able 1. Effect of different dates of sowing on plant height, number of tillers, grain and straw yield and grain:straw ratio of foxtail millet

Dates of sowing	Plant height (cm)	Number of tillers m^{-1}	Grain yield (q ha^{-1})			Straw yield (q ha^{-1})			Mean Grain:straw ratio
	1989-90	1989-90	1989-90	1990-91	Pooled	1989-90	1990-91	Mean	
16th December	83.3	25.2	8.2	3.5	5.9	26.6	16.0	21.3	0.28
26th December	84.8	29.3	8.6	7.5	8.1	30.3	26.5	28.4	0.29
5th January	80.1	27.9	6.7	7.1	6.9	25.1	28.6	26.9	0.26
15th January	96.6	25.2	15.1	7.8	11.5	36.4	36.8	36.6	0.31
25th January	90.7	26.1	7.9	5.1	6.5	33.1	31.4	32.3	0.20
4th February	93.8	24.7	4.0	4.9	4.5	19.9	27.4	23.7	0.19
14th February	92.4	26.4	3.0	4.2	3.6	24.6	22.3	23.5	0.15
' th February	83.5	25.3	1.3	4.0	2.7	24.2	22.4	23.3	0.12
CD at 5%	10.77	NS	3.9	2.8	2.1	NS	9.7	-	-

NS = Non-significant

decreased gradually. Similar decreasing trend was also observed in case of grain : straw ratio recording highest value on 15th January and lowest on 24th February sowing.

Thus from the results of the present experiment, mid January was found to be the optimum sowing time for foxtail millet in the Lower Brahmaputra Valley Zone of Assam.

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OWL PERCHES FOR RODENT MANAGEMENT IN RICE ECOSYSTEM

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ABSTRACT

Owl perches of various designs are used in different parts of Tamil Nadu for rodent management. Efficacy of one such owl perch was tested in the rice fields by counting the number of live rat burrows, 30 days after erection of perches and at weekly intervals thereafter in fields with and without owl perches. The owl perch was made of wooden rod (2 - 3m long) with a ball of straw in the top. These were pegged at random, mostly near the bunds at the rate of 45 per ha from the booting to harvesting stages of rice crop. Ther perches helped the owls, mostly the Barn Owl, *Tyto alba* (Scopoli) and the Spotted Owlet, *Athene brama* (Temminck) to hunt rats effectively. In fields with owl perches, there was no increase in the number of live burrows and in fields without perches, there was rapid increase in the number of live burrows. Rice yield from fields with owl perches was two times more than that from fields without perches. When owl perches were removed after a time, dramatic increase in the number of rat burrows was observed. The perches were used by the King Crow, *Dicrurus adsimilis* (Bechstein) during day time for perching and they hunted the flying insects.

KEYWORDS: Rodent Management, Owl Perches, Barn Owl, Rice Ecosystem

Rodents are formidable pests causing enormous losses to field crops and stored produce. Chemical control of rats with acute poisons and chronic anticoagulants is not only expensive but also environmentally unsafe. In addition, bait shyness and poison tolerance/resistance developed by rats are to be overcome. It is now realised that rodent control is essentially an ecological management (Prakash, 1968) and biological control offers the best solution for rat control (Stern *et al.*

1959). Kites, owls and snakes are usually natural predators of rodents in the field (Deoras, 1964). Among the owls, Barn Owl *Tyto alba* (Scopoli) feeds almost exclusively on rats, mice and shrews (Mason and Lefroy, 1912). The villagers put sticks (Owl perches) near the rat burrows in the field for owls to catch the rat (Srivastava, 1987). Owl perches of various designs are being used in different parts of Tamil Nadu for rodent management. Efficacy of one such owl perch was tested in rice fields in this paper.

