

THE RIVERAIN FORESTS OF SIND IN PAKISTAN

By H. P. DAVIS

THE province of Sind forms the north-western seaboard of the vast peninsula comprising India and Pakistan. As the Punjab is called after its five rivers, so the Indus, into which they all merge, gives its name to the land through which it thereafter continues its solitary course.

For a short stretch the river flows in sight of the Kirthar range of the Baluchistan highlands, and at one point even washes its foothills. But by far the greatest part of its wanderings lies through flat or slightly undulating country, where rainfall is almost unknown. The only source of moisture for cultivation here is found in the river itself. In summer, when the snows melt in the Himalayas, the lower waters rise and submerge the surrounding country. This annually flooded area formed originally the limit of cultivation, but the annual distribution of flood water has been brought under control : firstly by the construction of retaining dykes at some distance from the banks : more recently by the damming of the headwaters, near where they enter the province, to form a great reservoir. By this means a large part of the surplus water is held up during the season of abundance and then gradually released over a much wider area. The arable territory has been thereby enormously increased. Distribution moreover is prolonged over the winter months, instead of ceasing abruptly on the recession of the flood, so that now two crops a year can be grown in place of one.

Except in two places, one in Upper and one in Lower Sind, where a more stable rock formation is encountered, the Indus is continuously altering its course; here eroding its banks and there throwing up new alluvial deposits. By constant vigilance and counter-measures on the part of the Irrigation authorities this action is restricted almost entirely to the tract, that, on either bank, is enclosed by the protective dykes. Within these ramparts lie the bulk of the natural forests. These are subjected to an annual submersion lasting several months and extending to a depth of six or seven feet. It is under such conditions that regeneration, if any, must take place, and it is probably this unusual factor which has led to a severely restricted forest flora.

Actually the indigenous forest species are only four in number : Babul (*Acacia Catechu*), Kandi (*Prosopis spicigera*), Lai (*Tamariscus Indica*) and Bahan (*Populus Euphratica*). Of these the first three are universal ; the last occurs sporadically in groups. Babul, besides being the source of several useful by-products, is the fuel tree par excellence of the East. Although extremely durable it is unsatisfactory for general structural purposes. The others are of less value ; Lai, in fact, would have little market except for the general shortage of fuel. The poplar, curiously enough in view of its poor reputation elsewhere, is the only one of the quartette used locally for timber. It is light, easily worked, and very suitable for the brightly coloured lacquer articles which are a peculiar product of Sind. Where timber for furniture or building is required it is more convenient to import deodar or sissoo from North India.

Where forests are established outside the bandh, i.e., by canal irrigation, many other valuable species have been introduced. The only restriction to what can be grown on this rich alluvium is that imposed by the climatic range, which varies in Upper Sind from a light frost to a maximum shade temperature of 125° F., while a somewhat milder range is recorded in the lower part of the province. As these figures indicate, Upper Sind in summer is one of the hottest regions in the world, with a climate rendered all the more trying by the high degree of humidity in the flooded areas. In winter, in spite of almost continuous sunshine, there is a freezing wind from the snow-clad hills in the north-west which drives the inhabitants to fur caps and padded clothing.

In area and population Sind approximates fairly closely to Ireland, though in other respects there is little resemblance. Until the last world war the river Indus, which crosses the province diagonally from north-east to south-west, was, with the exception of the railway on its bank, practically the only rapid means of communication. Owing to the absence of stone, local roads have no foundation and crumble into dust so deep that it is often only by spreading long grasses and reeds that they are rendered even temporarily passable for vehicles. They are used by cars only as a last resort. The bandhs, indeed, provide an excellent surface for motoring (all other traffic being rigorously excluded). Driving, however, requires a steady hand, as the track is only wide enough for one, and there is a steep twelve foot slope on either side. At rare intervals the bandh is widened to allow of two cars passing. Woe betide the driver who for any reason finds his progress blocked between any two of these points, and is obliged to drive his car in reverse to the nearest crossing!

The necessity to despatch military transport rapidly up country during the late war led to the construction of an excellent tarmac road the length of the province. The first hundred miles of this road crosses desert country from Karachi to Kotri, where it meets the river, and thereafter follows the cultivated belt.

The importance of Karachi, which has long been the only seaport serving the north-west of the sub-continent, increased enormously six years ago when this city became the capital of Pakistan. Its position renders it one of the world's most vital airports. Unfortunately its power of expansion is limited, for it lies not on the Indus bank, but some miles to the north of the estuary, with an immediate hinterland of desert and bare hills.

