis*, can be used. This species is so widespread, adaptable and opportunistic, that it can be found from lowland rice to upland coconut, in field crops, cereal grains and vegetable, as well as in storage areas. Its reproductive potential, mobility, and adaptability to any habitat providing adequate food and shelter make it one of the most destructive and difficult to manage of all pests species found in the Philippines. With so many different crops and habitats available, a single strategy to manage or control this pest is impossible.

Integrated pest control (IPC) or integrated pest management (IPM) expresses the idea of using a combination of control methods for a pest that can reduce more effectively crop yield loss while having limited effects on non-target species. In 1978, a short course on Integrated Pest Control for Irrigated Rice in Southeast Asia sponsored by FAO, USAID and the Philippine Bureau of Plant Industry (BPI) introduced IPC concepts and laid the foundation for future pest management strategies. Participants developed strategies for their respective countries for implementation. Rats, brown planthopper and tungro were identified as the most important rice pests based on their potential damage at the national level in the Philippines.

Many components of an IPC program such as 1) a well-defined pest management strategy, 2) economic injury thresholds, 3) reliable monitoring and 4) predictive techniques of predictive models have been developed for disease and insect pests. Because of the lack of some basic information, the size and complexity of the agro-ecosystem, and the number of different crops potentially involved such a scheme for rats are still developmental.

Economic injury threshold, that is, waiting for a given damage level before initiating control measures against rats in rice and many other crops, is not applicable. In fact, rice farmers have unsuccessfully used this method in the past. Since baiting is a large component of the current pest management strategy, waiting for rodents to appear in sufficient numbers usually means that the rice will be in such a stage where it will be more attractive to the rat than any bait material used.

Monitoring data has not been of sufficient character to accurately predict an economic threshold level in the individual farm and no relationship between former damage and expected damage has yet been demonstrated. Thus, predictive modelling for rats in rice is still many experiments away.

Several constraints must be considered that will determine strategy effectiveness. Most important is the availability of control methods at the local level. For example, if anticoagulant rodenticides are not distributed and sold in an area, chemical baiting cannot be done. If lack of manpower prohibits synchronous planting, the result will be a multi-stage crop which is more conducive to rodent population build-up and its subsequent damage. The scarcity of labor may also influence the degree of weeding that takes place and that may contribute to increased rodent damage.

The linkage between research and extension is a factor that influences implementation of pest management strategies. The concept of pest management has affected the extension worker perhaps more than anyone. Under this scheme, he now needs to understand and be able to transmit IPC recommendations for several pests including insects, diseases, weeds and rats as well as knowledge of other inputs such as seed technology and agronomy. He also needs to know how to overcome traditional control methods that the farmer is accustomed to and usually hesitant to drop in favor of an unknown method. To do this, an extension worker must be confident of the recommendations that he receives and passes on. These methods therefore must be adequately field tested, demonstrated and repeated under several different conditions. If an extension worker has not participated in the development of a pest management strategy or if the recommendations he gives fail because of inadequate research or insufficient replication in different geographical areas, his credibility suffers and loses confidence in giving any future recommendations and the farmer may be reluctant to receive any from him from then on. It is therefore paramount that the recommended rodent pest management strategies be based on unbiased research techniques that have been regionally tested in farmers fields. This ensures that the pest management approach will move from the bureaucratic or institutional level to the farmer level, unimpeded by technical constraints.

Despite its importance as a pest, pest management information for rats has not been as organized as other disciplines like entomology. Very few major studies have entered the literature, and some basic biological and behavioral studies as well as large scale field trials and regional demonstrations of proposed techniques are still lacking. Information exchange within the country as well as between countries has also not reached the level of other disciplines. Most research findings and information exchange take place in Entomological Society Meetings or in unpublished reports that are not widely available. The publication of this book is a start in this direction to develop rodent pest management strategies.

Research prior to 1970 was primarily motivated from a purely control viewpoint and the national impact or effectiveness of control techniques was impossible to measure or even to estimate. The development of damage assessment techniques and the annual survey conducted by BPI since 1970 have quantified the impact of rat damage in rice and provided a basis for long term monitoring.

Approaches To Rodent Pest Management

The strategy used will depend largely on five factors such as 1) the time frame involved (preventive vs. curative), 2) the geographic area considered (areawide vs. local), 3) the placement of responsibility for control (government agency vs. individual), 4) the crop involved, and 5) the availability of necessary strategy ingredients at the local level.

