VERTEBRATE PEST CONTROL PROJECT

Food Security Management
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A SURVEY OF VERTEBRATE PEST INFESTATIONS IN PROVINCIAL GRAIN STORAGE FACILITIES IN NORTH-WEST FRONTIER PROVINCE AND BALUCHISTAN

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A SURVEY OF VERTEBRATE PEST INFESTATIONS IN PROVINCIAL GRAIN STORAGE FACILITIES IN NORTH-WEST FRONTIER PROVINCE AND BALUCHISTAN

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ABSTRACT: As part of our survey of provincial food grain storage centres, 16 sites in NWFP and 9 in Baluchistan were visited and inspected for vertebrate pest infestations. In NWFP, 46 godowns were surveyed and vertebrate infestations were noted in 42 structures. Birds were the major pests observed in 40 godowns. Severity of infestation was few in 36 and medium in 4 godowns. Rodents were noted in only 4 godowns and all were infested only with house mice. Severity of rodent infestation was recorded as few in all the structures. In NWFP structural defects were noted in 44 godowns. Structural conditions as judged from outside was good in 13, fair in 24 and poor in 9 godowns. In Baluchistan vertebrate pest infestations were observed in 19 out of 24 godowns surveyed. Birds were present in 18 structures and severity of bird infestation was few in 12 and medium in 6 godowns. Rodents were noted only in three godowns and severity was rated as few in all. No severe rodent and bird infestation was observed in NWFP and Baluchistan. Structural condition was noted as good in 14 and fair in 10 godowns in Baluchistan, but, structural defects were noted in 20 godowns.

1. INTRODUCTION

In our two previous reports, we detailed our survey findings regarding vertebrate pest infestations and causative conditions in provincial food department grain storage facilities in the Punjab (Brooks and Ahmad, 1986) and in Sind (Ahmad and Brooks, 1986). This report concludes the surveys of provincial grain storage facilities with a combined summary of our findings in Baluchistan and the North-West Frontier Province (NWFP). These surveys were carried out in June 1986.

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Wheat storage in these two provinces differs from that in Punjab and Sind. Whereas Punjab and Sind are major wheat producing areas of Pakistan, Baluchistan accounts for only 3.1% of the total national wheat production and NWFP only 8.2% (Table 1), (Agric. Statistics

Table 1: WHEAT PRODUCTION AND POPULATION BY PROVINCE IN PAKISTAN

Province	Wheat Production 000(Tonnes) 4-year Average (80-81 to 83-84)	Percent of Total	Population (1981) Thousands	Percent Total
Punjab	8,217	71.3	47,451	56.6
Sind	2,005	17.4	18,966	22.6
NWFP	940	8.2	13,060	15.6
Baluchistan	356	3.1	4,305	5.2
Totals	11,518	100.0	83,782	100.0

of Pakistan 1984). Punjab produces a surplus of wheat and moves wheat into NWFP and Baluchistan to feed the extra population in these wheat-deficit areas. Sind produces roughly enough wheat to feed its own population. Wheat moved into NWFP and Baluchistan remains in storage a much shorter time than it does in Punjab and Sind before it goes out to the grain dealers, flour mills and the general consumers. The average amount of storage capacity at the storage centres in Baluchistan is much smaller than in Punjab or Sind (Table 2). What it may be for NWFP we can't say for certainty because the actual number of storage centres couldn't be obtained from the NWFP Provincial Food Department.

These differences in storage practices mean that pest problems faced in Baluchistan and NWFP may differ from those faced in Punjab and Sind. This report will discuss the findings in Baluchistan and

Table 2: AVERAGE STORAGE CAPACITY AT PROVINCIAL FOOD DEPARTMENT STORAGE CENTRES (mt)

Province	No. Storage Centres	Total Capacity*	Average per Storage Centre
Punjab	274	2,175,650	7940
Sind	100	721,665	7217
NWFP	n.a.	339,200	n.a.
Baluchistan	46	169,852	3692

* Data from Food Grain Transport and Logistics Study, Ministry of Food, Agriculture and Cooperatives (1985).
n.a. = Not available.

