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## 39 SOLVING RODENT PEST PROBLEMS IN THE SAHEL

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### SUMMARY

Rodent pest management has been largely ignored in Africa despite serious and chronic crop damage. Recent rodent outbreaks have once again brought this problem to the attention of donor agencies and administrators of crop protection programs. After the last major rodent outbreak in the Sahel (1975-1976), little funding or opportunity was available to increase the knowledge of rat damage and control in the Sahel. Focus on these outbreak situations has in the past lead to virtually no effort to examine the annual chronic rat damage that probably causes even more aggregate crop losses and affects the daily lives of African people. The U.S. Agency for International Development (AID) and the U.N. Food and Agriculture Organization (FAO) now have invested some limited funds designed to find solutions. This beginning must be followed quickly to establish the necessary techniques, programs, and infrastructure to deal both with chronic damage and future outbreaks.

This paper summarizes Denver Wildlife Research Center (DWRC) activities from 1984 to the present and outlines plans for the next 5 years.

### RESEARCH CONDUCTED FROM 1984 THROUGH 1989

In November 1984, agricultural rodent problems were evaluated in five eastern Africa countries under sponsorship of FAO. Twelve primary rodent pests responsible for damaging planted and maturing field crops as well as stored foods were identified (Fiedler, 1985). The species most often involved in crop damage were the unstriped grass rat or Nile rat (*Arvicanthis niloticus*) and the multimammate rat (*Praomys [Mastomys] natalensis*).

These two species are responsible for most of the crop damage associated with the rat «outbreaks» that occur periodically, generally when rainfall follows a prolonged drought (Fiedler, 1988a). Such a potential outbreak situation existed in September 1984 when DWRC issued an alert through USAID to missions in the Sahel. An end to the drought which had been ongoing since 1979 in some areas would lead to rapid expansion of rodent populations with the expectation of serious crop damage. Rains had returned in the 1985 and 1986 growing seasons and, by the end of 1986, Sudanese farmers in some areas were losing up to 100% of their planted millet and sorghum seeds. The first official recognition of a serious problem came with requests from the Governments of Sudan and Chad for donor assistance in February 1987.

### SUDAN

AID/Khartoum requested assistance from DWRC shortly after Sudan's initial request; Fiedler (1987) met with the Sudan Ministry of Agriculture (MOA) and representatives of

several donors in April. After examining several affected areas, it was obvious that western Sudan millet and sorghum fields of subsistence farmers would be susceptible to severe losses during the June planting season. Available time, resources, and money were not sufficient for a countrywide program. Therefore, efforts were directed primarily to western Sudan where a second consecutive crop failure would have required large shipments of surplus grain at a much greater cost than that being invested in rodent control.

Thirteen hundred metric tons of whole sorghum (98%), vegetable oil (1%), and zinc phosphide rodenticide (1%) were procured, mixed, and distributed by the Sudanese MOA. A small amount of zinc phosphide bait (2-3 grams) was placed directly in rat burrows in and around fields prior to planting on about 1 million feddans (1 feddan = 0.43 hectare) of cropland. The result of this effort was evaluated by another DWRC biologist. Keith (1987) found that this large undertaking, which cost 6 million Sudanese pounds and entailed the total involvement of the Sudan Plant Protection Department (PPD) for about 3 months, was highly successful. Rodent activity after treatment was reduced by 90%. Because of careful planning, training, and professional execution by the PPD, this operation resulted in only a minimal nontarget animal loss and no human hazards.

## CHAD

In other Sahelian countries, rodent damage to field crops became severe in 1986 and rodent densities were high again in the spring of 1987. This prompted MOA/Chad to request AID's assistance which was provided through the DWRC. LaVoie's (1987) site visits in May confirmed high rodent densities and identified primary pest species (*A. niloticus*, *Mastomys* sp., *Gerbillus andersoni*, *Jaculus* sp.) in five crops. In October and November, DWRC biologist Mitchell (1987) initiated evaluations of the rodenticide warfarin in nine crop areas where infestation estimates ranged from 360 to 2,280 rodents/ha (based on burrow numbers). Rodent activity was estimated again after treatment and was reduced from 60-96% in vegetable and sorghum plots.

Field research and training programs were conducted in Chad in areas near N'Gouri and Bongor in April of 1988 (LaVoie, 1988). The primary rodent pest in both areas was the Nile rat. Small plot evaluations of the rodenticides warfarin, chlorophacinone, and zinc phosphide showed zinc phosphide as the most effective ; however the other materials also gave acceptable results but were much more expensive than zinc phosphide since multiple applications are required for the two anticoagulants. Agricultural extension personnel were trained in the safe and effective use of warfarin and in evaluation methods.

