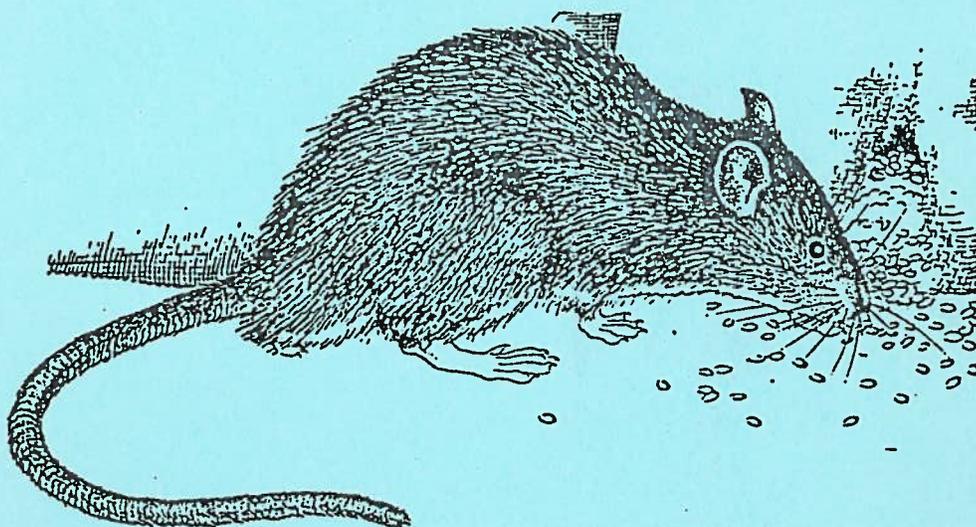


VERTEBRATE PEST CONTROL PROJECT

Food Security Management
Post-Harvest Management Component

VERTEBRATE PEST PROBLEMS IN PAKISTAN



INFORMATION BROCHURE No. 1

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Islamabad, Pakistan

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IN PAKISTAN

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VERTEBRATE PEST CONTROL PROJECT
NARC, ISLAMABAD

VERTEBRATE PEST PROBLEMS IN PAKISTAN

1. What are vertebrate pests?

The animal kingdom is divided broadly into those animals without backbones, the Invertebrates (insects, worms, crustacea, etc.) and those with backbones, the Vertebrates, consisting of fishes, amphibia, reptiles, birds and mammals.

The vast majority of vertebrate pests come from the birds and mammals. Any vertebrate animal that comes into conflict with man by reasons of its feeding habits, population numbers or disease-transmitting capabilities, can be a vertebrate pest. In practice the most serious vertebrate pests are the rodents, especially rats and mice adapted to live closely with man, and several kinds of granivorous or omnivorous species of birds. Occasionally other classes of mammals, such as rabbits and hares, jackals, and wild boar are locally important vertebrate pests.

2. Important Vertebrate Pests of Pakistan

The important vertebrate pests of Pakistan fall within four groups of animals of which three are groups of mammals and the fourth group is birds. The most important group are the rodents.

A. Rodent Pests

Rodents are mammals that are easily identified by the single pair of upper and lower incisors, a lack of canine teeth and only a few molars on each side. These consist of field and house rats, house mice and porcupines:

Lesser bandicoot rat	<i>Bandicota bengalensis</i>
Short-tailed mole rat	<i>Nesokia indica</i>
Soft-furred field rat	<i>Millardia melitana</i>
Indian gerbil	<i>Tatera indica</i>
Indian sand rat	<i>Meriones hurrianae</i>
Libyan sand rat	<i>Merione libyicus</i>
Roof or house rat	<i>Rattus rattus</i>
House mouse	<i>Mus musculus</i>
Murree vole	<i>Hyperacrius wyneei</i>
Indian porcupine	<i>Hystrix indica</i>
Striped squirrel	<i>Funambulus pennanti</i>

1. The lesser bandicoot rat is perhaps the most common field rat to be found in Pakistan. It occurs in the Lower Sind, over most of the Punjab and into the NWFP. It likes both irrigated farm lands and moister barani areas.

Bandicoots damage a variety of crops, including wheat, rice, sugarcane and groundnuts. Bandicoots are medium-sized dark brownish-grey colored rats with nearly bare tails slightly shorter than the head and body. They live in ground burrows and are solitary in habits.

2. The short-tailed mole rat is a medium-sized rat similar to the bandicoot but with a short tail. It spends most of its time in underground tunnels and burrows, rarely venturing above ground. It feeds extensively upon plant roots, bulbs and tubers but is known to damage nursery trees, sugarcane, root crops, wheat, rice and groundnuts.

