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**RODENT CONTROL IN WHEAT AND RICE:
A LARGE-SCALE CONTROL DEMONSTRATION IN GUJRAT, PHASE II**

By

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RODENT CONTROL IN WHEAT AND RICE; A LARGE-SCALE CONTROL DEMONSTRATION IN GUJRAT, PHASE II

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INTRODUCTION

A large-scale control demonstration to transfer knowledge to farmers of developed rodent control technology in wheat and rice was begun in January 1989 in Gujrat District. The initial phase, carried out during the wheat season, was described in Technical Report No. 20 (Brooks et al., 1989). During this first phase, several methods of transferring information, awareness, and of stimulating motivation, as suggested by Adhikarya and Posamentier (1987), were tried. A combination of media materials were used: posters placed in villages, handbills given to farmers, personal contact, audio/visual presentations and training. Ready-made baits were available at two sites, the CMP (Crop Maximization Programme) workshop at Kunjah and the Jheranwali Union Council Office.

As a result of this media campaign, 33% of the farmers in the area were aware of the availability of ready-made baits; most had learned of them from the posters. However, due to low rodent damage just four weeks before wheat harvest, few farmers had been motivated to purchase and use the baits.

During the rice season we decided to concentrate on four things: 1) give more direct training to the farmers at their villages, 2) use the posters and handbills again to create awareness of the problem and the availability of ready-made baits, 3) use more audio/visual materials to reach illiterates (we prepared a video on farmer rodent control in rice), and 4) make ready-made baits more easily available by placing them at more sites.

Rat damage to rice in Pakistan historically has been more severe than that to wheat. Few reports are available on losses in rice, however. Greaves and Khan (1975) estimated a 6% yield reduction in the rice crop in Punjab due to field rats. Fulk (1977) calculated the yield loss in rice in lower Sind due to the hoarding activity of lesser bandicoot rats. He estimated that 100

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kg of rice, equivalent to about 10% potential yield, was lost to rats per hectare. A recent survey carried out by Khan (1987) in three districts of Punjab revealed 16.1% damage to rice shortly before harvest and estimated the reduction in yield at 13.7%. Khokhar and Rizvi (1989), in contrast, in a survey of rodent damage to rice in Punjab in 1988, found it averaged only 0.77% of cut tillers in three districts. They attributed this low level of damage to heavy rains and consequent flooding of fields during the summer monsoon.

METHODS

Description of the Area

The area selected for the control demonstration lies approximately 9 km west of the city of Gujrat. It is bounded on the north by the Gujrat-Sargodha highway, on the east by the Upper Jhelum canal, and on the west and south by paved roads (Fig. 1). The area is comprised of 10 villages and the town of Kunjah and covers approximately 2200 ha. It lies within the project area of the Crop Maximization programme (CPM), a PARC/NARC project funded by the Italian Government. The CMP maintains a workshop near the town of Kunjah, which was utilized as one of the places where ready-made baits could be left for farmers to purchase. The CMP has operated in the area since 1985 and has a good relationship with the local farmers. Rice comprised about 60% of crops grown during the period of June to October 1989, along with sugarcane, and other crops. By early November, all the rice fields had been harvested. Wheat will be the next crop to follow and will be sown from mid-November until early January.

