

The agricultural importance of the wild boar (*Sus scrofa* L.) in Pakistan

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J. E. BROOKS, E. AHMAD†, I. HUSSAIN† and M. H. KHAN‡

Vertebrate Pest Control Project, Denver Wildlife Research Center, Denver, Colorado, USA, and National Agricultural Research Centre, Islamabad, Pakistan

†*Vertebrate Pest Control Project, National Agricultural Research Centre, Islamabad, Pakistan*

‡*Department of Entomology, University of Agriculture, Faisalabad, Pakistan*

Abstract. We surveyed damage by the Eurasian wild boar (*Sus scrofa* L.) to sugarcane, wheat, and maize in Faisalabad District and to groundnut in Rawalpindi, Attock, and Chakwal Districts in northern Punjab, Pakistan. In these areas, wild boars were the most important vertebrate pest in sugarcane, wheat, and maize, causing more damage than rats, porcupines, or rose-ringed parakeets. They were lesser pests in groundnut. The estimated damage to sugarcane was 11.3%, wheat 3.0%, maize 6.7%, and groundnut 0.9%. Combined yield losses in sugarcane, wheat, and maize are estimated to be 130.9 million Pakistan Rupees (Rs.) (US \$7.6 million)[§]. The loss of groundnut equalled Rs. 6.4 million. Farmers spend up to 2 months guarding sugarcane and maize fields from wild boar attacks. Highly toxic poisons in baits are the only effective method of crop protection currently used in Pakistan. To minimize sugarcane damage, farmers are changing from growing soft-rind, high sugar-content varieties to hard-rind, lower sugar-content varieties. Recommendations are made for future research and development of methods to control the wild boar in Pakistan.

Introduction

The Eurasian wild boar, *Sus scrofa*, is distributed from the west coast of North Africa and Europe in a broad belt, both north and south of the Himalayas, across Asia and extending in the east to Japan, Taiwan, and Indonesia (Heptner *et al.*, 1966). Thus, Pakistan is part of its ancestral range. Wild boars are found at up to about 1000 m elevation in the Margalla and Murree Hills and at lower elevations throughout Punjab and Sind Provinces to the mouth of the Indus River. They occur west of the Indus around Peshawar, Mardan, Bannu, and Dera Ismail Khan (Roberts, 1977).

In Pakistan, the development of the irrigation canal system has increased the habitat for wild boars. Originally, they were restricted to the riverain habitat which provided their life essentials: dense cover, abundant water, and seclusion. They were preyed upon by tigers and wolves before man eliminated these predators. But as agriculture spread beyond the riverain zones in Punjab and Sind with the opening of the canals, a variety of suitable habitats for wild boars appeared in isolated patches all over the Indus plain (Beg and Khan, 1982). These new habitats brought wild boars into contact with croplands where they now obtain much of their food.

In Pakistan, Roberts (1977) reported that wild boars damaged ripe sugarcane, potatoes, wheat (both newly sown and at the milk stage), and rice in the milky stage. Smiet *et al.* (1979) killed wild boars from riverain forests and reported that they subsisted mainly on roots and tubers of *Scirpus*

spp. and *Cyperus* spp., while crops such as sugarcane, clover, and mustard were found only in a few stomachs. Khan (1982) analyzed the stomach contents of 48 wild boars killed in Faisalabad District and found that wheat and molasses scum were the most common items, followed by *Cyperus* spp. tubers, maize, sorghum, cotton, mesquite pods and leaves, sugarcane, and rice. Animal remains consisted mainly of earthworms, snails, crickets, a few frogs, fish, rats, lizards, one bird, and carrion.

Shafi and Khokhar (1986) surveyed sugarcane fields at Chiniot, Sargodha District, and Manan Wala, Sheikhpura District. Damage assessments were made in 25-ha plots of each variety. They found 35.4% damage to all stalks of Triton, a soft-rind, high sugar-content variety, while damage to the hard-rind varieties BL-4 and L-118 was 8.3% and 6.7%, respectively.

Some preliminary information on the biology of the wild boar in Pakistan has been reported in a few papers (Taber, 1965; Roberts, 1977; Smiet *et al.*, 1979). Inayatullah (1973) and Beg and Khan (1982) presented data on wild boar distribution and habitats in Pakistan.