NWFP. A final summary report will detail findings from all four provinces in Pakistan, draw comparisons between them, and provide recommendations and strategies for dealing with vertebrate pest infestations in provincial grain storage facilities.

2. METHODS

A listing of food storage centres, their capacities etc. were collected from Department of Food, NWFP and Baluchistan. The list provided by NWFP Department of Food gave the capacity upto district level, although there were some centres even at tehsil level or in some district more than one storage site were present, e.g. in Abbottabad according to the list provided, there is only one centre but during the survey it was seen that there were three other centres at Havellian and Haripur so it is difficult to state the exact number of sites in NWFP (Appendix-1). We have provided a more complete listing of the probable number and location of centres (Appendix-1a) as derived from several other sources. The listing provided by the Food Department, Baluchistan, was complete and they have given every centre upto either district, tehsil or town level (Appendix-2). Only

those sites were selected for survey of vertebrate pest infestations which were easily approachable or as advised by the Food Department and having capacity of more than 1000 mt. Some centres were located in tribal or agency areas and permission to visit them would have been required.

The interview/inspection survey form used in NWFP and Baluchistan was the same as used in previous survey of Punjab and Sind (Appendix-3). The interview/inspection procedure used was as previously described by Brooks and Ahmad (1986).

3. FINDINGS

i) North-West Frontier Province (NWFP)

Sample Characteristics

In NWFP, 16 food storage centres were surveyed for vertebrate pest infestations and causative conditions (Appendix-1a). Physical inspection of 46 godown structures (45 house-type and 1 bini shell) were made. The total storage capacity of the godowns visited was 66,776 mt. In some centres in addition to wheat, small amounts of sugar were also stored. In the inspected godowns there was stored at the time of the survey 65,594 mt of wheat and 77.5 mt of sugar, which equals approximately 98% of the total storage capacity of these centres.

Only those stocks were examined which were stored inside the structures, although outdoor short-term or transit storage on plinth or under tarpaulins was also observed (Fig. 1). Wheat at all the house-type godowns or bini shells was stored in bags weighing approximately 95 kg. The quality of grain was judged as good in 32 structures,

fair in 11, and poor in 1 and it was not observed in 2 godowns. The average duration of storage was 108 days and it varied from one day to 18 months. Some of the longer-term storage was wheat being held for distribution to Afghan refugee centres. Total staff at these 16 centres visited include 44 technical and 313 non-technical persons (only chowkidars and sweepers).