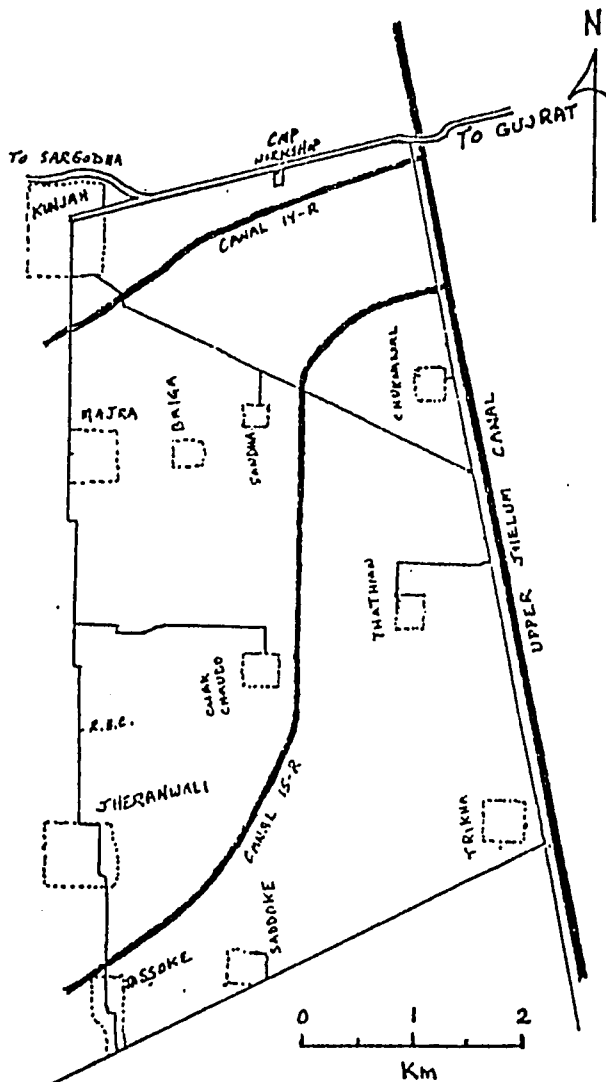


Fig. 1. Map of the Kunjah area, Gujrat District.

چوہے مرگاؤ فصل بچاؤ

چوہوں سے فصلوں کو بچانے کیلئے

ستاتیارزہم

اور ہدایات

بارڈ (BARD) پراجیکٹ

دولتالہ

سے حاصل

کریں .

ورڈ پیپرٹ پیسٹ کنٹرول پراجیکٹ (ایف. ایس. ایم)
قومی زرعی تحقیقاتی مرکزہ اسلام آباد

دوسرا طریقہ

یہ طریقہ پائپ کے اندر زہر رکھنے کا ہے۔ اس مقصد کے لئے ۲ انچ لمبا اور تین انچ قطر کا پی۔وی۔سی پائپ لیں اور اسے چوہوں کے تازہ بلوں کے قریب سطح زمین کے برابر رکھ دیں اور اس کے دونوں سروں کے درمیانی حصے کو مٹی سے ڈھانپ دیں۔ پھر پائپ کے درمیان میں نیلی دوائی کا ایک پکیٹ کھول کر رکھ دیں۔ یاد رہے کہ چوہوں کو کھانے کے لئے یہ زہر پانچ سے سات روز تک مسلسل ملتے رہنا چاہیے۔



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احتیاطیں

۱۔ زہر کو بچوں اور پالتو جانوروں کی پہنچ سے دور رکھیں۔

۲۔ اگر ہاتھ زخمی ہوں تو زہر کو مت چھوئیں۔

۳۔ زہر کو خشک اور محفوظ جگہ پر تالا لگا کر رکھیں۔

۴۔ زہر کو مٹی سے محفوظ رکھیں۔

۵۔ اگر کوئی شخص غلطی سے زہر کھالے تو فوراً قریبی ڈاکٹر سے رجوع کریں۔

۶۔ کالی دوائی کا کوئی تریاق نہیں۔ جبکہ نیلی

دوائی کا تریاق وٹامن "K" کی گولیوں یا ٹیکوں کی شکل میں میسر ہے۔



چوہوں کے خاتمہ کیلئے بارڈ پراجیکٹ دولتارہ سے دو طرح کے تیار زہر دستیاب ہیں۔

① کالی دوائی یا زنک فاسفائد

(ٹھکڑوں کی شکل میں)

اس دوائی کے دو یا تین ٹھکڑے چوہے کی تازہ بل کے اندر ڈال دیں۔ اگر بل کھلے ہوئے نہ ہوں تو دوائی ڈالنے سے پہلے ان کو کھول لیں۔ اس دوائی کو زیادہ سے زیادہ دو مرتبہ استعمال کریں۔ اگر پھر بھی چوہوں کے تازہ بل موجود ملیں تو نیلی دوائی کا استعمال کریں۔

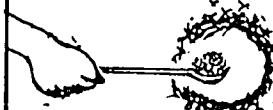


② نیلی دوائی یا راکومن (دانے دار)