Near Bongor, rodent populations appeared to peak in February or March, soon after the December harvest, and then begin a natural decline until about June or the beginning of the rainy season. Damage to maturing rice was a chronic problem. Rodent control operations were carried out in February and March 1987 by the MOA Plant Protection personnel using Klerat<sup>1</sup> (a wax-block bait, containing 0.005% brodifacoum, a single dose lethal anticoagulant rodenticide) as the primary control tool. A report (Hassane, 1987)

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<sup>1</sup> Reference to trade does not imply U.S. Government endorsement

summarizing this operation identified a significant problem with secondary poisoning of raptorial birds. A large number of these birds of prey were killed by feeding on rodents poisoned during the operation. In addition, the use of Klerat presented a potential human health hazard, because people in the area sometimes ate rodents. The MOA personnel working in and around Bongor were given training in the safe and effective use of warfarin, a less toxic rodenticide for controlling rodents in rice fields, and methods of evaluation. A key recommendation for the Bongor area was that rodent control operations be conducted when necessary during the crop period, not after harvest when raptor concentrations were present.

## **SENEGAL**

In Senegal, heavy rodent damage to crops was first noted in October 1986. In December and January 1986-87, a survey of rodent activity indicated that a large agricultural area along the Senegal River was seriously infested. A site assessment by DWRC and FAO scientists confirmed extremely high populations of the Nile rat throughout the Senegal River Valley (LaVoie and Elias, 1987a). Visual counts of 25 rats/100-m transects during mid-day suggested that both Nile rats and multimammate rats were at or near peak densities. Senegal Crop Protection personnel reported that more than 400,000 ha of crops were severely damaged by several rodent species.

Followup rodent surveys in Senegal and Mauritania in 1989 were conducted in four regions of the Senegal River Valley (LaVoie, 1989a). Sampling provided data on the agricultural rodent pest species, their relative abundance by area in relation to crop type, and rodent damage assessments in seasonally susceptible crops. The principal pest species was the Nile rat. Rodent activity was greatest in fallow rice fields or those with secondary crops and vegetable-producing areas. Damage assessments indicated severe rodent damage to both vegetable seeds and seedlings.

## **MALI**

Site inspections of irrigated rice growing areas in Mali were made in May of 1987 in response to the requests from MOA/Mali to AID (LaVoie and Elias, 1987b). Rodent burrow openings averaged 0.6 to 0.8 per linear meter of rice paddy dike. The number of rodents sighted relative to burrow openings suggested that the irruption of *A. niloticus* had peaked early in 1987 and was then declining to chronic densities.

## **BURKINA FASO**

Crop Protection personnel in Burkina Faso observed higher than normal rodent crop damage in 1986-87 ; however, we could find no evidence that rodents were at irruption densities (LaVoie and Elias, 1987c).

## **CURRENT ACTIVITIES AND FUTURE PLANS**

A review of the available literature on African rodent agricultural and disease problems, encompassing 6 major rodent pests and 71 minor ones, was recently published (Fiedler, 1988b). In addition, FAO will soon release a manual on pest management of rodents in eastern Africa (Fiedler, in press).

DWRC has established an AID-funded rodent pest management project in Chad that will be fully operational in 1990. Initial pre-project research activities have included trapping and monitoring rats in the primary agricultural areas (LaVoie, in preparation ; and Wilson, in preparation). The project will determine seasonal patterns of rodent reproduction, annual population dynamics, and patterns of crop damage, so as to prepare a predictive model for rodent outbreaks. Detailed evaluations of rodent control methods and materials will also be completed under the Chad/USAID/DWRC Project.

Short-term technical assistance to other Sahelian countries should include field research to :

- Define the primary rodent pest problems through :
  - . species identification;
  - . damage assessments in major crops;
  - . rodent population assessments related to seasonal patterns of rainfall and crop cycles.
- Prioritize rodent pest problems.
- Devise rodent pest management strategies through :
  - . developing and testing of materials and techniques;
  - . conducting small-scale control trials.
- Demonstrate and adapt control methods and strategies to local conditions through:
  - . regional field testing ;
  - . refinement based on feedback, and further testing if necessary.
- Develop a Sahelian rodent information and assistance network.
- Publish recommendations in appropriate local and regional sources.

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