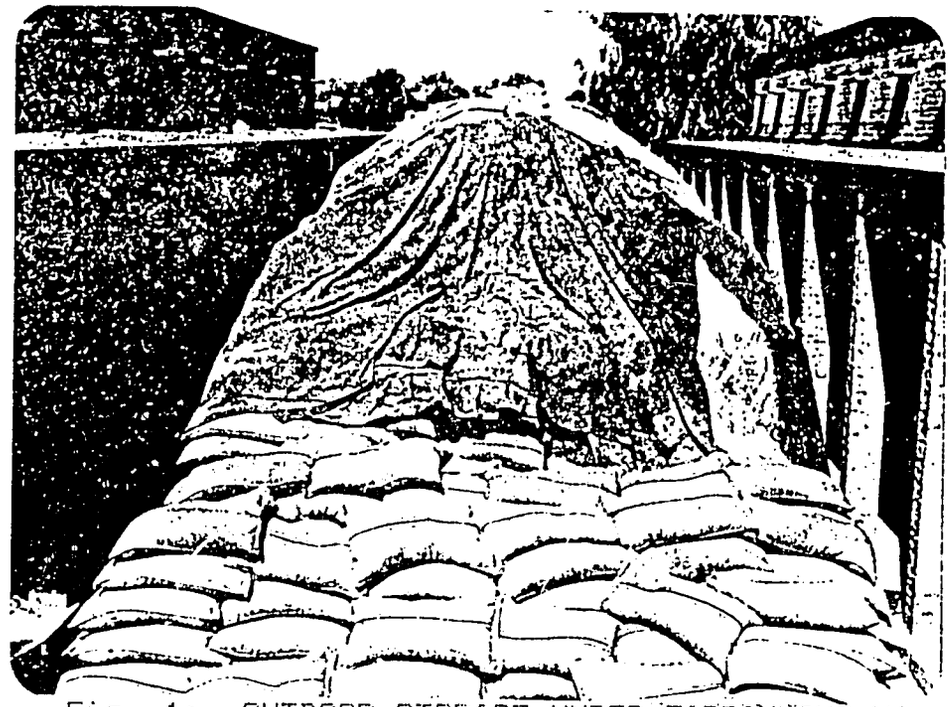

Fig. 1: OUTDOOR STORAGE UNDER TARPAULINS

Structural Conditions

Structural conditions at 46 godowns inspected in NWFP as judged from outside was good in 13 (28.3%), fair in 24 (52.2%) and poor in 9 (19.5%). This is the highest proportion of poor structures we have seen in any of the provinces. Six of the 9 godowns noted as poor were 10 years or less in age. The age of structures in NWFP ranged from 2 to 35 years and mean age was 16.7 years.

Structural Defects

Out of 46 godown structures, structural defects were noted in 44 (95.6%) godowns in NWFP. The most frequently observed structural defect in godowns under NWFP Food Department was defective walls, which were seen in 43 (93%) godown structures, followed by defective

floors in 39 (85%), defective windows 36 (78%), defective doors 35 (76%) and roofs were defective in 18 (34%) godowns. In NWFP none of the 44 godowns was found with only one structural defect. Two types of structural defect were present in 7 godowns, 3 kinds of defects in 6 godowns, 4 structural defects in 16 godowns and all 5 structural defects were seen in 15 godowns. An average of 3.7 types of defects per godown structure was calculated in NWFP. There was no correlation between age and the number of kinds of structural defects (Table 3).

Table 3: AGE OF PROVINCIAL GODOWN STRUCTURE VS. NUMBER OF TYPES OF STRUCTURAL DEFECTS IN NWFP

Age in Years	No. of Godowns	Mean No. of Types of Structural Defects
0- 5	9	3.44
6-15	12	3.66
16-25	19	4.05
26-35	6	3.50

Vertebrate Pest Infestations

In NWFP 42 (91.3%) godowns out of 46 were noted with vertebrate pest infestations. Out of these 42 godowns, bird infestations were noted in 40 (87%) godown structures and the infestations were mostly due to common house sparrows and sometimes pigeons. No bird infestation was noted as severe in this province whereas, severity of infestation due to birds was medium in 4 godowns and few in 36 godowns.

Rodents were not so frequent in NWFP food storage centres. They were noted only in 4 structures (8.7%) and here also severity of infestation was recorded as few in all the centres and no medium or

severe infestations were noted. Only house mouse (*Mus musculus*) infestations were observed in the 4 godowns.

Other vertebrates were more frequent than rodents; cats were present in 10 godowns (21.7%) and evidence of dogs was seen in two centres.

Pest Control Methods

Godowns were sprayed with malathion and bagged stocks were fumigated with phosphine using "Celphos", the Indian-produced aluminum phosphide, as well as "Phostoxin". Because some stocks had been in storage for 12 to 18 months, in a few centres 5 to 6 fumigations had been carried out.

ii) Baluchistan

Sample Characteristics

In Baluchistan 9 out of 46 food storage centres under the Provincial Food Department were visited. In these 9 centres, 24 house-type godown structures were surveyed for vertebrate pest infestations. Mainly wheat was stored in the godowns but at some places sugar was also stored. The total capacity of the godown structures visited was 23,900 mt which is equal approximately to 14% of total provincial capacity. Wheat in storage was 12,112 mt and there was 85 mt of sugar. Wheat was stored in bags only and here also only the stocks stored inside the structures were surveyed. Grain quality was rated good in 22 structures, in one godown sugar was stored and one godown was empty. The duration of storage ranged from 1 day to 5 months and the average duration of storage in Baluchistan was 48 days. In these 9 centres, 14 technical and 90 non-technical (chowkidars and sweepers) employees were working.

