MOBILE DUNES CREEP FORWARD AND BURY VILLAGES, FARMS, WELLS, AND CANALS.

the reliability of seasonal flooding and thus limited natural regeneration in the *Acacia* and *Tamarix* forests which formed a natural barrier to the sand along the fringes of the flood plain. Rainfall is now almost never sufficient to allow natural regeneration of even the hardiest perennial vegetation outside the flood plain.

The flood-plain forests were largely cleared, in part because of agricultural expansion made possible by diesel pumps. There has been persistent over-cutting for timber and fuel wood, associated with the failure of state forest control, a rising population, sedentarisation of nomads and refugees along the valley, and increased urban demand. Hardy shrubs such as *Capparis* and *Salvadora*, which used to colonise

" IN THE OPEN DESERT WHERE THE SURFACE IS HARD AND SMOOTH, *BARCHAN*, OR CRESCENT DUNES, FORM. THE SPEED OF *BARCHAN* MOVEMENT IS IN GENERAL INVERSELY PROPORTIONAL TO DUNE SIZE, AND IN THIS AREA MOST *BARCHANS* ARE SMALL AND MOVE AT UP TO 30 METRES PER YEAR. "

the low dunes near farmland, have also suffered from continuous browsing by an increasing population of goats and camels. Many of these changes are vividly depicted in the oral histories collected by Cross and Barker (1992).

Prior to the imposition of state control of forests, communities held traditional rights over nearby woodland, under their *umdah*, or sheikh. Community attitudes changed with state control. People were willing to risk being caught felling trees as penalties were often not imposed. The forest service became demoralised and the forests were treated as an open-access resource. The Forest Act of 1989 recognised the need to involve user groups in forest management, and there is provision for the creation of community-owned forests and plantations. But this change has come too late to save the northern riverine forests, which have already been cleared. The result is that previously stabilised dunes at the edge of the flood plan were reactivated.

Wind velocity has to reach a threshold level to entrain sand particles. Once reached, sand movement will continue until wind velocity drops to a much lower level. Often this occurs where obstacles in the path of the wind create turbulence and a protected zone of quiet air (small on the windward side and more extensive to the lee). All sand movement control methods manipulate these principles in order to prevent sand entrainment, or to cause sand deposition, or in some cases to dissipate existing accumulations.

In the open desert where the surface is hard and smooth, *barchan*, or crescent dunes, form. The speed of *barchan* movement is in general inversely proportional to dune size, and in this area most *barchans* are small and move at up to 30 metres per year (Ibrahim 1984). *Barman* dunes merge to form *barchanoid* transverse dunes. Sand also accumulates around obstacles such as rocky hills, trees, or buildings.

Around the agricultural land and villages, more complex dune forma-