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ROYAL COMMISSION
ON
AGRICULTURE IN INDIA

INTRODUCTION
TO

VOLUME ~~VI~~

TAKEN IN
SIND.



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AGRICULTURE IN INDIA

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TO
VOLUME XI

EVIDENCE ²⁸
TAKEN IN
SIND



CALCUTTA: GOVERNMENT OF INDIA
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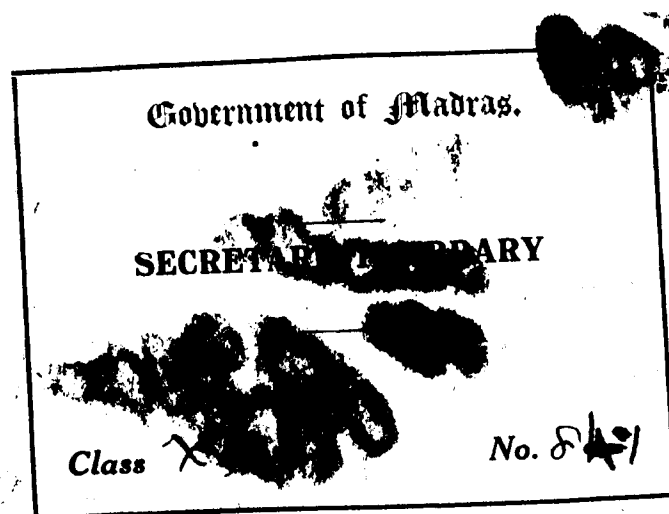
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28

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SIND



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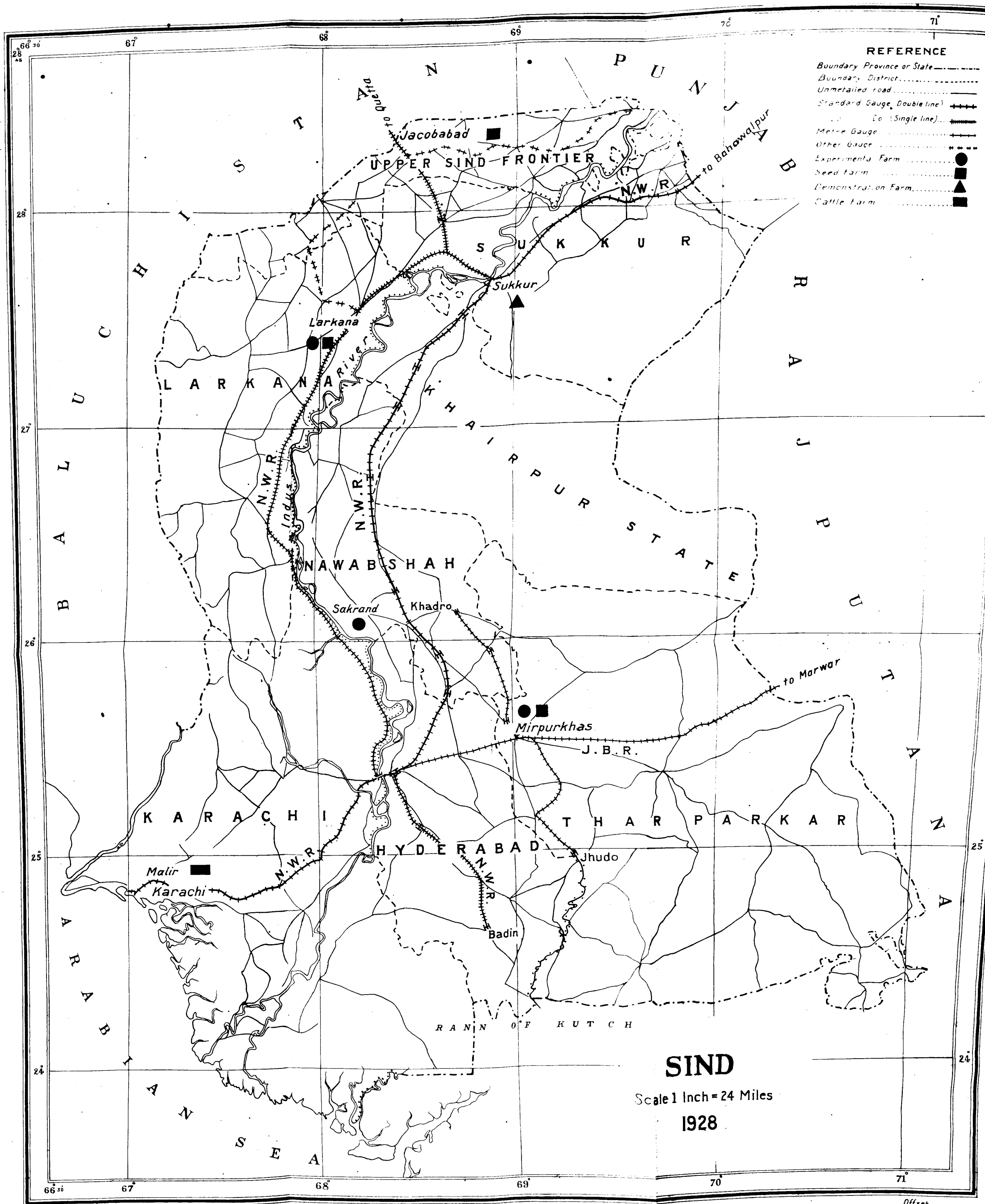
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SIND