Structural Conditions

Structural conditions at 24 godowns inspected in Baluchistan as judged from outside was good in 14 (58.3%) and fair in 10 (41.7%) godowns. No godown was rated as poor. The age of the godown structures in Baluchistan ranged from 1 to 41 years and mean age was 16.7 years.

Structural Defects

In Baluchistan structural defects were noted in 20 godowns (83%) out of 24 surveyed. The most frequently noted defect was doors, which were recorded in 17 godowns (71%), followed by defective walls and windows, each present in 16 godowns (67%). Defective floors were seen in 12 godowns (50%) and defective roofs were noted in 4 godowns (17%). One type of structural defect was present in 2 godowns, 2 structural defects in 2 godowns, 3 structural defects in 6 godowns, 4 structural defects in 9 godowns and all the 5 structural defects in only one godown. An average of 2.7 structural defects per godown was estimated in Baluchistan. There was a positive correlation between the number of kinds of structural defects and increasing age of the godowns (Table 4).

Table 4: AGE OF PROVINCIAL GODOWN STRUCTURES VS. NUMBER OF TYPES OF STRUCTURAL DEFECTS IN BALUCHISTAN

Age in Years	No. of Godowns	Mean No. of Types of Structural Defects
0-10	12	2.0
11-20	4	3.0
21-30	3	3.6
31-40	5	3.6

Vertebrate Pest Infestations

Vertebrate pest infestations were noted in 19 (79%) of the 24 godowns surveyed. Bird infestations were observed in 18 (75%) structures (almost all were due to house sparrows; pigeons were seen at only 2 centres). Severity of bird infestation was few in 12 godowns and it was medium in 6 godown structures. No severe bird infestation were noted in food storage godowns visited in Baluchistan.

Rodent infestations were found in 3 structures (12.5%) and in all these structures house mice (*Mus musculus*) were the problem species. Severity of rodent infestations was rated as few in all three godowns. Among other vertebrates, cats were present in only 1 godown (4%).

Pest Control Methods

No fumigation had yet been carried out in any of the centres in Baluchistan. "Phostoxin" is the fumigant used by the Food Department. Generally, unless stocks are received in infested conditions from either Sind or Punjab, there is little need for fumigation because of the short duration of storage. Malathion is used as a pre-storage spray in godowns and is sometimes applied to bagged grain for insect control.

4. DISCUSSION

Grain Quality and Duration of Storage

In NWFP, grain quality ranged from good in a majority of centres, to fair in 4 and poor in one. In Baluchistan, all stocks examined were rated as good. The average duration of storage in NWFP was 3.6 months and ranged up to 18 months in one godown. Some of this longer storage

was due to stocks being held for distribution to Afghan refugee centres. In Baluchistan, the average duration of storage was quite short, only 1.6 months. These differences in storage periods may have accounted for part of the poorer quality grain as seen in NWFP.

Structural Condition

NWFP is obvious in having the lowest proportion of godown structures rated as good and the highest proportion rated as poor. In looking over the data for age vs. structural condition, there is no positive correlation between these two variables. Instead, some structures only 5 to 6 years old were rated in poor condition.

In Baluchistan, on the other hand, no structures were rated as poor even though the average age of all godowns examined was 16.7 years, the same as in NWFP.

Types of Structural Defects

In NWFP, the most frequently noted structural defect was the walls, followed by floors, doors, windows and roofs. Almost 40% of the godowns had defective roofs, the highest proportion with this defect we have seen in any of the four provinces. Defective doors and windows occurred in over 3 out of every 4 godowns inspected.

In Baluchistan, the most common structural defect was the doors, followed by windows, walls, floors and roofs.