اس دوائی کو دو طریقے سے استعمال کیا جاسکتا ہے۔

پہلا طریقہ :-

ایک چمچ کی مدد سے نیلی دوائی کے پکیٹ کا چوتھا حصہ چوہے کے تازہ بل کے اندر ڈال دیں۔ دوبارہ معائنہ کرنے پر دیکھیں کہ اگر دوائی ختم ہو گئی ہے تو مزید دوائی ڈال دیں۔



یہ زہر پانچ سے سات روز تک چوہے کو کھانے کے لئے ملنا چاہیے۔ خیال رہے کہ زہر کے دانے بل کے باہر نہ بکھرے رہیں۔

دھان کے چور



اپنی فضلوں کے چور ہوں کو ختم کرنے کیلئے

کستان تیار موٹر زہر اور دہلیات

کراپ میکسپہا آئزیشن ورکشاپ کنجاہ گجرات سے حاصل کریں،
راٹلی کی ٹریڈنگ ورکشاپ

یزید زہر آپ کو اپنے یافتہ گاوں کے ممبردار سے بھی مل سکتا ہے

ورٹیسپرٹ پیسٹ کنٹرول پراجیکٹ (ایف، ایس، ایم)
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دیں اور اس کے دونوں سروں کے درمیانی حصے کو مٹی سے ڈھانپ دیں۔ پھر پائپ کے درمیان میں نیلی دوائی کا ایک پکیٹ کھول کر رکھ دیں۔ یاد رہے کہ چومہوں کو کھانے کے لئے یہ زہر پانچ سے سات روز تک مسلسل ملتے رہنا چاہیے۔

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چومہوں کے خاتمہ کیلئے سی۔ایم۔پی۔ورکشاپ کبجہ سے دو طرح کے زہر دستیاب ہیں

① کالی دوائی یا زنک فاسفائیڈ

(ٹسکروں کی شکل میں)

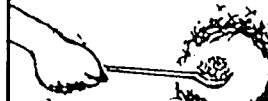
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② نیلی دوائی یا راکومن (دانے دار)

اس دوائی کو ڈو طریقے سے استعمال کیا جاسکتا ہے۔

پہلا طریقہ

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Multi-Media Information and Awareness Campaign

We planned on transferring the rodent control technology in several ways: 1) providing a supply of ready-made baits of both zinc phosphide and coumatetralyl, in 100 g packets to be sold at our one rupee cost; 2) by providing awareness and knowledge training directly to farmers at their villages; and 3) providing some other media materials to create awareness and information regarding the availability and uses of ready-made baits to reduce damage to wheat and rice. These were in the form of posters and handbills.

The mini-campaign was planned with the objectives of 1) informing farmers that rodents can damage their crops and decrease crop yields, 2) that ready-made baits and other control methods can reduce crop damage, 3) ready-made baits and instructions on how to use them were available at inexpensive cost at several sites in the Kunjah area, and 4) motivate farmers to take individual and collective action on rodent control in their fields.

The campaign strategy used several media in attempts to inform and motivate farmers. A poster, in Urdu language, depicted a Punjabi rice farmer standing in his field, holding a rat by the tail in his right hand and a bag of ready-made bait in his left. The main caption says "Kill the rats - save the crop". The rest of the poster explains that ready-made baits to do this are available at several places in the area (Fig. 2). In all, 450 posters were put up in the 10 villages and the small town of Kunjah. A farmers handbill in Urdu depicted a large ugly-looking rat running away with a sheaf of rice over his shoulder, while pursued by several comic figures of farmers. The caption says "Thieves of Rice" (Fig. 3). These handbills were distributed by the researchers while in the fields and were supposed to be given to each farmer purchasing the ready-made baits. A 13-minute Urdu language video training-tape entitled "Dhan Key Chor (Thieves of Rice)", was produced and shown to farmers throughout the area as part of the audio/visual transfer of information, especially to those farmers unable to read.