Wild boar damage to several grain and oilseed crops had never been adequately assessed in Pakistan; therefore, we evaluated their economic impact on these crops. Between December 1985 and October 1986, surveys in sugarcane, wheat, and maize fields were carried out in Faisalabad District; groundnut fields were surveyed in Rawalpindi, Chakwal, and Attock Districts in northern Punjab Province.

Damage assessment methods

Sugarcane

In December 1985, 24 villages in Faisalabad District were randomly selected and three villages were visited daily. At each village, local farmers were contacted, interviewed, and their fields were examined for damage. Wild boars are known to hide and rest in field interiors during the day, where most damage is concentrated. During our study, three to six observers entered the fields and located all or almost all of the damaged areas in the field. Then observers arrived at a consensus estimate of the overall damage. Damage was estimated as percent of damaged stalks within each field. The mean differences in damage to soft- and hard-rind sugarcane varieties were tested statistically with the *t*-test.

[§]Rs. 171 US \$1.00

Wheat

In late April 1986, we selected 103 wheat fields along road transects, stopping approximately every 6 km and inspecting four or five fields at each stop. Pre- and post-harvest wheat fields were examined for wild boar activities (footprints, bedding areas, trampled wheat, rooting, eaten stems and panicles). The percentage of the area within the total field area that had been trampled, rooted, or eaten by wild boars was estimated.

Maize

In October 1986, damage surveys were conducted in 87 maize fields in Faisalabad District. Fields were selected along road transects at approximately 10-km intervals. Additional information was obtained from farmers through interviews. Fields were visually inspected by four observers, and the approximate percent of area damaged was estimated. In addition, two 5 × 5 m quadrats were taken in some fields where damage was exceptionally severe to check our damage estimates. In the quadrats, both damaged and undamaged stalks were counted.

Groundnut

In October 1986, damage assessments were made in 164 groundnut fields by using a road transect. Stops were made at every 5 km if groundnut fields were present. At each stop, four fields were surveyed. Four rectangular quadrat samples (1 × 5 m in size) were taken from within each field, generally near the corners. The number of plants, both damaged and undamaged, within these quadrats was counted. Notes were taken on soil type and presence of weeds and grasses. Damage was caused by several vertebrate pests but wild boar damage was easily differentiated.

Results

Crop damage

Damage by wild boars to the several crops surveyed is summarized in Table 1. Wild boars are the most important vertebrate pest species in sugarcane, wheat, and maize, but of lesser importance in groundnut. Wheat and groundnut had the least severe damage; sugarcane and maize had the most intensive damage. The high damage to maize may be due to it being the only attractive crop in the area at the time. Wheat, potatoes, chillies, clover, and peas are all damaged at the same time of year. Sugarcane fields were infested, 60.5% were positive. Over 50% of maize fields were infested, while only 30.1% of wheat and 19% of groundnut fields showed presence of wild boars.

Damage patterns

Sugarcane. Wild boars damage sugarcane by tearing away the rind on stalks they knock over, or on stalks already leaning over, or on the ground. Once the rind is stripped away from a 10- to 50-cm long stalk, boars consume the soft, juicy inner pith. Wild boar damage is easily differentiated from rodent damage by the presence of large pieces of rind:

Table 1. Damage by wild boars to field crops in some districts in Pakistan

Crop type	No. fields examined	No. fields with damage	% Crop damage	Extrapolated estimated yield loss (MT)
Sugarcane	81	49	11.3†	392,000‡
Wheat	103	31	3.0	25,600‡
Maize	87	44	6.7	4930‡
Groundnut	164	32	0.9	5160§

† Damage estimated based upon data from 28 fields.

‡ Based upon 1983–84 production figures for Faisalabad District.

§ Overall yield loss in Rawalpindi, Chakwal, and Attock Districts based upon 1983–84 production figures (source: Agricultural Statistics of Pakistan, 1984).

also the damage includes the nodes, which are rarely touched by rodents. Most damage occurs in large patches in field interiors, where animals bed down during daylight hours, and along pathways they use in coming and going from field interiors. Once damaged, stalks usually wither and die. There was no statistical difference ($t = 0.75$, $p = > 0.10$) between the percent damage in 34 fields of soft-rind sugarcane and in 46 fields of hard-rind varieties.