The high proportion of structures with defects, 95.6% in NWFP and 83.3% in Baluchistan, is indicative of a lack of a good preventive maintenance program either under the Provincial Food Department or the Public Works Department. There is a lot of capital investment tied up

in food storage godowns yet they are being allowed to depreciate rather rapidly.

Vertebrate Pest Infestations

Despite the average age of godowns of 16.7 years in both provinces, and the many conditions conducive to vertebrate infestations, i.e., defective doors and windows, there were recorded only 3 house mouse infestations in Baluchistan and 4 in NWFP. No other rodent species was noted. The presence of cats was more common than mice in godowns in NWFP. Only one godown in Baluchistan was found with cats living inside.

House sparrows were the common pest bird seen around grain storage centres in both provinces. Unless the flocks are large (100 to 200 birds or more) with easy access to godown interiors, their presence has an insignificant impact on stored wheat losses. Their presence seems as much due to spilled grain outside as that stored inside the structures. Pigeons were noted in a few instances but their presence is usually due to spilled grain outdoors also.

Pest Control Methods

The same practices were applied during fumigation in provincial food storage centres under NWFP and Baluchistan Department of Food as were mentioned by Brooks and Ahmad (1986) in Punjab. Last year in some centres godowns were not fumigated because the stocks were stored for short durations and the condition of stocks were good as received. This year fumigation was done at some centres and at other centres they were planning to fumigate the stocks. "Phostoxin" was used in both the provinces.

The estimated losses due to vertebrate pest infestation in the NWFP and Baluchistan are insignificant. The small house mouse infestations seen in both provinces could not contribute but a small fraction to the overall losses due to all causes. Losses due to spillage or bag damage in many of the godowns is responsible for much greater losses than any caused by vertebrate pests. This has been the case in our surveys in all the four provinces.

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Appendix-1

List of Food Storage Centres under NWFP Department of Food

District/Agency	Capacity (mt)
Peshawar	51500
Aza Khel	112100
Nowshera	14300
Charsadda	6500
Mardan	12000
Kohat	15000
Bannu	13900
D.I. Khan	57500
Abbottabad	29500
Mansehra	4700
Kohistan	500
Dir	9600
Swat	6800
Chitral	5750
Malakand	4100
Khyber	500
Mohmands	500
South Waziristan	500
North Waziristan	1000
Kurram	500
TOTAL	346750

Appendix-1a

STORAGE CENTRES IN NWFP

	1.	Reshin	
	2.	Garam Chashma	
	3.	Chitral	
	4.	Drosh	
	5.	Arundu	
	6.	Dir	
	7.	Khawaza Khela	
	8.	Badgi Sharif	
	9.	Shauglapur	
	10.	Saidu Sharif	
	11.	Battgram	
o	12.	Mansehra	
	13.	Abbotabad	
o	14.	Havelian	G.T. Road
	15.	"	Rly. Station
o	16.	Haripur	
	17.	Swabi	
o	18.	Mardan	Rly. Road
o	19.	"	Masiti
	20.	Dargai	
	21.	Takht-i-Bhai	
o	22.	Charsadda	
o	23.	Nowshera	
o	24.	Aza Khel	
o	25.	Peshawar	Kohat Road
	26.	"	Rly.Station
o	27.	"	G.T. Road
o	28.	Kohat	Rawalpindi Rd.
	29.	"	Billy Tang
o	30.	Hangu	
	31.	Karak	
o	32.	Bannu	P.R. Centre
o	33.	"	Jaman Road
o	34.	"	Rly. Road
	35.	Lakki	
	36.	Serai Naurang	
	37.	Tank	
	38.	Kulachi	
	39.	D.I. Khan	
o	40.	"	Rakh Zindani
	41.	North Waziristan	
	42.	South Waziristan	
	43.	Kurram	
	44.	Khyber	
	45.	Mohmands	