3. The soft-furred field rat is so-called because it has soft, silky fur. It is smaller sized than the house rat but is larger than the house mouse. The back is grey colored and the belly is white. They are distributed in the lower Indus Valley up to about Sukkur, are found in north-eastern Punjab but do not occur in NWFP. They are most abundant in irrigated lands. They damage wheat, rice and sugarcane.

4. The Indian gerbil is a medium-sized rat with rather long hind legs. The back is sandy-brown and the belly is white. The tail is hairy, with long tufts near the end and with a lateral light colored band running down each side of the tail. The Indian gerbil is found throughout Pakistan except in sand dunes and rocky mountains. It is known to damage wheat, sugarcane, rice and other crops, but are never very abundant as compared to the other field rats.

5. The Indian sand rat is not as large as the Indian gerbil but can easily be distinguished by its much smaller ears and a creamy colored but not white belly. These rats prefer sandy soil and are not normally found in irrigated fields or damp ground. They are rather abundant in the barani areas as well as desert areas from NWFP, through Punjab and into Sind.

They are gregarious animals and live in large colonies with many burrow openings and well-marked trails. They are active in daytime, feeding in hot weather in the early mornings and late evenings. They have been seen to damage young growing wheat in Bannu and Kohat Districts where their burrow colonies lie on the edge of wheat fields. They have been found in abundance around grain storage bins near Bahawalpur in Punjab and Bolhari in Sind, where they are living in sandy soils.

6. The Libyan sand rat is similar to the Indian sand rat in appearance but occurs only in the high cold plateau regions of Baluchistan and NWFP. The belly fur is pure white, not creamy as in the Indian sand rat.

Libyan sand rats are highly gregarious and colonial and occur in scattered colonies both in stony uncultivated slopes as well as valley bottoms around cultivated fields. They are known to damage wheat fields and fodder crops and store the cut plants inside their burrows.

7. The roof or house rat is by far the most common rat pest in cities and villages throughout most of Pakistan. They are well-adapted to living in mans' structures and subsist largely upon food scraps and stored foods. They are major pests in wholesale grain markets, farmers houses and in poultry houses.

Roof rats are dark grey-brown with a white or creamy grey belly. The tail is dark colored and nearly naked in appearance. Roof rats are agile climbers into roof drains, ceiling beams and trees.

8. The house mouse is probably the most common rodent pest in farms and village housing. They are small, with light brownish-grey backs and white bellies. The tail is naked in appearance. House mice are extremely good climbers and inhabit the upper parts of rooms and structures.

House mice occur throughout Pakistan, including the northern Himilayan regions. They do occur in field crops, such as sugarcane and rice, but apparently do little damage. They are the most frequently encountered pest rodents in grain storage centres.

9. The Murree vole is a small-sized, very dark brown burrowing rodent with short velvety fur, long cylindrical body and well-developed blunt head with powerful protruding incisors. The tail is very short. It spends most of its life underground and, as a consequence, has very tiny eyes and very small ears. It is adapted to live in the pine forest zone at quite high elevations (1850 to 3000 m) in the Punjab and Frontier Hills.

It is a serious pest of apple orchards, as well as maize and potato crops grown at mountain elevations. It damages apple trees by gnawing the bark, either just below the soil surface, or in winter time, up to a few inches above the ground surface. It gnaws maize stalks, cutting them just at or below ground level.

10. The Indian porcupine is a rodent although it looks considerably different from rats or mice. They are easily recognized by the back being covered with long hollow quills which are barred in black and white. They are the largest rodent in Pakistan with full-grown adults weighing up to 18 kg. Normally they live in family groups sharing one very extensive and deep burrow system, which if undisturbed will be continuously occupied for many years.

Porcupines occur over most of Pakistan, even into mountainous areas and juniper forests in Baluchistan as well as irrigated tracts in Sind and Punjab. They cause serious damage because of eating the bark of certain trees, such as mango, apricot and orange, as well as many forest trees. They damage succulent root crops like potato and sweet potato and vegetables and fruits, i.e. cucurbits and musk-melon. They cause breaches in the embankments of water channels.

11. The striped squirrel, also known as the Northern palm squirrel, is common in large cities, villages and semi-desert areas. They live mainly on seeds and berries of trees but are quite omnivorous. They can be damaging in vegetable gardens and in maize fields have been seen eating sprouting seedlings.

B. Lagomorph Pests

There are very few species of rabbits, hares and pikas in Pakistan. These are not rodents but are members of the mammalian group known as lagomorphs. They differ mainly from rodents in having two pairs of upper incisors, one secondary pair directly behind the main pair. The main pest species is the collared or Afghan pika, *Ochotona rufescens*. Of minor importance is the desert hare, *Lepus nigricollis*.

