

Observations on the use of Electric Fence for Protecting Rice Crop from Rat Damage

by

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Rodents are one of the serious pests of rice crop. Various chemical and mechanical methods of control of the rodents have been tried by many workers, but none of them proved effective, especially for protecting the crop from migratory rats. Hence the efficacy of providing electric fence, for preventing rat damage in rice crop was tested at the Regional Agricultural Research Station, Aduthurai during 1969 and 1970. The results are presented hereunder. Electric fence is being used in the western countries for preventing wild animals from entering cultivated fields. It is also in use for regulating grazing space in the pasture lands. The electric fence energised by battery is in use at the International Rice Research Institute, Philippines and is found useful for preventing the rat damage to rice crop (I.R.R.I. Annual Report, 1965) There is also a report of the efficient use of the electric fence in the Bangkok Rice Experiment Station at Thailand, for protecting rice crop from field rats (Anon., 1967).

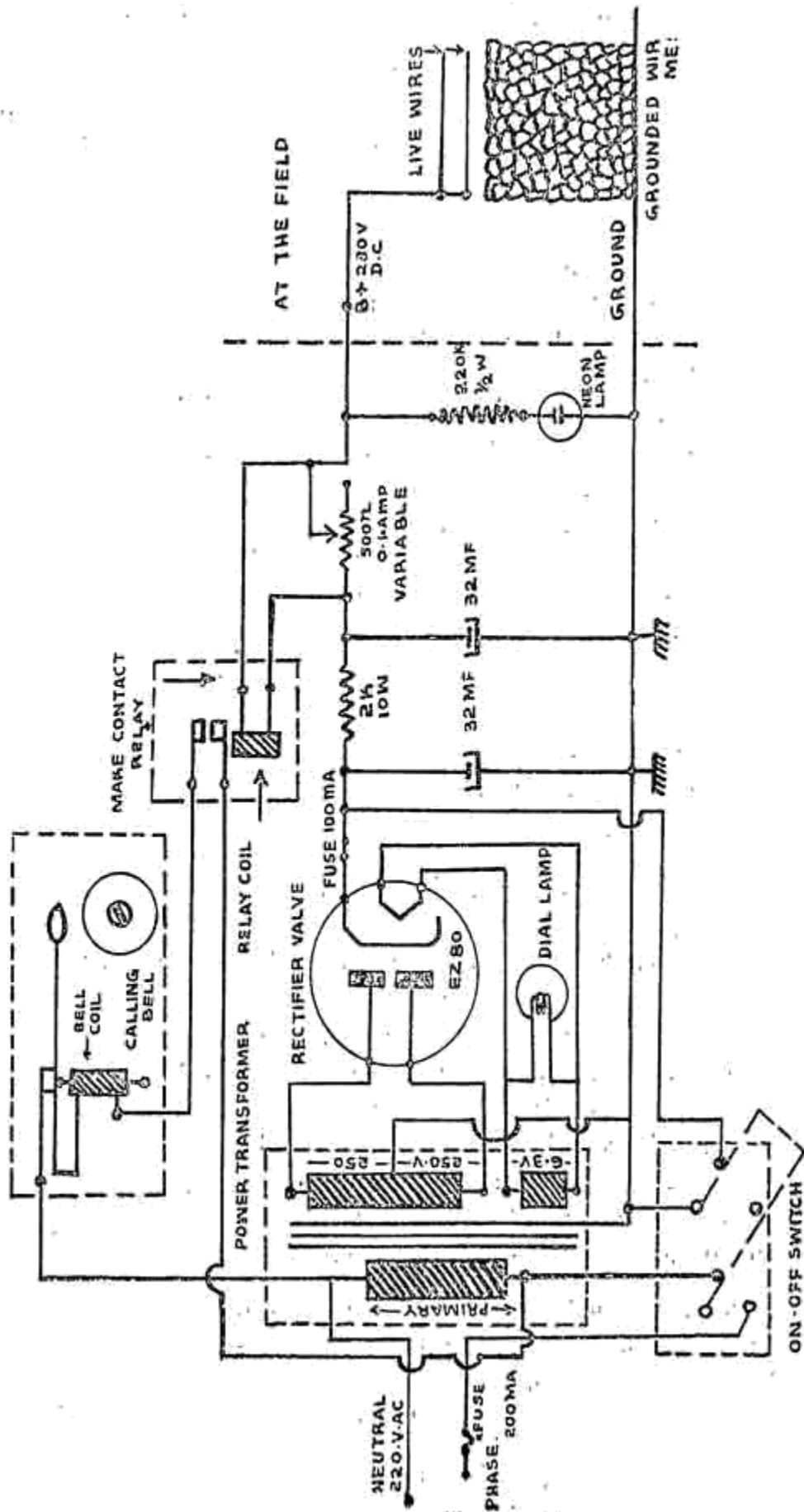
Materials and Methods : Since severe rat damage was usually met with in the farm, when rice crop is raised in summer months, about one hectare with summer season paddy (Feb, March to May) was taken up for the experiment.