o Centres surveyed for vertebrate pest infestations

List of Food Storage Centres under Baluchistan Department of Food

Division	Centre	Capacity (mt)
Quetta	o Quetta White Road	34800
	o " Spinny Road	
	o " Sariab Road	
	" Gawalmandi	
	o Pishin	15000
	Chaman	2000
	Zhob	3000
	o Muslimbagh	8100
	Loralai	5600
	Duki	2000
	Barakhan	1000
	Musakhel	1000
	Nushki	3100
	Dalbandin	1600
	Total	77200
Sibi	o Sibi	16050
	Harnai	500
	Mach	500
	o Dhadar	1700
	Belpat	2600
	Jhatpat	3850
	Usta Mohammad	9300
	Kohlu	600
	Dera Bugti	800
	Kahan	100
	Total	36000
Kalat	Kalat	1650
	Surab	2000
	o Mastung Mastung Road	5950
	o " Theri Godown	
	Khuzdar	2700
	Awaran	250
	Bela	2300
	Uthal	1200
	Hub	3600
	Kharan	3850
	Washuk	100
	Bashiwa	100
	Ledgasht	500
	Total	24200
Mekran	Turbat	10400
	Panjgur	6700
	Pasni	5200
	Gawadur	2200
	Jiwani	700
	Ormare	250
	Dump	1600
	Muleda	500
	Mand	1100
	Total	28650
	GRAND TOTAL	166050

Centres surveyed for vertebrate pest infestations.

Appendix-3

VERTEBRATE PEST SURVEY
OF FOOD STORAGE FACILITIES

District _____ Town _____ Date _____

Name and Address of Facility _____

_____ Govt. [] Private [] Other []

Manager's Name/Person Contacted _____

Number of Employees/Titles _____

Pesticide Application: fumigant Used _____

Schedule of Treatments _____ Frequency of Inspection _____

Any Other Control Methods: Traps [] Predators [] Barriers [] Other []

Training Needs: Present Refresher Training Given: Yes [] No []

Schedule of Training _____ Duration of Training _____

Godown No. _____ Stored Food _____ Quantity _____ mt. Duration _____ mo.

Quality: Excellent [] Good [] Fair [] Poor [] Bagged [] Bulk []

Bulk under tarps outdoors [] Bagged under tarps outdoors [] Bagged outdoor uncovered []

Structural: Type of structure _____ Age _____ Capacity _____

Structural condition: Good [] Fair [] Poor []

Structural Defects: Yes [] No [] Doors not fitting [] Floor cracked/broken []

Wall cracked [] Windows unscreened/broken [] Leaking Roof [] Grilled doors []

Vertebrate Pest Problems: Yes [] No [] House mice [] Roof rats [] Other rodents []

Pest Birds [] Other vertebrates [] (Cats, dogs, bats, etc.)

Severity of infestation: Rodents: Few [] Med [] Severe [] Birds: Few [] Med [] Severe []

Evidence: Droppings [] Live or dead animals [] Burrows outside [] Burrows inside []

Kinds of damage: Food consumption [] Contamination [] Bag damage [] Structural []

Remarks: _____

Godown No. _____ Stored Food _____ Quantity _____ mt. Duration _____ mo.

Quality: Excellent [] Good [] Fair [] Poor [] Bagged [] Bulk []

Bulk under tarps outdoors [] Bagged under tarps outdoors [] Bagged outdoor uncovered []

Structural: Type of structure _____ Age _____ Capacity _____

Structural condition: Good [] Fair [] Poor []

Structural Defects: Yes [] No [] Doors not fitting [] Floor cracked/broken []

Wall cracked [] Windows unscreened/broken [] Leaking Roof [] Grilled doors []

Vertebrate Pest Problems: Yes [] No [] House mice [] Roof rats [] Other rodents []

Pest Birds [] Other vertebrates [] (Cats, dogs, bats, etc.)

Severity of infestation: Rodents: Few [] Med [] Severe [] Birds: Few [] Med [] Severe []

Evidence: Droppings [] Live or dead animals [] Burrows outside [] Burrows inside []

Kinds of damage: Food consumption [] Contamination [] Bag damage [] Structural []

Remarks: _____