1. GENERAL FEATURES.

The Province of Sind, lying between 23° and 28° north latitude, forms the extreme north-western portion of the Bombay Presidency and consists of the lower valley and the delta of the Indus. It is bounded on the north by the Punjab and the Bhawalpur State; on the east by Rajputana; on the south by the Rann of Cutch and the Arabian Sea; and on the west by Baluchistan. The province, excluding the State of Chattrpur, consists of seven British districts and covers an area of about 47,000 square miles.

The soil of the province is almost entirely alluvial, having been formed by the detritus of the Himalayas carried down by the river Indus from which it takes its name. For much of its length in the alluvial plain, the river bed is most unstable and the river prone to alter its course, sometimes by many miles, in a single flood season. There are traces of ancient river beds in many parts of the tract, and the Indus is known in past ages to have discharged its waters into the sea at a point about 200 miles east of its present mouth. For about five months in the year the level of the river rises above that of much of the surrounding country and thus enables the water to be drawn off for irrigation by canals which take off from the main river at points where its banks have for long been stable. To the east, the level valley of the Indus is bounded by the Kirthar Range of mountains which separates Sind from Baluchistan; this range has an average elevation of 2,000 ft. with some peaks rising to 7,000 feet. The hills are stony and barren but support a characteristic vegetation and afford grazing to large herds of cattle, sheep and goats.

The forests which consist mainly of *babul* (*Acacia arabica*) fringe the banks of the river for 300 miles.

The finest and most productive region lies in the neighbourhood of Shikarpur and Larkana in a long, narrow stretch extending 100 miles from north to south, enclosed on the one side by the river Indus and on the other by the hills of Baluchistan. Another great alluvial tract with an average width of 70 to 80 miles stretches westward from the Indus. Sandhills abound near the eastern border, and large tracts remain sterile for want of irrigation.

The soil of Sind consists of a plastic clay strongly impregnated with salts and is remarkably fertile under irrigation.

No soil survey of the province has been made. Five types of soils are, however, usually distinguished: (1) *variasi*, loose sand fit only for shallow cultivation, (2) *kacha*, land resulting from recent inundation, (3) *chiki* or *paki*, hard black soil which has been under water for some time and which is usually very stiff and heavy to work,

(4) *rao* or *raewari*, soil enriched by the detritus of hill torrents, and
(5) *dasar*, a term widely used for soft or light coloured but productive soil. Besides these, there is also the *kallar* or salt-affected land.