Ready-Made Baits

The campaign strategy relied on having a supply of ready-made baits available for farmers to purchase and use. Two forms were provided: a 2% concentration of zinc phosphide in a wheat flour-cornmeal biscuit bait and a 0.0375% concentration of coumatetralyl (Racumin) in a broken rice bait. Both were packed in 100 g amounts in polythene bags with Urdu language labels and instructions and were to be sold at our cost, one rupee per package. The two types of baits were available for purchase at the 1) CMP workshop, 2) the Agricultural Extension Offices in Kunjah, and 3) with village numberdars at several locations. Altogether, baits were available at 8 sites within the target area.

Damage Assessment

Rodent damage to rice was measured at several growth stages: flowering, grain-formation, and ripening. Fields were selected at random using each of the 10 villages as a reference point. Transects were followed using the four cardinal compass directions of north, south, east, and west. Starting from the village periphery, a transect was walked for 200 m and the first field lying nearest to that point was selected; another was taken after another 100 m. The longer interval was used near the villages to avoid the "village effect", where the vegetable gardens and fodder crops predominate.

At each field, the corner to start from had been preselected from random numbers. Starting from the appropriate corner, samples were taken from randomly preselected numbers of steps along the field diagonal. The rice hill nearest the observers foot was then sampled, counting all cut and uncut stems. In this manner, 25 hills were sampled on the field diagonal. If the corner of the field was reached before all samples had been taken, the remainder were taken on the other field diagonal.

Rodent Activity Measures

Rodent activity in the fields was measured by counting the number of active burrows. After counting the damaged and undamaged tillers in the field, the observer counted all active, fresh burrow mounds on the bunds (if the field contained water), and in the field interior if it was dry. In some ways, this would be a cumulative measure, especially in the case of bandicoot burrow mounds, but generally, the burrows from the previous month were obliterated, rain-washed, or obviously old and were not counted.

Evaluation of the Control Demonstration

The effectiveness of the media materials, training, and ready-made baits were evaluated by interviewing farmers at the end of each harvest season. A total of 103 farmers was interviewed during mid-November and asked the same questions as used in the previous wheat season. As given in the previous report, our goals in this phase were to reach at least 40% of the farmers with an awareness message and have at least 20% of the farmers purchase and use the ready-made baits.

RESULTS AND DISCUSSION

Damage to Rice

Data from the three damage assessments made in August, September and October are given in Table 1. At flowering stage, damage was just starting and no actual counts were made. Damage increased sharply by September but was still quite low (0.29%) at

this growth stage (grain formation). At harvest, damaged tillers were 1.26% of the total examined, a quite low figure. Several causes contributed to this low level of damage. First was flooding of the rice fields by heavy rains in late July, which probably killed many rats by drowning. Secondly, in many fields, there were

Table 1. Rodent infestation and rodent-damaged stems in rice fields near Kunjah, Gujrat District, 1989.

Month	No. fields examined	Rodent infested fields	Cut stems/ total stems	Percent damage
August	101	41	-	0.01*
September	78	43	61/21113	0.29
October	78	60	233/18509	1.26

* Estimated from visual inspection only.

numerous rice grains scattered on the ground underneath the plants just prior to harvest. These were readily available to rodents in these fields. In this situation, there was no need for rats to cut tillers to obtain the rice grains.

Rodent Activity

Rodent activity in the rice fields was measured by the changes in number of rodent-infested fields and by the change in number of active burrow mounds from one assessment to the next. This information is summarized in Table 2. There was little increase in activity and field infestations until just before harvest. Then infested fields increased sharply and burrowing activity increased 6-fold. This same pattern for *B. bengalensis* had been observed during the preceding wheat season. Burrowing activity increased sharply because the fields were drying, permitting the rats access to field interiors.

Table 2. Infested fields and average number of burrow mounds of lesser bandicoot rats (*B. bengalensis*) in rice fields in the Kunjah area, 1989.

Month	No. fields examined	No. rodent infested	No. of rodent burrow mounds	Burrow mounds per field
August	101	41	90	0.87
September	78	43	91	1.17
October	78	60	533	6.83

Rodent Species Present

Several rodent species present in wheat fields were not seen in rice fields, mainly because of their flooded condition during the several irrigations. It was only during the ripening stage, when fields were allowed to dry, that burrowings by *Tatera indica* and *Mus musculus* first appeared. In September, trapping one night resulted in the capture of two bandicoot rats only. Examination of their stomach contents revealed that they were feeding not upon rice but upon the seeds of *Echinochloa colona*, a common weed in rice fields at this time. We did not see signs of soft-furred field rats or short-tailed mole rats.