The fuel requirements of the ever increasing urban population has for some years presented a serious problem to the authorities. Domestic consumption is met almost entirely from charcoal and firewood produced in the forests of Sind. With its new capital status, the demands of Karachi have increased immensely and create an intolerable drain on these sources of supply, already strained by wartime overfelling.

The conservation and expansion of these forests is therefore of the utmost importance. By setting aside for afforestation part of all the new

lands brought under irrigation by the original Sukkur barrage, and by providing for a generous measure of afforestation in all the similar irrigation schemes recently undertaken, notably the new barrage under construction at Kotri, the local Government are now endeavouring to augment the existing fuel reserves, and also, where possible, to create forests of timber species capable of supplying local needs.

To a forest officer, even one who is accustomed to many varying types of tropical forests, the first introduction to the Sind riverain areas is a unique experience. Forests are elsewhere usually associated with hills or broken country: the level lands are too much in demand for agriculture to be spared for tree growth. In the tropical jungle, too, we are accustomed to find a very wide variety of species and ground flora, and abundant wild life. Sind offers the reverse of these conditions. The terrain is dead flat; the lack of ecological variation is monotonous, and, although wild duck on the water and partridge on the land are plentiful, the only indigenous quadrupeds appear to be wild pig and a small variety of deer. The compartments are laid out in chessboard fashion, separated by broad rides, and each covers a quarter square mile. The chief species are thorny and often offer an impenetrable thicket which precludes all but the most objective inspection. Growth is rapid and the rotation short. The main silvicultural problems are concerned with natural regeneration, and in the inundated, as distinct from the irrigated areas, these are of some complexity. For ideal soil conditions there must be a good "abkalani," a word which in Sindhi connotes the period of inundation, on the abundance and duration of which, as on the monsoon elsewhere, the whole success of growth depends. Babul, the most desirable species, does not coppice well and is a capricious germinator. It has a hard pod, intended by Nature to be disseminated after digestion by grazing animals, and its seeds do not readily respond to other treatment. The most effective sowing is by broadcasting from boats, just before the recession of the waters, so that germination may take place on the heated surface of the mud. This method is adopted on the freshly felled areas as well as on the newly formed alluvial tracts. Besides being a very laborious proceeding it involves a very careful judgement by the local staff of the most propitious moment. This means in practice that the water must have become so shallow that the boat is continually grounding, and becomes merely a receptacle of seed pushed or dragged by wading men. The other two species reproduce freely from coppice and require less elaborate propagation.

In the irrigated plantations regeneration is usually accomplished by agri-cum-silvicultural methods. The land is leased, often at a high rental, for cultivation of cotton or cereals, and the tenant undertakes to level the ground, to sow lines of seedlings between his crops, and to tend them for the period of his occupation. In irrigated plantations the duration and depth of the inundation is controlled by sluices admitting the prescribed quantities of water. Levelling has to be accurate in order

to make the most economical use of the water, which is expensive and limited, and this operation requires technical skill and experience. By leasing out the land on agri-silvicultural tenure to a contractor the necessity of carrying out the levelling and watering by departmental action is avoided, while a substantial return is secured which can be off-set against the expense of irrigation in the later stages of the rotation. After three or four years the side shade from the rows of young trees begin to overshadow the crop and the tenancy ceases.

One peculiar feature of the management of unstable riverain areas lies in the annual loss of area by erosion, counter-balanced in the long run by the accretion of new land from which the river has receded. By close observation it is usually possible to forecast the direction and degree of each change in the river's course. Here the forest officer must work in close collaboration with his opposite number of the Irrigation Department. The general set of the river at all points of its course is checked and plotted by technical experts after each year's abkalani, and these results are used as a guide for the demarcation of the areas doomed to erosion, which are then sold standing as part of the year's annual cut. Apart from the adverse effect of these fellings on the symmetry of the working plan, where they involve often the sacrifice of immature stands, the supervision of these erosion strips, known in the local language as "loot," creates a major headache for the forest officer. Those forecast early and sold early in the working season are straightforward enough. Unfortunately the caprice of "old man river" frequently foils the best laid schemes of the experts. From the commencement of the warm weather, when the river commences to rise with the melting of the Himalayan snows, the closest watch must be kept by the local staff on the danger spots within their charges, and the slightest eccentricity reported post haste. Emergency strips may have to be suddenly selected, and attempts made to salvage the growing stock, if possible through a purchaser, or if not by departmental action. With a rapidly rising river the sequence of operations often has to be telescoped, when marking, felling and extraction proceed simultaneously, with the waves sometimes lapping the feet of the labourers as they fell and pile the faggots in the waiting boats.