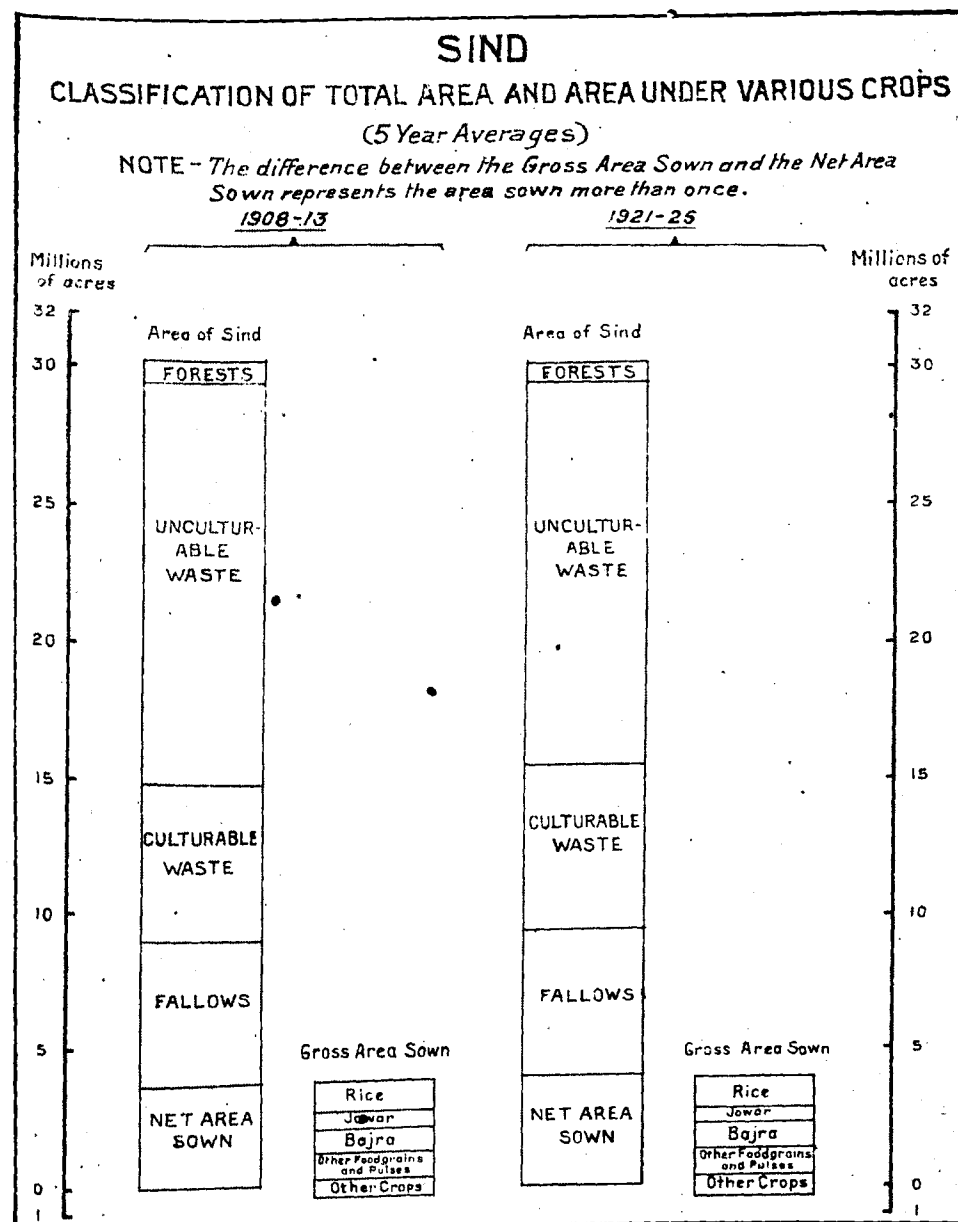
Owing to the absence of monsoon rainfall, the climate of Sind ranks amongst the hottest in India. On the coast, sea-breezes render it equable but, in northern Sind, variations of temperatures are extreme. For the whole province, the average mean temperature of the summer months is 95° and that of the winter months 60° . In the north, the summer maximum frequently rises to 114° and occasionally to 125° ; while in the winter, frost occurs at night and, even in the day time, the temperature falls to 40° . Nowhere in India is the hot weather so prolonged.

The rainfall of Sind is very scanty and irregular; in some years, there may be no rain, and, in others, cyclonic storms may bring 16 inches in a day. The average is about 8 inches. Except in the two areas noted below, cultivation depends not upon the rainfall, but upon the river Indus. These areas are the hilly tract of Kohistan on the west, and the tract to the south-east of the province known as the Thar desert. These tracts are above the river valley and cannot be reached by canals; rainfall is uncertain and the cultivation is most precarious. The inhabitants are chiefly nomadic cattle and camel breeders, and, to them, agriculture is only a subsidiary industry.