Media Campaign Results

Altogether, 450 posters were placed in the 10 villages and the small town of Kunjah (Fig. 4). Handbills were distributed to farmers by the researchers and they were to receive them when buying ready-made baits. Training was given on three occasions in September and reached 82 farmers and 9 agricultural extension field assistants. The Urdu-language video training-tape, "Dhan Key Chor" was shown 5 times (some were reruns) to this audience. News of the ready-made baits was announced from the mosques in some of the villages. Ready-made baits were available at 1 Rupee per 100 gram packet at 8 different sites within the target area.



Fig. 2. Placing the posters.

Farmers Evaluation Interview

In mid-November, a total of 103 farmers was interviewed to evaluate the success of the multi-media mini-campaign and the use of the ready-made baits. The findings of the evaluation, and a comparison with similar responses following the wheat season, are given in Table 3. Insects were the most important pest in rice, while rodents were the big pest in wheat. The proportion of farmers doing rodent control decreased, which is to be expected, since rodent damage to rice was much less than in the previous wheat season. Poisoning remained the number one method of control, with watering and "Saints" (the use of Quranic exorcism) following far behind. Cats and dogs remained about the same as in the wheat crop.

Concerning the multimedia campaign and materials, more than half the farmers were aware of ready-made baits, an increase from the previous 37%, and again, the posters were the primary source of this knowledge. Training overtook handbills and personal

contact as the second source. The relatively poor showing of all the methods other than posters makes one question whether they are worth the effort.

The percentage of farmers questioned that had used the ready-made baits increased from 10% to almost 13%, but so had the percentage using self-prepared baits.

The majority had purchased ready-made baits at the CMP workshop, Kunjah. One farmer bought a bait packet at a seed shop and paid five rupees. He was the one person who said the bait was too expensive.

Table 3. Comparison of farmers interview responses in wheat and rice season.

Questions	Answers			
		Wheat (111)*		Rice (103)*
1. What are the main pest problems in this crop season?	Rodents	98	Insects	71
	Weeds	66	Rodents	33
	Birds	14	Birds	2
	Insects	7	Porcupine	2
2. Did you do any rodent control to reduce crop damage?	Yes	81	Yes	58
	No	27	No	41
	No reply	3	No reply	4
3. What methods of control did you use?	Poison	72	Poison	52
	Watering	10	Watering	4
	Saints	9	Saints	4
	Manual	5	Manual	1
	Smoking	0	Smoking	1
	Cats & dogs	2	Cats & dogs	3
	Traps	0	Traps	0
4. Were you aware ready-made baits were available?	Yes	37	Yes	46
	No	63	No	43
5. From what did you learn this?	Poster	24	Poster	38
	Training	2	Training	5
	Handbills	3	Handbills	3
	Per. contact	5	Per. contact	1
	Announcement	0	Announcement	1
	Other	4	Other	3
6. What types of bait did you use?	Ready-made	11	Ready-made	13
	Self-made	11	Self-made	17

7. Where did you buy the ready-made bait?	CMP Workshop	4	CMP Workshop	5
	Un. Council	3	Ag. Extension	1
	VPCP Staff	3	VPCP Staff	1
			Numberdars	1
			Seed Shop	1
8. What price did you pay	Rupees 1 =	11	Rupees 1 =	11
			Rupees 2 =	1
			Rupees 5 =	1
9. What is your opinion about the cost of the bait?	All right	9	All right	7
	Cheap	1	Cheap	5
	Expensive	1	Expensive	1
10. Was there any problem in getting the bait?	Yes	1	Yes	1
	No	10	No	12
11. Was rodent control an individual/joint effort?	Individual	9	Individual	13
	Joint	1	Joint	0
12. At what crop growth stages did you use the poison?	Tillering	4	Tillering	1
	Booting	6	Booting	6
	Ripening	0	Ripening	1
13. What were the results, ineffective, effective?	Ineffective	1	Ineffective	0
	Effective	10	Effective	13

* Number of farmers interviewed.