At the time of transplanting, no seedlings were planted along the sides of the peripheral bunds upto 2 or 3 feet. In this space between the bund and the planted crop, the fence made of half an inch hexagonal netting (chicken wire mesh) was fixed vertically using bamboo stakes at 3 feet interval as supports for the fence. The fence was about one foot high with its bottom well within the mud. Two ordinary G. I. wires of 1/18 gauge were passed around the fence parallelly with an inter space of 2 inches between the wires. The bottom wire was kept at about 4 inches above the level of water in the puddled field. The wires were prevented from coming into direct contact with the fence by keeping $\frac{1}{2}$ " porcelain reals in between the wire and fence and by tying them to the stakes with the help of PVC wire bits.

The electric unit consisted mainly of a transformer, rectifier valve, rheostat, capacitor, calling bell or flash lamp, a fuse and switches, assembled as per the schematic diagram given in Fig. 1. The electricity was supplied to the unit from 220 volt A. C. main. One of the two leads from the unit which

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SCHEMATIC DIAGRAM OF ELECTRIC UNIT



supplies current to the fence was connected to the two parallel G. I. wires, whereas the other lead was connected to the wire netting. When switched on, the two wires got a potential of around 280 volts D. C. current, and the wire mesh acted as the ground. As the rats which attempted to get into the field has to pass over the live wire while climbing, they connected the live line to the wire mesh and received the shock which was enough to kill them instantaneously or benumb them so that they will fall down into irrigation water below and get drowned to death. The cost of fixing the fence in a hectare works out to Rs. 941/-, inclusive of the cost of unit (vide Statement No. 1). The current consumption charges for the unit are negligible as the consumption will only be 2 to 3 units per month. Before commencing the experiment with the electric unit, the bunds inside enclosed fields were made free from rodents by digging open the burrows and killing them and by poison baiting.

STATEMENT NO. 1

Cost of fixing electric fence around one hectare area.		Rs. P.
Cost of the fence :		
4.25 rolls of 22 gauge $\frac{1}{2}$ inch hexagonal wire mesh @ Rs. 120/- per roll		510.00
440 Bamboo stakes @ Rs. 9/100	....	39.60
10 Kg of 18 gauge G. I. wire @ Rs. 3.50/Kg	....	35.00
880 Porcelain reels @ Rs. 6.25/100	....	55.00
1 $\frac{1}{2}$ coil PVC wire @ Rs. 34/coil	....	51.00
		<hr/> 690.60
Cost of unit	....	200.00
Labour charges for fixing the fence	....	50.00
		<hr/> 940.60 or
	Total cost	<hr/> 941.00

NOTE: The same wire mesh and bamboo stakes can be used for three or four cropping seasons. Other materials including the unit can be used for number of years if properly handled.

The unit was switched on daily from 6 p.m. to 6 a.m. and the rats fallen dead near the fence were collected, counted and recorded in the mornings. The fence was in operation in 0.72 hectare area from 11—3—69 to 30—4—69 during 1969 and in 1.08 hectare from 4—5—70 to 27—5—70 during 1970.

Results and Discussion : All the three species of rodents prevalent in the tract viz., *Bandicota bengalensis* G & H, *Millardia meltada* G and *Mus booduga* G were found to be killed in the electric fence. It took about one or two seconds for each rat that come into contact to get killed by the shock, as could be seen from the ringing of the calling bell attached to the unit. Occasionally few rats got stuck up, by biting the fence or the wire and thus resulting in continuous ringing of the calling bell. In such cases the watchman had to go round and remove the dead rat with the help of a dry stick.

The rats were getting killed daily. The details recorded are furnished in Table 1. During 1969 when the fence was in operation from the early stage

TABLE 1. *Rat Catches in the Electric Fence*

Particulars	1969	1970
Area covered by electric fence	0.72 hectare	1.08 hectare
Period of operation	11-3-69 to 30-4-69	4-5-70 to 27-5-70
No. of days of operation	46	21
Number of rats killed :		
<i>Bandicota bengalensis</i> G & H	337 (95.74%)	920 (82.14%)
<i>Millardia meltada</i> G.	1 (0.28%)	45 (4.02%)
<i>Mus booduga</i> G.	14 (3.98%)	155 (13.84%)
Total rats	352	1120
Range in No. of rats killed per day	1 to 12	9 to 206
Average No. of rats killed per day	8	53
Average No. of rats killed per day per hectare	11	49

of the crop, the numbers killed per day ranged from 1 to 12, the average per day being 8. The total number of rats killed during 1969 was 352 in 46 days. Out of this 352 rats, *B. bengalensis* G & H accounted for 95.74% whereas *M. booduga* G and *M. meltada* G were 3.98 and 0.28% respectively.