MATERIALS AND METHODS

The owl perch was made of a wooden rod (2 - 3 m long) with a ball of straw at the top. The perches were pegged at random, 1.5 m away from the bunds @ 45 per ha from booting to harvesting stage of the rice crop. The efficacy was assessed by counting the number of live rat burrows, 30 days after erection of perches and at weekly intervals thereafter in fields with and without perches. The experiment was conducted during 1989 - '92 at the Agricultural College and Research Institute, Madurai.

RESULTS AND DISCUSSION

In fields with owl perches, there was no increase in the number of live burrows (Table 1). But in fields without owl perches, there was a rapid increase in the number of live burrows at the end of the experimentation (Table 2). When owl perches were removed after a time, dramatic increase in the number of rat burrows (21 - 175) was observed within three weeks (Table 3). Fields with owl perches yielded nearly two times more than that from fields without owl perches (Table 4).

Table 1. Efficacy of owl perch against rice field rats : Fields with owl perches

Area (ha)	Before erection (30 days)	Rat burrows (No.) After erection of perches (days) 37	44	51
0.8	5	5	5	5
0.5	3	3	3	3
0.5	3	3	3	3
0.7	8	8	8	8
Total 2.5	19	19	19	19

Table 2. Efficacy of owl perch against rice field rats : Fields without owl perches

Area (ha)	Rat burrows (No.) 30 days	37 days	44 days	51 days
0.8	6	17	19	26
0.5	5	21	25	32
0.5	8	32	37	48
0.7	12	22	28	37
Total 2.5	31	92	109	143

These perches helped the owls, mostly the Barn Owl and the Spotted Owlet, *Athene brama* (Temminck) to hunt rats effectively in the fields. Thirumurthi and Bhanumathi (1991) observed three species of owls, *viz.*, *A. brama* (72.9%), *T. alba* (18.8%) and the Great Indian Horned Owl, *Bubo bubo* (Franklin)(8.3%) in rice fields. About 60.2 per cent of the winter food of *A. brama* was composed of rodents (Jain *et al.*, 1982). Similarly, Fulk and Khokar (1976) found 31.6 per cent bones of rodents in the pellets of *B. bubo*. This indicates that a single species of owl may not be effective for rodent control in all locations.

The Barn Owl often takes its shelter for nesting/roosting in man made structures, like temple towers, unused rooms, barns, gaps or crevices present behind the statues in the sanctum sanctorum and innerside of temple towers. Nests have also been observed in the ground and in gaps present in the vehicles of gods (Neelanarayanan *et al.*, 1993). These observations indicate that barn owl population is limited by non-availability of normal nesting sites. So provision of nest-boxes and perching rods will encourage the owl population considerably. The type of nest box is largely a matter of common sense based on a knowledge of existing nesting sites and different designs are now recommended (Bunn *et al.*, 1982.

Table 3. Efficacy of owl perch against rice field rats

Area (ha)	With owl perch 30 days	Rat burrows (No.) After removal of owl perches 7 days	14 days	21 days
0.6	4	7	18	31
0.8	2	18	22	57
0.8	10	17	32	41
0.3	5	11	24	46
Total 2.5	21	53	96	175

Table 4. Efficacy of owl perch : yield of rice

Treatments	Yield (kg/ha)
Fields with owl perches	5288
Fields without owl perches	2114

Cramp, 1985; Shaw and Dowell, 1990; Sridhar, 1991,Kanakasabai *et al.*, 1994). Similarly, different kinds of owl perches are recommended (Gunathilagaraj, 1991; Kanakasabai *et al.*, 1994). In Malaysia, nest boxes are erected in paddy fields and oil palm plantations to encourage the owl population (Sebastian, 1991; Noor, 1995).

Craghead and Craghead (1956) made a through study on predation by hawks and owls on a rodent population. They concluded that the total weight of food required and the number of prey animals killed by a raptor population in a year are of high magnitude and that raptor population needs to be recognised as an effective means of biological control. Howard (1967), however, observed that the combined predator pressure by hawks, owls, snakes and carnivores usually help only to increase the seasonal and annual density of vertebrate preys rather than the reverse. Therefore, before employing predators as means of biocontrol, one must analyse basic predator-prey interactions. Wodzicki (1973) also reviewed that predators cannot effectively control rodent population.