1. Collared pikas are smaller animals than rabbits or hares. In appearance they are attractive looking animals with soft silky fur of a reddish-grey color and furry rounded ears. They have no tail and their legs are rather short.

They are confined to mountain steppe areas, i. e., dry rocky slopes above 1850 meters elevation and they live among loose rock falls or under the roots of juniper trees. They are found in all the higher valleys of northern Baluchistan.

Pikas have been a minor pest of young green wheat and fodder and vegetable crops. They cause serious damage to orchard trees in the winter months when greens are unavailable and they gnaw the bark on apple and cherry trees.

2. The desert hare occurs throughout the drier areas of the Indus Valley and the barani areas of Punjab and the NWFP. It is a large greyish-brown animal with long well-developed ears. The tail is short and tipped with black. The hind legs are elongated for a speedy bounding gait when running. Hares rely on their speed to escape predators. The desert hare has been found to be a minor pest of groundnut in the Rawalpindi area.

C. Artiodactyls

Artiodactyls are even-toed hoofed mammals, such as the sheep, goats, cattle, camels, hippopotami, and the wild boar. The wild boar, *Sus scrofa*, is the only pest species of this group that occurs in Pakistan. Wild boars are native to most of Europe, north Africa and in Asia as far east as Japan and the islands of Indonesia. The wild boar in Pakistan was originally restricted to the riverine habitat, but as agriculture spread beyond the riverine zone with the opening of the canal system, a variety of habitats for the wild boar appeared in isolated patches all over the Indus plain. Besides the riverine forests and flood plains, scattered

blocks of irrigated forest plantations are now available, as are reedy and grassy vegetation bordering canals and drainage ditches. The widespread creation of these new habitats has brought the wild boar into close association with the croplands.

Wild boar damage a variety of field crops, of which the most important are sugarcane and maize, but also includes wheat, rice, potatoes, sweet potatoes, groundnuts, clover, chillies, peas, and water melons.

D. Pest Birds

The majority of granivorous birds (grain-eating) tend to be gregarious and gather together in small or large flocks for foraging and feeding. Frugivorous (fruit-eating) birds also tend to occur in groups, although not so large as the granivorous birds. Some species, such as the crows, are omnivorous, and feed upon whatever is at hand. Some eight or nine species are pests in food crops in Pakistan as listed below.

House sparrow	<i>Passer domesticus</i>
Baya weaver	<i>Ploceus philippinus</i>
Rose-ringed parakeet	<i>Psittacula krameri</i>
Red-vented bulbul	<i>Pycnonotus cafer</i>
Rosy starling	<i>Sturnus roseus</i>
Collared dove	<i>Streptopelia decaocto</i>
Rock pigeon	<i>Columba livia</i>
House crow	<i>Corvus splendens</i>
Asiatic or jungle crow	<i>Corvus macrorhynchos</i>

1. House sparrows are the familiar town and village bird, being a common parasite of man. They roost communally in noisy chattering flocks in untidy nests in bushes, trees or often placed on buildings. They gather in large flocks to raid wheat, millet and sorghum fields. They are the most common and abundant birds at grain storage centres.

2. Baya weavers nest in distinctive colonies with large globular hanging grass nests with long hanging entrance tunnels. In riverain areas they inflict considerable damage to standing wheat and ripening rice.

3. Rose-ringed parakeets are the noisy bright green birds that feed in large flocks on sunflower, maize and orchard crops. Nesting takes place in tree holes. This species is absent from purely desert or high mountain areas. They are particularly abundant throughout the Punjab.

4. Red-vented bulbuls are garden dwellers and can be serious pests of vegetables and soft fruits. They occur throughout the Indus plains and sub-montane areas in Pakistan.

5. Rosy starlings are migratory and come through Pakistan in late spring and in the post-monsoon months. They travel in large flocks and are known to attack millet in Sind province.

They are highly gregarious during migration and occur mostly over Sind and southern Punjab provinces. They are omnivorous and can be beneficial in feeding on young locusts when swarms are hatching.

6. Collared doves are resident in Pakistan and widespread in the Indus plains and desert border regions. They are adapted basically as seed-eaters on the ground. They are pests of post-harvest wheat on the threshing grounds and can be pests on sprouting maize.

7. Rock pigeons are resident in Pakistan and are the wild counterpart of the domestic pigeons kept by villagers. These birds are serious pests of grain (wheat and rice) on threshing yards and just after harvest while the bundles are still lying in the fields. They are common around grain storage centres where they feed mainly on spilled grain outdoors.