Most farmers agreed that the price was all right or even a little cheap. Very few had any problem in getting the bait. Rodent control was mainly an individual effort. All the farmers using ready-made baits in rice found them to be effective.

The goals of reaching 40% of the farmers who were aware of the ready-made baits was more than achieved, with posters being the primary means of doing so. The other goal, of having 20% of the farmers use the baits was not achieved because the damage to rice did not warrant taking action.

Despite ready-made baits being easily available, very few farmers used them in the rice crop. Much of this could be due to 1) flooding of the rice fields in late July because of heavy rains, and 2) premature shattering of rice panicles and scattering of the rice grains. These two factors led to very low levels of rodent damage to rice and a consequent lack of motivation and interest in rodent control by the farmers.

CONCLUSIONS AND RECOMMENDATIONS

Again, as in the wheat season, rodent damage to rice just four weeks before harvest was not severe enough to cause farmers to take action. Several reasons are advanced for this: heavy floods in late July probably drowned and killed some rats in the fields and premature shattering of panicles and dropping of partially filled rice grains. These were easily picked up and eaten by the rats, thus stem cutting in these fields was greatly reduced.

The multimedia mini campaign, primarily the posters, had been seen by more than half the farmers interviewed and they were aware of ready-made baits. Training, given on 3 occasions to 91 persons, reached only a very limited proportion of the total target group in the Kunjah area. It was not easy to gather the farmers, even with one or more days notice, because they were busy in other activities. Training sessions, themselves alone, seem not to be that much of an incentive to come out in number. The video presentation helped, and was well-received and liked by the farmers, but more material in the way of entertainment is needed. The farmers handbills were to be distributed with the ready-made baits when they were purchased. A few were distributed at the 3 training sessions, but the majority apparently were never handed out. Unless we arrange a better distribution of handbills, they are not worth the effort.

The goal of making 40% of the farmers aware of the baits was achieved, primarily with the posters. The goal of having 20% of the farmers use the baits obviously is not something we can control and is quite dependent upon the severity of (or lack of) the rodent damage to the crop.

The control demonstration will be carried out again in wheat season, January to June 1990. Posters will be used again. A video training tape on rodent control in wheat will be prepared for farmer use. Handbills will be used only if we can come up with a better method for their mass distribution. Perhaps instead of a handbill for farmers, we may prepare a comic leaflet to be distributed to primary school children. Farmers training will be given at village level, with a more entertaining format, perhaps using displays, banners, give-aways (bags of bait), and announcements from the mosques. Judging by the small response that had received training (5% of those interviewed) and knowing we had reached 82 farmers in the training, it appears there could be more than 1000 farmers in the target area. Training may have to be extended to 200 to 300 farmers in the whole area to have much impact.

Baits were readily available at the 8 sites. Farmers agreed the price was no problem, perhaps even cheap. If rodent damage to wheat is approaching 2% by late March or early April, then farmers may take rodent control actions during the coming season. If wheat

is not damaged at this level by that time, then we again can expect little motivation.

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VERTEBRATE PEST CONTROL PROJECT

Reports and Publications

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Apr 1986	No. 2	Vertebrate pest infestations in Punjab provincial food storage facilities.
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1989	No. 2	<u>Reference Manual</u> : Vertebrate Pest Management in Grain Storage Centres. (Revised). 38 pp.
1988	No. 3	<u>Handbook</u> : Anaj ke godam: Nuksandeh janwaroon ke barey main aik rehnuma kitab. (Grain storage: Handbook on vertebrate pest management). 24 pp. (In Urdu).
1988	No. 4	<u>Poster</u> : Godamoon main anaj ko nuksan puhchaney waley janwar (vertebrate pests of grain storage godowns). (In Urdu).
1988	No. 5	<u>Video Cassette</u> : Khurab godam aur acha godam (Bad godown and good godown). (Urdu & English), 22 minutes.
1989	No. 6	<u>Video Cassette</u> : Dhan key chor (Thieves of paddy). (Urdu), 13 minutes.
1989	No. 7	<u>Slide Set</u> : Khurab godam aur acha godam (Bad godown and good godown). (with audio cassette in Urdu), 28 minutes.