However, rodents are a serious threat to agriculture and any predator that can help to reduce their numbers must certainly be classed as beneficial. To encourage population of barn owls, several pre-requisites, *viz.*, islands of natural vegetations as refuge and good quality water, are needed. In fields where owl perches are erected, poison - baiting of rodents should be dispensed with and dead rats from poison baiting should be removed when chanced upon. But the relationship between the predator and prey is so complex that it is sufficient to say that barn owls will thin out the numbers of rodents in the immediate vicinity of their roost only (Bunn *et al.*, 1982).

These owl perches were utilised by the King Crow, *Dicrurus adsimilis* (Bechstein) during day time for perching and they hunted the flying insects. The King Crow is almost entirely insectivorous. In olden days, if their presence was desired on a ripe crop for control of crop pests, a few bamboos or sticks stuck in various places encouraged the birds to a certain extent (Mason and Lefroy, 1912). Thus owl perch is useful for the management of both insect and non-insect pests in rice ecosystems.

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COEFFICIENT OF RESISTANCE (K) IN LOCALLY AVAILABLE FOOT VALVES IN COIMBATORE AREA

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ABSTRACT

It is revealed that in Coimbatore pumpset market, the coefficient of resistance(K) is more in the case of hemispherical foot valves and it ranges from 1.66 to 5.24 in the case of dominant foot valves like Gowri, Green, DPF and Mohan Kumar brands. In the case of cylindrical foot valves like Kirloskar, Sujala and Jothi brands the resistance is less and it varies from 0.94 to 2.30. Hence cylindrical shape foot valves are more desirable from the energy conservation point of view.

KEY WORDS: Foot valves, Coefficient of Resistance, Pressure loss, Strainer opening Ratio

In Tamil Nadu, there are about 9.5 lakhs of pumpsets that have been energised, out of which the diesel powered pumpsets being about 5 to 10 per cent and the remaining powered by electricity. A saving of atleast 10 per cent in the power consumption can be accomplished through the well designed foot valves of the pumpsets by reducing the pressure loss. Inorder to findout the efficiencies of foot valves in Coimbatore, a study on various commercially available foot valves was taken up at the Tamil Nadu Agricultural University during 84-85 and the results of the study are reported.

MATERIALS AND METHODS

The study was taken up to analyse the performance of locally available foot valves to identify areas of deficiency. With this view in mind, the locally available foot valves were tested in the hydraulic laboratory. The very commonly used foot valves of sizes 21/2" . 3" and 4" were tested in the laboratory. The locally available foot valves are predominantly hemispherical in shape, slots essentially rectangular in configuration, are oriented in radiyal direction, however there would be one or two rows of slots which are provided in the horizondal direction in the lower most portion. The top hemispherical portion is of solid wall enclosing the assembly of the leather flap. Thi: top portion ends in flange which can be coupled t the other flange fitted at the bottom of the suctio pipe. The details are given in Table (1).

In the course of experiments, water wa pumped from the sump with a five horse powe centrifugal pump and recirculated back. Th suction pipe line was 3" in diameter and delivery 21/2". A pressure tapping has been in the suction pipe line just above the foot valve and connected to the limb of monometer with the other end being open to atmospher. The discharge pumped out was metered by actually collecting in a tank. The pressure loss in the foot valves was observed on the manometer.

An equation was obtained to work out the pressure loss using the observed data. Considering two points for this purpose and applying Bernoullis theorem, we get

$$Ha + x = Hs + \frac{Vs^2}{2g} + hf \text{----------(1)}$$

But $Hs = Ha + H - 13.6\Delta H - (H - \Delta H) + W^1$
$[(H-\Delta H)+Y+x)]$----------(2)

That is $Hs = Ha - 13.6\,\Delta H + H$ ($\because W^1$ NO)------(3)

Eliminating Hs and rearranging for hf