8. House crows are resident throughout Pakistan, commonly seen in cities, towns, villages and in the countryside. They are highly gregarious. They can be a pest of sprouting wheat and maize.

9. The Asiatic or jungle crow is migratory through Pakistan, arriving in the lower plains following the beginning of the cool season in the higher mountains. At this time they are pests of groundnut in barani areas of Punjab and a serious pest of ripening maize.

3. Extent of Crop and Stored Food Losses due to Vertebrate Pests in Pakistan

A. Wheat

Wheat is the most important grain crop grown in Pakistan. Production has averaged between 10 and 13 million metric tons during the last 5 years. Damage assessments were carried out by the Vertebrate Pest Control Laboratory (VPCL) staff in 1978 and 1979. In 1978 and 1979 the damage caused by rodents amounted to 2.9% and 2.0%, respectively. In the same surveys, damage by birds (house sparrows and parakeets) was also recorded and losses from both species ran 5.6% in 1978 and 2.2% in 1979. Thus the combined losses due to rodents and birds in 1978 were 8.5% and in 1979 ran 4.2%.

A study of bird damage to wheat was done at the university of Agriculture, Faisalabad in 1972. The observers found that sparrows accounted for a 2.26% loss and parakeets only a small amount (less than 0.34%).

In 1976 Beg and Khan found that rats had cut 7.5% of the wheat tillers in Faisalabad District. The severity of damage appeared dependent upon the presence of *B. bengalensis*. In

1985 we completed surveys of rat and wild boar damage to wheat in Faisalabad District and found the damage due to both pests was 5.24%.

What do these damage figures mean in terms of the value of the wheat crop? Rodent losses average between 2.0% to 3.0% countrywide. Losses due to house sparrows and parakeets add another 2.6% to 5.6%. Wild boar within the range of wheat-growing areas can add another 1% to 2% overall losses to wheat production. The total losses due to rodents, birds and wild boar could be as small as 5.6% and as high as 10.6% of total production. Based upon the value of wheat in 1983-84, using wholesale prices in the Lahore area, this would represent losses equal to 1,128.7 million Rupees (U.S. 80.6 million dollars).

B. Rice

Damage assessments in rice fields in eastern Punjab and lower Sind by the VPCL staff from Karachi revealed that at least four rodent species were present: the lesser bandicoot rat, short-tailed mole rat, soft-furred field rat and the house mouse. Damage levels were found to vary considerably from year to year depending upon climatic conditions. Heavy rains flooded fields, forced rats onto bunds and led to less than normal damage. The most serious pest was the lesser bandicoot rat. Losses from rodents and birds were estimated to run about 5.1% average year to year. Maturing rice is attacked not only by rats but also house sparrows, Baya weavers and parakeets. Wild boar damage rice fields through trampling and a minor amount due to consumption of maturing rice panicles.

C. Sunflower

Damage surveys by the VPCL staff of parakeet attack on sunflower in the main growing areas of Punjab and Sind in 1981 showed that the damage averaged 11.7% in seven districts in Punjab and 16.6% in nine districts in Sind. An earlier study in Multan district had estimated that parakeets consumed about 30% of the standing sunflower crop. The economic losses, based upon 1983 production statistics, amounted to U.S. \$ 1.95 million.

D. Sugarcane

Cane from 250 farms was examined by the VPCL staff at four sugar mills for rat damage in 1978 and 1979. These mills represented two districts each in Sind and Punjab. Overall, rats had reduced sugar production by 10.7% in 1978 and 7.7% in 1979. Some 11% of the farms had suffered more than twice this average loss.

In 1985, the staff of the Vertebrate Pest Control Project at NARC checked sugarcane fields in Faisalabad District for damage by wild boar. Some 81 fields in 24 villages, drawn at random, were examined. Wild boar damage to sugarcane was

estimated at 5.26% of all stalks and 60.5% of all fields showed evidence of wild boar attack. The estimated value of the lost production in this one district due to wild boar was U.S. 2.85 million dollars.

E. Maize

Maize is particularly subject to attack by wild boar, porcupines and pest birds, primarily parakeets and crows. Damage assessments of wild boar damage to maize in Faisalabad District, carried out in October 1986 by the Vertebrate Pest Control Project staff at NARC, indicated that overall damage averaged an 8% loss of yield. Based upon 1983 maize prices this would be equivalent to a loss of Rs. 12.6 million (equal to U.S. \$900,000 in 1983).

Maize is also damaged by rose-ringed parakeets and house crows when in the ripening stage. Damage assessments in NWFP and Punjab found that pest bird attack was mainly on the field edges. The average level of damage of all the fields surveyed ran between 2% to 3%.