Wheat. Wild boars damage wheat in several ways. The animals make bedding areas in field interiors by wallowing and then spreading stems to make a mat to rest upon. Stems were often trampled into the ground. Ground surfaces were laid bare due to wallowing and rooting. In addition, stems and panicles are cut by boars 20–24 cm above ground and are consumed.

Maize. Wild boars begin consuming maize when kernels are in the milky stage. Stems are knocked over with the body or snout. The kernels are eaten from the cobs, and if the cobs are sweet and soft, they are sometimes also consumed. Wild boars trample the maize stems into the ground, and damage can be found anywhere in the field.

Groundnut. Wild boars root out groundnuts from underneath the plants, scooping out a depression 5–10 cm deep and as much as 30–40 cm in diameter. Some plants are uprooted and die, others have the nuts removed but the plants survive. Wild boars prefer groundnuts in the soft, fresh-growth stage before the shells harden.

Farmer pest control practices

The methods farmers used to prevent wild boar damage varied from simply guarding fields at night to using lethal electric fencing. Night-guarding is the method most used in maize and groundnut fields and is done for up to 2 months. A platform is erected in the field about 2 m above the ground for protection from wild boars, and one or more persons may guard during the night. The person guarding may have dogs to sound an alarm when wild boars enter the fields. Noisemakers are used to frighten away wild boars. Rarely do farmers have access to a shotgun and shells.

Other control methods include lethal barriers, such as electric fencing carrying 220- to 240-V charges. These

fences are also lethal to dogs, porcupines, donkeys, buffaloes, and humans; therefore, governmental authorities have declared them illegal. Nevertheless, several electric fences were seen in Faisalabad District. Other physical barriers such as mud-plastered walls about 1 m high have been erected to enclose fields of up to 16.2 ha. These walls are very effective if maintained.

Hunting wild boars with dogs or killing them with shotguns, clubs, and spears was practiced by a small number of farmers who possessed these means. A bounty system, offering Rs. 75 for each boar's tail was initiated in Punjab Province in 1982 but was cancelled because of lack of funds.

A variety of insecticides were used in poison baits. Endrin, dimecron, carbicron, and aldicarb were most often used. A mixture of aldicarb and sodium fluoroacetate, placed in gelatin capsules inserted in bait balls, effectively killed wild boars in sugarcane and other field crops (M. H. Khan, personal communications). Shafi and Khokhar (1986) killed wild boars successfully in sugarcane fields with sodium fluoroacetate and fluoroacetamide applied at 0.03% and 0.035% concentrations, respectively.

Discussion

In Pakistan, wild boars consume available cereal grain and root crops during the appropriate growth stages. Wild boars are primary pests of sugarcane and maize throughout their range, and important secondary pests of wheat, rice, groundnut, melons, potato, and sweet potato (Mirza, 1978; Ahmad *et al.*, 1986; Brooks *et al.*, 1986a, b; Shafi and Khokhar, 1986; Ahmad *et al.*, 1987).

The agricultural losses due to wild boars in Faisalabad District were estimated at Rs. 96.7 million in sugarcane, Rs. 24.4 million in wheat, and Rs. 9.8 million in maize (the total equivalent to US \$7.6 million). Our findings of 11.3% damage to sugarcane agree with the findings of Shafi and Khokhar (1986), who surveyed sugarcane fields for damage after wild boars were killed with poison baits. Their data suggest that damages from 10 to 15% overall could be expected. In addition, losses due to wild boars in groundnut in the amount of Rs. 6.4 million were observed in three districts in northern Punjab.

Wild boars exert a strong influence upon agricultural production in Pakistan. They affect the crops a farmers plants and the crop protection measures that are used. Wild boars have made serious constraints upon sugarcane production. Many farmers plant lower sugar-content, hard-rind varieties instead of the higher sugar-content, soft-rind canes that are preferred by boars. Night irrigation of fields is hazardous to farmers because of the presence of wild boars in or near their fields. Water is simply turned on and not tended, resulting in water wastage. Farmers grow maize crops despite the attack of wild boars, because it is used either as a cash crop or for animal fodder. Maize is one of the few crops grown during the monsoon season that can be harvested in time to plant wheat.