The height and duration of the inundation of the river is dependent on the melting of the snows in the Himalayas and on the rainfall in the Punjab, and varies greatly. If the river remains high from May to September, a bumper harvest may be reaped over an area of 4.5 million acres. If the river fails, as it did in 1918-19, the area falls to 2.75 million acres and the outturn is very poor.

The most important crop in Sind is rice (1,000,000 acres). The next in importance is *bajri*, which covers almost the same area. The other important food crops are *juar* (600,000 acres), wheat (500,000 acres) and gram (200,000 acres). Amongst non-food crops, cotton was cultivated last year in 326,000 acres and oil-seeds in about the same area. During the decade, 1911-21, the minimum annual value of the crops in the whole of Sind was, according to an estimate made by the Agricultural Department, Rs. 11 crores in 1918-19 and the maximum Rs. 24.1 crores in 1916-17. The relative importance of the chief crops of Sind is shown by the accompanying diagram.

Rotation of crops is little practised in Sind. Large areas are kept fallow every year. The area privately owned but not cultivated exceeds the net cropped area. Government waste land including forest forms two-thirds of the entire area of the province and of this about a third is culturable waste.



2. PROVINCIAL INCOME
GOVERNMENT OF
(Figures are in
Revenue and Expenditure)

Receipt heads	1921-22	1922-23	1923-24	1924-25
<i>Revenue Receipts</i>				
Principal Heads of Revenue—				
Land Revenue	144.2	83.5	72.1	62.0
Excise	81.0	35.5	40.3	30.1
Stamps	16.0	19.4	20.2	19.8
Forests	8.0	6.2	6.3	6.0
Registration	1.8	1.6	1.5	1.5
Scheduled Taxes			0.2	0.6
Irrigation—				
Works for which Capital accounts are kept (Net receipts after deducting working expenses.)	— 24.0	36.5	39.3	39.2
Works for which no Capital accounts are kept	0.5	0.5	0.1	0.1
Interest	1.7	3.6	2.7	1.8
Civil Administration—				
Administration of Justice	1.5	2.1	1.9	1.8
Jails and Convict Settlements	0.8	0.8	1.0	1.2
Police	0.2	0.3	0.2	0.4
Education	0.7	1.0	1.0	1.5
Medical	0.2	0.4	0.4	0.3
Public Health		0.1	0.1	0.2
Agriculture (including Veterinary and Co- operation).	0.4	0.4	0.7	0.7
Miscellaneous departments	0.1		0.1	0.1
Civil Works	0.5	0.9	0.7	0.9
Miscellaneous	1.8	2.2	3.2	2.6
Total ..	185.4	195.0	192.0	180.7

N.B.—1. As there is no separate budget for Sind, the above figures have been extracted from
2. Figures for Capital Receipts in Sind are not available.

AND EXPENDITURE.

BOMBAY (SIND)

lakhs of rupees)

charged to Revenue

Expenditure heads	1921-22	1922-23	1923-24	1924-25
<i>Expenditure charged to Revenue</i>				
Direct Demands on the Revenue—				
Land Revenue	23.0	40.1	39.2	13.8
Excise	2.5	1.3	1.3	1.9
Stamps	0.7	0.9	0.8	0.7
Forests	4.2	3.5	3.6	4.1
Registration	0.8	1.0	0.9	0.9
Irrigation—				
Works for which Capital accounts are kept	11.4	12.9	16.2	21.5
Miscellaneous Irrigation Expenditure ..	38.2	23.1	13.5	23.1
Civil Administration—				
General Administration	14.3	20.7	19.6	44.8
Administration of Justice	10.0	9.6	10.0	11.5
Jails and Convict Settlements	6.3	5.9	5.2	5.9
Police	40.8	36.1	35.1	36.0
Ports and Pilotage	0.1	0.1	0.1	0.3
Education	23.4	23.0	26.6	28.8
Medical	5.9	4.6	5.3	5.3
Public Health	3.1	3.5	2.9	2.9
Agriculture (including Veterinary and Co- operation.)	3.5	3.3	3.3	3.4
Miscellaneous departments	0.3	0.3	0.3	0.3
Civil Works	22.2	10.4	6.5	8.6
Miscellaneous—				
Superannuation Allowance and Pensions ..	5.9	6.1	6.9	7.1
Stationery and Printing	1.2	1.3	0.9	1.0
Miscellaneous	1.5	1.3	4.0	5.2
Total ..	219.3	209.0	202.2	221.5
<i>Capital Expenditure in Sind</i>				
Construction of Irrigation Works ..	5.6	19.1	51.5	124.0
Capital outlay on Improvement in Public Health.		5.3	0.5	
Civil Works not charged to Revenue		7.1	5.5	12.2
Total ..	5.6	31.5	57.5	136.2