The reverse process, the reafforestation of the newly recovered territory, is much more leisurely. These "kuchos," as they are called, do not automatically revert to the Forest Department, even if they originally formed part of forest. They must be formally claimed, against possible counter-claims by private owners, and only after re-allotment can re-afforestation proceed. There is intense land-hunger in Sind, as in most regions with an expanding population, and the Forest Department is at all times engaged in a fierce rearguard action to maintain its territory.

The life of a forest officer in Sind follows the general pattern of that of a district officer in the tropics. Several months are spent in headquarters and the remainder of the year "on tour," that is to say in moving systematically around his charge. He is usually accompanied by his

“bandh-o-bast,” a comprehensive word used to cover servants, staff and all their necessary paraphernalia.

The period from July to September is that usually spent in headquarters, with occasional flying visits to see urgent operations afield. This is the hottest time of the year in Sind, and coincides with the floods, when the riverain forests are submerged. Little or nothing can be done there till the water subsides. It is, however, a very busy time in the office, with sales, conferences, administration reports and audits, and all the important business which cannot be dealt with on tour.

Touring in this season is a severe ordeal to all but those conditioned to withstand intense heat. Forest inspection has to be completed before sun-up and the rest of the day spent indoors in semi-darkness in a temperature that, in spite of the ceiling fan, seldom drops below 100 degrees.

But if summer inspections involved a certain discomfort, conditions in the cold weather were delightful. A chain of Government rest houses stretches at intervals along the river banks, permitting a stay of several days at each, and the various departmental officers plan out their itineraries many months ahead with such exactitude that they follow each other in unbroken sequence like golfing couples on a crowded course. In the writer's time touring was usually *en famille*, and a station wagon sufficed for all immediate necessities and personnel, while the rest of the equipment travelled by train where possible, or by hired lorry, but most commonly by camel. Touring officers usually engage a camel contractor for the season, who provides all the necessary animals. These include one or more trained for riding, for this is by far the most convenient medium for forest inspection. Forest officers all the world over are wont to pride themselves on their walking powers, but a day's tramp over the soft sand of a Sind forest is calculated to shake the most resolute spirit. The advantages of camel riding are two-fold, the extra height of the animal adds enormously to one's field of vision, and its pace enables one to cover far more ground in a single outing with less fatigue.

The Sind riding camel carries an elaborate superstructure, which makes him appear to have two humps. This illusion is produced by the artificial backrest provided for the passenger, who sits immediately behind the driver, with the real hump, concealed by a cloth, between. The camel possesses the unique accomplishment of kneeling with its hind as well as its forelegs, and is mounted while in this position.

The transport of kit between successive halts is always carried out at night, and as darkness falls on the eve of departure the camp is full of the dim recumbent shapes of camels being loaded, and the clank of metal and the creak of cords. Now and then objurgations of the drivers are broken by the harsh bubbling groan with which one or other beast expostulates against any further impositions. When the last load is in place the whole caravan rears up and is away with surprising sudden-

ness, and nothing remains of it but a distant tinkling in the dark.

Other aspects, too, of Sind life have their evocative quality. White sails moving among the tree tops are a quaint feature in a forest scene, a constant reminder of the river's presence. Sailing barges are, of course, in regular use on the Indus, and much of the forest material is extracted by water. Such craft descend the river easily enough in the fair season. It is more difficult to return, as the stream is then too narrow to permit of tacking, and the boats have to be laboriously towed by manpower along the banks.

In spite of the frequent monotony of the forests a landscape painter in Sind would find plenty to engage his attention. The drab firelines often open on to charming vistas of sky and stream. But it is along the canals that one sees the finest contrasts. The green lines of babul stand out with brilliance, and the vivid winter foliage of the poplars, as they curve away into remote distance, is a sight to be remembered.

The prevailing style of Sindhi architecture is unimpressive, consisting mainly of flat-roofed houses, sparsely windowed and densely clustered to afford mutual shade and protection. Hyderabad city, which must not be confounded with its namesake of the Deccan, which is in India, not Pakistan, is a significant exception. Standing on rising ground by the Indus, it shows up impressively from a long distance, and puzzles the stranger by its extraordinary outline. This is produced by the air-scoops, rising from every rooftop like brooding spectres, and giving the approaches of the town a weird and somewhat sinister appearance. These "moongs," as they are called, are a most effective device, that might be advantageously adopted elsewhere, for catching and utilising the prevailing breeze. Their invention is an indication of the practical enterprise of the inhabitants, for Hyderabad, besides possessing an historical past, is the home of one of the most progressive commercial communities of the East, which has its branches and agents from Gibraltar to Shanghai.