During 1970 the conventional methods such as poison baiting with 2% zinc phosphide, bow trapping, digging open burrows and killing the rats with the help of trained labour and a trained dog, cynogasing of the burrows (which could not be opened fully) etc. were systematically followed in these fields from the time of planting of the crop. But when the crop reached shot blade stage, severe rat damage was noted in the crop especially in plots with earlier types.

A close examination of the bunds in the experimental fields showed only few rat burrows clearly indicating that the damage is due to foraging rats that came from neighbouring fields and the migratory rats. This also proved the ineffectiveness of the above conventional methods for protecting the crop from such rats. Hence the electric fence was fixed around about one hectare area when the crop was in flower. During the first week, the daily catches were unexpectedly high showing the very heavy influx of rats into the experimental crop from the adjoining area. This is the first time it has been observed that the level of rat population that may migrate into about a hectare of rice field may exceed 200 per day (Photograph showing the rats killed in a night collected near the fence for counting). Most of these rats were traced to come from the hay stacks and mango paddock situated about 100 to 200 feet from the fenced area. The daily catches ranged from 9 to 206, the average being 53 per day. The total number of rats killed in the 21 days

TABLE 2. Hourly catches of rats for the first 8 days

Date	Time								12 mid-night to 1 a. m.	Percentage	Total	Percentage	Total	Percentage	Total for the day					
	6 p. m. - 7 p. m.	7 p. m. - 8 p. m.	8 p. m. - 9 p. m.	9 p. m. - 10 p. m.	10 p. m. - 11 p. m.	11 p. m. - 12 mid-night	1 a. m. - 2 a. m.	2 a. m. - 3 a. m.								3 a. m. - 4 a. m.	4 a. m. - 5 a. m.	5 a. m. - 6 a. m.		
6-5-70	—	22	56	11	10	7	106	25	51.46	106	51.46	25	50	10	5	7	3	100	48.54	206
7-5-70	3	10	7	6	30	20	76	15	64.41	76	64.41	15	15	5	3	4	—	42	35.59	118
8-5-70	8	6	10	9	5	7	45	8	66.18	45	66.18	8	4	5	5	1	—	23	33.82	68
9-5-70	10	16	4	15	7	3	55	10	63.95	55	63.95	10	7	5	7	2	—	31	36.05	86
10-5-70	1	6	3	5	4	12	31	3	64.58	31	64.58	3	5	7	1	1	—	17	35.42	48
11-5-70	6	7	5	4	7	3	32	7	62.75	32	62.75	7	4	3	4	1	—	19	37.25	51
12-5-70	5	2	3	4	3	4	21	3	58.03	21	58.03	3	5	2	2	3	—	15	41.97	36
13-5-70	2	6	3	4	3	2	20	5	48.78	20	48.78	5	4	3	5	4	—	21	51.22	41
Total	35	75	91	58	69	58	386	76		386		76	94	40	32	23	3	268		654

of operation was 1120 and in this the percentage of *B. bengalensis* G & H, *M. booduga* G and *M. meltada* were 82.14, 13.84 and 4.02 respectively.

When a hourly count of the dead rats was made it showed that more number of rats were coming to the field during the first half of the night, than in the second half, precisely indicating the period of activity of these nocturnal animals (Table 2).

It was also observed that there was no fresh rat damage in the fenced crop, whereas in the adjoining fields of about 2 acres which were protected only by the conventional methods, there was complete destruction of the crop which came to flower earlier than surrounding plots.

Summary and conclusion : Rat damage to rice crop when raised in isolated fields during the summer season is very severe. The damage is more pronounced in types that mature earlier than in the adjoining late maturing varieties. The damage is mostly due to the foraging rats that come from adjoining area and the migratory rats. The daily influx of such rats into a small area of two and a half acres may be 200 or more, and the most predominant rodent species was *B. bengalensis* G & M which accounted for 82 to 96% of the total population. The conventional methods of rat control are ineffective under such conditions and the electric fence is the only alternative which can provide complete protection of the crop provided the cropped fields are cleared of the rats before fixing the fence. The cost of fixing the electric fence in a hectare of rice field comes to Rs. 941/- approximately.

Warning : The electric fence is also dangerous to human beings if not properly used. Hence all precautions that are necessary while handling electric installations are to be strictly followed. Any person who is operating the fence should understand clearly that he is working at his own risk.

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