Farmers' indigenous methods of crop protection are labour-intensive. Sometimes up to 2 months are spent in night-guarding fields, but the methods used to frighten wild

boars are largely ineffective. When lethal methods are used, such as electric fences or highly toxic baits, the hazards of killing non-target species of wildlife, livestock or even humans are quite high.

High-cost control methods used in developed countries, such as hunting wild boars for sport or for meat (Tisdell, 1982) as in Poland, France, and Australia, or fencing vast tracts of land as in Australia and Hawaii (Tisdell, 1982; Stone and Keith, 1987), have little applicability to conditions in Pakistan. Being an Islamic country, the wild boar is not utilized as meat. Hunting pressure in Pakistan does exert a moderate effect upon the population of wild boars.

Tisdell (1982) mentioned clearing of shrub or cover in hot areas to deny pigs access to shade and shelter. This makes them more vulnerable to the effects of heat in the summer, and they become easy targets for hunters. Vast areas of the Punjab and some areas of Sind, particularly water-logged soils, now support medium to dense growths of mesquite (*Prosopis juliflora*), while *Saccharum munja* and *Typha* spp. occur in marshy places and provide excellent hiding and breeding areas for wild boars when the croplands are harvested. The only feasible method of management in these areas would be to drop the water table through intensive and expensive schemes to provide better drainage. They could then be returned to agricultural uses.

The other method mentioned by Tisdell (1982), denial of access of water, which was practiced in some areas in Australia, is obviously impossible in an irrigated agroecosystem. Wild boars are seldom over 1 km from fresh water; usually they are even closer than that to the nearest small canal or irrigation ditch.

Recommendations

Methods for control of wild boars that are simple, inexpensive, relatively safe, and effective for use by small land-holding farmers are needed in Pakistan. We believe that lethal control is the only practical answer to the problem. We propose that an immediate program should be instituted to develop the proper toxicants and baits.

1. Find the best, most suitable, and specific toxicant for wild boars by screening tests of candidate materials in pen trials. Several of the anticoagulant rodenticides should be evaluated; warfarin, coumatetralyl, and brodifacoum are good candidates. Several materials used in carnivore control should be tested such as carbofuran and methomyl.
2. Bait preference trials should be conducted to determine the best baits for field use. Baits should be easy to prepare, inexpensive, and have a useful field life of several days or more.
3. Bait delivery systems should be evaluated to select those most appropriate for farmer use. O'Brien (1986) has outlined methods for designing target-specific vertebrate pest control systems, using as an example the control of feral pigs with poisons in Australia. These methods are also applicable to Pakistan.

Non-target species of concern in Pakistan are raptors (kites and eagles), omnivorous birds (house

crows and vultures), granivorous birds (sparrows and mynas), carnivores (foxes, jackals, dogs, wild cats, civets), and omnivorous small mammals. O'Brien (1986) proposed that delivery systems unique to feral pigs habits be utilized, such as placing the bait in a tough packing (because the pig is a large, powerful animal), burying the bait under a few centimetres of soil (because pigs forage fossorially), use widely separated bait stations (pigs forage widely), and place baits in late afternoon (pigs are nocturnal).

4. The environmental hazards of toxicants, baits, and delivery systems should be evaluated before a final control method is recommended and utilized. This will require carefully conducted pilot field trials, moving on to large-scale trials if the pilot trials prove effective.
5. Some basic research on the biology and habits of wild boars in agroecosystems in Pakistan is needed. The daily and seasonal range of movements of individual animals and animal groups should be known, for example. The density of animals in several crop types and seasonal variations in crop utilization need to be documented. The average size of the wild boar social group that forages together for food should be determined. Wild boars are not supposed to be territorial, but this needs confirmation from field studies.

Reduction of crop damage by wild boars and development of methods for farmer use are some of the goals of the Vertebrate Pest Control Project (VPCP) in Pakistan. Reduction of damage to sugarcane and maize should be priority items since these are both important crops in the Pakistan economy. The steps outlined above should lead to these goals.

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