Several miles from Hyderabad is the newly founded Miani Forest school, where subordinates up to the rank of forester receive their training. The curriculum includes a fair measure of practical work at which the students, who are mostly drawn from the cultivating classes, excel. Each has his own plot allotted to him, in which he is taught to apply not only the usual principles of nursery work but also their use in conjunction with artificial irrigation, upon which all the afforestation schemes of Sind depend.

At one of the few points where the course of the river is stable there stands a small town still bearing the traces of ancient fortification. There is a very strong local tradition that here resistance was offered to the conquering army of Shikander, better known as Alexander the Great, on his march down the Indus to the sea. Historians have not located with any certitude the various episodes of this phase. According to original sources several forts were encountered along the bank, in the storming of one of which the monarch exposed himself recklessly and

was wounded. The old fort at Saiwan stands in a distinctly strategic position, capping an almost vertical knoll on the very edge of the river, where it commands a wide view on all sides. It is a possibility that this may be the authentic scene of Alexander's exploit. The crest is now the site of a couple of Rest Houses, and the touring officers who occupy them to-day look out over a prospect of forest which cannot be markedly different in content from that encountered by that doughty warrior.

But the Sind forests are linked with even further antiquity than Alexander's invasion. This is the buried city of Mohendro Dero, the existence of which was only discovered in 1922. These remains, which cover about a square mile, are now agreed to belong mainly to the third millennium B.C. They indicate a remarkable degree of civilisation. The town is laid out in chess board style, divided by main and side streets into convenient rectangular blocks. The streets are narrow and unsuitable for vehicular traffic, very like many towns of Sind to-day where protection from the sun's rays is the first consideration. The houses are built of burnt brick, which argues an ample supply of fuel for baking, such as might have been provided by forests similar to those of the present day. The city is situated entirely within the original boundaries of reserved forest and is protected from inundation by a bandh. Previous to its discovery as a site of major archeological importance, it had received its name from the curious series of mounds which cover the area, and were the reputed burying place of some previous generations. Mohendro Dero means in Sindhi "the mound of the dead." It was only in excavation of these tombs that a whole system of underlying strata was found, dating from a very remote urban civilisation.

Just how advanced these ancient people were can be gauged from the excellent system of sewerage found beneath the main streets, fed by subsidiary drains from the houses, many of which were also fitted with rubbish shoots leading down into permanent brick bins, presumably cleared by the municipal sweepers of the day. In the matter of public swimming baths Mohendro Dero, for its size, could show a lead to our own capital, for it possessed at least one very fine establishment, 40 feet by 24 in area, and 8 feet deep, lined with bitumen, surrounded by changing rooms, and with arrangements for changing the water.

The best evidence of the conditions of life existing at the time is furnished by the objects found in excavation, some of which are on view in the museum on the site. Among these we have pottery, jewellery, toys and images. But the most striking of all are the engraved seals, which are executed with great technical skill. These are important not only for their inscriptions, which have so far baffled the scholars, but for the light they shed directly or indirectly on the climate and customs that prevailed in Sind in the third millenium B.C. In them are shown not only domestic animals very much as they are to-day, but also elephants, tigers and rhinoceros, none of which are found at present within a considerable distance of the Indus valley. This would seem to indicate the

existence there in those days of the mixed deciduous rain flora which is the usual haunt of these animals, quite unlike the present inundated desert forest.

Apart from Mohendro Dero there is now abundant evidence available to show that in prehistoric times the Indus flowed through a densely populated region, and this points to a considerable climatic change in the course of time. The extensive use of burnt brick found in the excavations has been taken to show that not only was ample fuel available, but the necessary manpower to use it. While the inundated fringe of the Indus might conceivably have produced the requisite fuel, even as it does now, it is unlikely that it could at the same time have supported a numerous population. There must therefore have been abundant arable land in the vicinity, dependent, not on river flooding, but on actual rainfall. This view is borne out by the frequent traces found by Sir Aurel Stein in the adjoining rainless hill region of Baluchistan, of artificial dams and terraces evidently designed to conserve a copious annual rainfall.

It is therefore, I think, reasonable to assume that the southwesterly monsoon currents, that visit the rest of the west coast of the sub-continent, extended once far enough north to include Sind, and that the Indus valley enjoyed originally the double advantage of regular rainfall combined with inundation, which must have rendered it one of the most fertile regions in the world.