the budgets for the Presidency of Bombay.

3. REVENUE ADMINISTRATION AND LAND RECORDS

Sind is a province of the Bombay Presidency and is under a Commissioner, who has considerably larger powers than those of an ordinary Commissioner of a division. Under certain Acts, he has the powers of a local government, whilst under others he has powers which in the rest of the presidency are exercised by heads of departments. There are seven districts in Sind, of which six are under Collectors and one under a Deputy Commissioner. The Collector or Deputy Commissioner is in charge of the revenue administration of the district and is also the chief magisterial authority, and the district registrar. For each taluka in the collectorate, there is an officer called the *mukhtiarkar* who, in addition to his revenue duties, is in charge of the sub-treasury and exercises magisterial powers. An assistant or deputy collector is in charge of a revenue subdivision comprising several talukas. The collection of the land revenue is performed by the *tapedars*, each of whom is responsible for a group of villages which varies in number from five to ten. Between the *mukhtiarkar* and the *tapedar*, there is a staff of inspecting officers known as supervising *tapedars*, of whom there is one to every four or five *tapedars*. The Manager of Encumbered Estates is an officer of the Indian or the Provincial Civil Service. He is appointed under the Sind Encumbered Estates Act, which was passed to provide relief to *jahagirdars* and *zamindars* in debt. The management of their estates is undertaken by the Manager upon an application by the landholders.

The functions of the Land Records Department are to provide statistics necessary for sound administration in all matters connected with the land, to reduce and simplify litigation in the revenue and civil courts, to provide a record of rights for the protection of all who have interests in land, and, lastly, to simplify and cheapen periodical settlement operations. A branch of the provincial Land Records Department is located in Sind and is under a Superintendent of Land Records. The work in the district is carried on by district inspectors, *tapedars* and supervising *tapedars*. Control over the district staff is exercised by the Collectors, the functions of the Superintendent of Land Records being limited to inspection and advice. A complete record of rights and interests in land has been prepared for the unalienated villages in the province except the Kohistan tract of the Karachi district and the desert tract of the Thar and Parkar district, and has proved of great value to the public.

Before the advent of the British in 1843, the land revenue was levied in kind as a share of the produce. The system was continued for some time but payment in cash was introduced at an early date. Later, a survey and settlement on the lines of what had been adopted in the Bombay Presidency was introduced in Sind, but had to be altered to suit the special conditions of a province where a large part of the land is left fallow every year. The assessment is fixed by the method known as irrigational settlement. In this settlement, the villages of a taluka are divided into groups arranged in accordance with the facilities which they enjoy for obtaining water and for the disposal of produce at a market. Rates are then prescribed for the different methods of irrigation in each group of

villages. The pitch of the assessment is governed by the trend of prices, the value of land, and the state of the canals. This system has the merit of leaving the occupant the choice of the best method of irrigation, season by season, suited to the height of the river and the water supply available. Assessment is levied on each survey number only when it is cultivated; the size of the number has been reduced to the area cultivable with one pair of bullocks. No assessment is collected on lands which are not cultivated, but to prevent the land lying idle, a fallow assessment is charged once in five years. The period of settlement is normally fixed at twenty years, except in areas where important irrigational projects are under consideration or which are particularly exposed to the vagaries of the river.

There are few tenant rights in existence. The bigger zamindars cultivate the lands through *haris* who are tenants-at-will and usually pay rent in kind. The smaller zamindars cultivate themselves.

