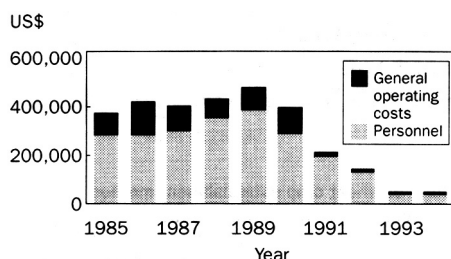


the costs of rat control and damage. The system includes 1) the installation of underground pipes to replace open drainage canals (this removed kilometers of difficult-to-manage rat habitats), 2) the implementation of a closed season twice a year to limit food supply and breeding of rats, 3) periodic bund reconstruction to destroy habitats, 4) baiting stations around farm perimeter in fields and along bunds, 5) weekly flame throwing (primarily in active burrows), and 6) the use of an active barrier system (ABS). The ABS was developed by Y. M. Lam in Malaysia and modified slightly by G. Quick and others for IRRI conditions. It

consists of low plastic fences rather than metal fences. Both systems have live traps behind holes spaced around the barrier. The 24-h surveillance and electric fence system are no longer used.

Changes in rat control practices have permitted mechanization of many farm



Rat control expenditures. IRRI, 1985-94.

operations. Covering drainage canals and the removal of fixed fences allow large machinery to enter fields easily, resulting in other cost reductions.

The importance of rat control at a research station differs from that of farmers. Researchers are typically dealing with crops that are worth more than the cost of the lost grain. For example, a breeding line or experimental plot may represent several years of work, information, and researcher time and effort. Nevertheless, the systems used at IRRI have general application and highlight the importance of general hygiene and sustained effort. ■

## Farming systems

### Fertilizer management on two contrasting soil types in the rainfed lowland rice production system in Cambodia

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We surveyed 25 farmers in 3 communes and 9 villages in the Svay Rieng District, 100 km southeast of Phnom Penh, during July 1994. Annual rainfall is about 1300 mm, mainly between May and October, with rice transplanted in July-August and harvested in December-January. The area contains "black" Aluminosol (plinthaquult) and "sandy" cultural hydromorph (plinthustalf) soil types. Typical analysis of the sandy and

black soils are, respectively: pH (water), 5.9, 5.1; organic C (%), 0.29, 1.09; total N (%), 0.03, 0.11; CEC (meq 100 g<sup>-1</sup> soil), 1.3, 6.7; Olsen P (ppm), 0.4, 2.6; clay (%), 6, 27; silt (%), 55, 38; and sand (%), 38, 35.

More than two-thirds of the surveyed farms had both soil types but generally more black than sandy (Table 1). The black soils, located in the lower parts of the toposequence and farther from the village than the sandy soils, had a more reliable water supply. All but two farmers regarded the black soil as superior to the sandy soil when fertilizer was applied. About 35% of the farmers, however, regarded the sandy soil as superior to the black soil when no fertilizer was applied. On average, farmers applied more fertilizer to black soil than to sandy soil (Table 2). Cost, availability, and ease of transport were major factors affecting the rate of fertilizer application. Farmers did not discriminate between

fertilizer types and applied them as MAP (16% N, 20% P<sub>2</sub>O<sub>5</sub>) or DAP (16% N, 46% P<sub>2</sub>O<sub>5</sub>), depending on availability. Urea was managed differently from the compound fertilizer. Use of farmyard manure (FYM) was closely linked to transportation; hence, sandy soils near the village received most of the manure. The hardness of the soils caused difficulties in plowing and required different transplanting strategies. Water availability to the plant also seemed to vary between the two soil types. Crops matured unevenly and 4-5 d earlier on the sandy soil than on the black soil. Farmers clearly distinguished between the two types of soil and had a sophisticated understanding of their respective management requirements. The black soil, although referred to by farmers as homogeneous, ranged from better to poorer than sandy soil. These factors must be considered when formulating soil classes for extension and research. ■

Table 1. General information on the households surveyed in Svay Rieng District.

Total sample	25
Av farm size	1.6 ha (± 0.7)
Av family size	6.7 persons (± 2.1)
Av area of farms with	
only sandy soil	0.95 ha - 4 farmers
only black soil	1.50 ha - 3 farmers
sandy and black soil	1.75 ha (1.0 black; 0.75 ha sandy) - 18 farmers

Table 2. Rate of fertilizer applied to the sandy or black soil types of Svay Rieng District.

Fertilizer type	Farmers applying fertilizer (no.)		Av rate (kg ha <sup>-1</sup> )	
	Sandy soil	Black soil	Sandy soil	Black soil
DAP or 16:20:0	20	19	39.7 (± 21.2)	48.2 (± 24.3)
Urea	7	8	16.3 (± 7.2)	18.3 (± 13.6)
FYM	3	3	-	-