Orchard Crops

The collared pika, *Ochotona rufescens*, was found to be a serious pest of apple trees and juniper nurseries in the Ziarat Valley of Baluchistan. Normally the pikas live in crevices between rocks and stones; occasionally they excavate burrows under juniper tree roots and between bushes of *Artemisia*. Normally this is on open stony soil in the higher plateau country in central Baluchistan.

Some of these lands have now been converted into farming areas, especially the narrow mountain valleys, and subsistence crops like barley, wheat, potatoes and animal fodder are grown. In higher valleys it was found that fine quality apples could be raised and provide a cash crop. Apple orchards have increased in popularity and acreage every year.

During the winter months when native vegetation is lacking, foraging pikas feed on apple tree trunks and branches, sometimes completely debarking trees from 25 to 40 cm above the ground. The amount of damage varies depending upon the severity of the winter but it has ranged from as little as 0.13% of trees killed in 1979 to highs of 5.1% in 1977. The percent of trees partially damaged, however, runs from 1.5 to 47.1%, depending upon winter weather. The losses can run into the hundreds of thousands of U.S. dollars.

Other orchard crops are damaged by birds, particularly parakeets and bulbuls. Soft fruits, such as apricots, guava, mango and oranges are particularly attacked in Punjab and NWFP.

G. Stored Food Losses

Some 4 million metric tons of wheat are procured by the provincial food departments and stored until redistributed into the wheat deficit areas. A recent survey of vertebrate pest infestations at provincial grain storage centres by the Vertebrate Pest Control Project staff from NARC revealed that infestations were rarely severe and actually most were minor in nature. The most common rodent was the house mouse while roof rats were relatively uncommon. Pest birds, mainly house sparrows and sometimes pigeons, were common at grain storage sites but mainly the birds were feeding on grain spilled outdoors. The overall losses to both rodents and birds were estimated at not more than 0.2% of total wheat in storage, or about 8,000 mt nationally per year.

At least another 6 million metric tons of wheat is retained at farm and village-level. It is stored under a variety of conditions and in several types of containers or jute bags, many of which are subject to attack by rodents, mainly house mice and roof rats. Estimates of losses at farm and village level are yet to be made but conservatively at least 1% to 2% of the stored quantity is lost throughout the country annually based upon studies of losses at farm and village level in India and Bangladesh.

A summary of the economic value of crop and stored food losses per annum in Pakistan is given in Appendix I. Most loss estimates are based upon those derived by the staff of the Vertebrate Pest Control laboratory, Karachi, during the past 13 years of research carried out in the field. The annual toll, and this listing is incomplete, comes to well over 4,900 million Rupees, or the equivalent of over 200 million U.S. dollars based upon 1983 commodity prices.

SUMMARY OF ESTIMATED LOSSES OF VARIOUS FIELD CROPS
AND STORED GRAINS IN PAKISTAN DUE TO VERTEBRATE PESTS

(Data on Losses from "Handbook of Vertebrate Pest Control
in Pakistan, 1980" and other Sources).

CROP	PRODUCTION 1983-84 (000 mt)	LOSSES (000 mt)	VALUE OF LOSSES*		PRINCIPAL PEST SPECIES
			Pak. Rs. (Million)	U.S. Dollar (Million)	
Wheat	10881.9	600.7	1,128.7	86.8	Rats, Birds
Rice	3339.5	170.3	449.8	32.1	Rats, birds
Sugarcane**	34287.3	2760.1	665.2	47.5	Rats, wild boar
Maize	1013.5	90.6	198.6	14.2	Parakeet, crow
Sorghum	222.1	16.0	31.8	2.3	Birds
Barley	139.5	7.8	14.0	1.0	Parakeet, sparrow
Potato	509.8	11.6	23.5	1.7	Porcupine, wild boar
Groundnut	88.0	4.6	35.6	2.5	Rats, wild boar
Sunflower	41.6	-	27.3	1.9	Parakeet
Apples	128.1	6.4	75.0	5.4	Pika, porcupine and birds
Sub Total			4,622.2	195.4	
<u>STORED GRAINS</u>					
Provincial Food Depts.	4,090.0	8.2	15.4	1.1	Rats, mice, birds
Farm & Vill.	6,000.0	120.0	225.5	16.1	Rats, mice
TOTALS			4,863.1	212.6	

* Based on wholesale market price of commodities at Lahore, 1983-84.
1 U.S. Dollar = 14 Pak. Rupees.

** 1983 mill price = Rs. 241 per metric ton.