1. Preventive vs. Curative

Various terms have been applied to this factor and include prophylactic vs. therapeutic, prevention vs. stopping, endemic vs. epidemic or normal vs. outbreak. The former refers to the application of long term, regular, low level inputs as opposed to immediate, crises-oriented large inputs. The choice would depend upon the other factors mentioned above, particularly the type of crop involved and the availability of control methods. Generally, however, traditional approaches have emphasized the acute approach and the more recent pest management methods emphasize the chronic long term approach.

2. Geographic Area

The area considered for control implementation will affect the strategy or approach. The smallest unit possible is one farmer's field while the largest is the entire Philippines with many political subdivisions in between. The most common unit is the barangay which covers perhaps 10-1000 farms and farmers. The most challenging is the control in one rice paddy where no other rodent control is being done by neighbors. These adjacent areas provide a continuous source of rats and increase costs on a per unit area in the targeted field. Within this single farm, some methods are not practical or available such as synchronous planting or habitat modification which are more applicable in larger areas. Obviously, more effective, economical and longer lasting control becomes possible as the considered area for control becomes larger. On the other hand, if an area of control becomes too large, supply lines for extension or technical assistance, or even necessary commodities used in control programs may break down and decrease the overall effectiveness of the strategy.

3. Responsibility

Prior to the Masagana-99 Program implementation, the Philippine Government was largely responsible for providing rodenticides and, in outbreak situations, the field application of rodenticides. This instilled within the agro-community a dependence on the government for rat control. Large scale government operated programs are logically difficult to implement and usually revert back to responding only to acute outbreaks rather than the more effective prophylactic approach.

In contrast, the Masagana-99 program placed the burden for rat control in rice on the individual farmer. He is now provided a loan of P50 to purchase rodenticide, bait, bait holders and to place these items in his rice paddies. The extension agent or technician is available to provide advice based on published recommendation, but the ultimate responsibility for control falls on the farmer himself. The farmer is, actually, the best person for the job. He is familiar with his own farm and adjacent crops or habitat, and is present in the field more often than any technician would be. All he needs is occasional advice, a sound package of technology to implement and perhaps a loan to be repaid at harvest.

Rodent control in urban and non-crop areas should be the joint responsibility of the government and the private sector. The sites where rodent populations should be reduced to prevent outbreaks that could lead to economic or health hazards include river banks, railways, roads, unused lands, sewers, city drains, and refuse disposal sites. Control in homes could be done personally by the homeowners or contracted to private pest control operators. Howard (1980) stated that "Rodent Control is largely a people problem, and to be effective it first requires the resolution of many economic, political and social problems which more often are more complicated in cities than with agriculture."

4. Type of Crop

The rat, *Rattus r. mindanensis*, affects more different crops than any other single pest in the Philippines. This omnivorous character prohibits the selection of any single strategy to cover all crops. Rodent pest management in coconut will be drastically different from that in rice. Many crops will only be "accidentally" damaged by an opportunistic rat population that is temporarily without preferred food or shelter. Damage in rice is much more predictable compared with the apparent sporadic occurrence of rat damage in corn.

In many situations, more than one crop may be involved. This would include for example coconut and sugarcane adjacent to rice paddies or perhaps pineapple grown under coconut trees.

Population dynamics of rodent populations have been intensively studied in rice/uncultivated habitat, but in several other crops, mixed crops (multiple or inter-cropping) or more complex agro-ecosystem, detailed characteristics of rodent populations have not been described. Specific recommendations for any situations are therefore not yet available.

5. Availability of Pest Management Inputs

In some areas of the Philippines, there are occasional shortage of anti-coagulant rodenticides. Obviously, a control strategy dependent on chemical baiting with anticoagulants could not be carried out. Another constraint is the lack of adequate manpower at transplanting time, thereby resulting in staggered planting and a multi-stage crop which in turn prolongs the availability of food and shelter to rodent populations. This competes with most recommended control strategies. Weeding in and around the rice paddy is also, for the most part, dependent on manpower but the timing of weeding is not as critical as planting in terms of rodent control.

Regional testing of recommended strategies might reveal other input deficiencies that need to be resolved at the local level. Again this emphasizes the critical need for thorough field demonstration of developed strategies prior to implementations.

The emphasis for effective rodent pest management should focus on increased yields and not necessarily to be measured by visual evidence of acute population reduction techniques. Rodent control specialists were as guilty as entomologists in the early pest control years when they measured success in terms of dead animals rather than using yield data to compute cost/benefit ratios. It may take another generation before this concept is adequately understood and accepted by the majority of farmers. Farmers are more skeptical of new technology because they are the ones actually "betting their money" that such technology would work. Current pest management strategies for rodent control do not place emphasis on physical methods which run contrary to man's basic instinct to take bolo or club in hand and "attack" the enemy.