4. THE CULTIVATOR.

The census of 1921 gave Sind a population of 3,280,000 which was only slightly in excess of the population of 1901. There had been an appreciable increase between 1901 and 1911 but this increase was wiped out by the influenza epidemic of 1918 which took a great toll of life in Sind, especially in rural areas. The decrease in rural population between 1911 and 1921 was highest in the Karachi district (14.7 per cent), and lowest in the Nawabshah district (6.6 per cent).

There are 27 towns in Sind and 5,167 villages. The province is sparsely populated, the average number of persons per square mile being 71. Of the population, 2.4 millions or 75 per cent are Muhammadans and 800,000 or 25 per cent are Hindus. If the population is classified by occupation, we find that 1.9 millions are landholders and tenants or agricultural labourers and their families. The non-agricultural population is 1.4 millions. The agricultural population can be divided into three classes, (1) the big zamindars, a small but very influential class, (2) the small zamindars or peasant proprietors and (3) the *haris* or ploughmen who have no direct interest in the land.

The number of holdings in Sind is about 220,000. Their size and distribution is shown in the following Table:—

1. Under 5 acres	..	68,819
2. Between 5 and 25 acres	..	93,959
3. " 25 " 100 "	..	42,015
4. " 100 " 500 "	..	11,596
5. Over 500 acres	..	2,251

The total area in these holdings is a little over 8 million acres; the average area of the holding is 38.7 acres and the average assessment per holding about Rs. 54. The proportion of holdings in each class varies from district to district. The Upper Sind and the Thar Parkar districts have large estates. In Larkana and Sukkur, the proportion of large landholders is very small, but, in the former, they hold a considerable proportion of the land.

The *hari* is a tenant who pays rent usually on a share basis, the share being half the crop on flow land and one-third of the crop on lift

land. He is, as a rule, financed by the landowner himself, who also directs what is to be grown and how it is to be grown, while the *hari* provides his own men, bullocks and implements.

The problem of the consolidation of holdings was investigated but it was found that the evil of fragmentation does not exist in Sind to any large extent and that as large areas of land are still available, the problem has not yet become important.

In years of good inundation, the economic condition of cultivators in Sind is favourable. They are not so well off in the delta, as the region is malarial. The position of the farm labourer has improved very much in recent years, as there is a greatly increased demand for labour. The extension of peasant proprietorship under the Sukkur Barrage system will also benefit men who have the necessary industry and ambition to take advantage of the new conditions.

The staple food of the agrarian classes is either *juar* or *bajri*, except in the delta and the rice-growing parts of the north where rice is generally used. The consumption of wheat is increasing. All classes, except a few Hindus, eat flesh, fowl and fish. The ordinary villager lives in a low hut consisting of mud walls and a roof of thatch, with a hedge round it. Large sections of the people, however, especially in the delta, live in movable shelters of brushwood and thatch. The house of the zamindar is built of dry bricks with a flat roof, and is usually surrounded by a wall enclosing the court-yard.

The Sindhi is very hospitable and inclined to improvidence in his expenditure; and, in consequence, large numbers are in debt. Where there are no co-operative societies, the cultivator resorts to a *bania* who is both a shopkeeper and a moneylender. He advances to the cultivator whatever he requires on condition that the crop is brought to him for disposal. Wherever the co-operative movement has taken root, the cultivator is being freed from this incubus and is becoming independent. The cultivators have ample leisure after their agricultural operations are over; but are reluctant to leave their villages and go to towns to seek employment. Occupations, such as the care of livestock, goats, sheep and cattle are largely in the hands of special classes. For large works, labour has often to be imported from outside Sind. When the Sukkur Barrage is completed in 1931, and the irrigation system under it developed during the next generation, irrigation will be available for the whole year over the greater part of Sind instead of for four months, and full employment will thus be available for a large proportion of the population.

5. THE AGRICULTURAL DEPARTMENT.

The Agricultural Department in Sind is an integral part of the Department of Agriculture in the Bombay Presidency and is, therefore, under the control and guidance of the Director of Agriculture, Poona. Work in connection with agricultural problems in Sind began with the establishment of an experimental farm at Hyderabad in 1884, when experiments were made with American cotton and the Egyptian date palm; the distribution of wheat and rape seed in the Nara Valley was also commenced. Very little headway was, however, made until 1903 when the construction

of a perennial canal (the Jamrao Canal) suggested the possibility of growing long staple cotton and experiments were also undertaken with wheat, *berseem* and the irrigation systems in vogue.

In 1906, a special officer was appointed to carry out investigations into Sind conditions and especially to study the problems of cultivation of Egyptian cotton. This led, in 1907, to the appointment of a deputy director of agriculture for Sind. Since then, work has developed in several directions. Excluding the lower grades of assistants and the special staff employed in connection with the experimental work undertaken in view of the Sukkur Barrage, to which reference is made below, the staff now consists of—

- (1) one deputy director of agriculture;
- (2) one botanist. Although he is designated cotton breeder, he is also in charge of rice breeding and wheat breeding;
- (3) a divisional superintendent of agriculture who is in charge of work in east Sind; and
- (4) thirteen graduate assistants.

The Livestock Expert for the Bombay Presidency has control of a farm in Sind for the maintenance and improvement of the red Sindhi or Karachi breed of cattle. Sind can also indent on the services of expert officers of the Bombay Government, such as the Agricultural Chemist, Economic Botanist, etc.

The main lines of experimental work have been the following:—

(1) *The introduction of long staple cottons.*—Attempts to introduce Egyptian varieties have for the present been abandoned; and attention is now concentrated on the introduction of American cottons. The two Punjab types, 4 F. and 285 F., have now been introduced on a large scale, especially in the Jamrao area. These are high yielding cottons, but the cotton breeder in Sind has succeeded in isolating still higher yielding strains from the general Punjab stock. These Punjab and American cottons are being multiplied as fast as possible; and it is hoped that Sind will shortly be self-dependent in the matter of American cotton seed.

(2) *The improvement of Sind deshi cotton by selection.*—Of the several strains isolated during the last few years, the variety known as 27 W. N. has been selected for distribution and has become popular.

(3) *The improvement of wheat.*—Here the work being done is the introduction of Pusa and Punjab wheats as well as the development of high yielding strains of Sind wheat. Pusa 12 has become the standard type of wheat in upper Sind. Two new strains have, however, now been evolved which are doing even better than Pusa 12. It is now possible to recommend different varieties and improved strains of wheat for different parts of Sind, and these have already become very popular. A wheat seed farm is maintained at Jacobabad.

(4) *The improvement of rice.*—Experimental work on rice has been recently taken up; and early and more prolific types have now been isolated which, on experimental areas, give an increased yield of 20 to 30 per cent. These are now being tried on a large scale in cultivators' fields.

(5) *Work on agricultural implements.*—Agricultural implements used in Sind are generally very crude. An appreciable advance has

now been made by the department in the introduction of the Egyptian plough and various types of implements of economic value.

The establishment of the Sukkur Barrage canal system will revolutionise the character of the agriculture in Sind. When the scheme is completed, the cropped area in Sind will be increased by two to three million acres annually, and cropping will be possible throughout the year. New and difficult problems will arise when perennial irrigation is introduced into a country which has hitherto been watered only during a small part of the year. The Government of Bombay, therefore, appointed, in 1923, a committee to make suggestions as to the best way in which such problems should be tackled. The committee recommended the starting of experimental work at once under the best and most scientific direction obtainable and the finance thereof on a liberal scale; and, in particular, (a) the establishment of three first class experimental stations: one on the right bank of the Indus, preferably at Larkana, another on the left bank of the Indus at Sakrand, and a third at Shadipalli for the Eastern Nara tract; (b) the establishment of five subsidiary stations; (c) experimental work on fruit culture and cattle breeding; (d) larger expenditure on propaganda, the provision of higher agricultural education in the province itself, and the separation of the Agricultural Department in Sind from that of the presidency proper, the former being placed under the sole control of a local Director of Agriculture. The total capital cost of this scheme is estimated at Rs. 7,69,000; and the recurring cost, Rs. 4,10,000. The Government of Bombay accepted the recommendations with certain reservations but have not yet succeeded in finding the finance necessary. For the present, provision has been made only for the new experimental station at Sakrand with a Director and a botanist, a soil physicist and chemist, a horticultural expert and six graduate assistants under him; and also for an agricultural engineer for Sind. The land at Sakrand is typical of large areas in the country. The problems which the station is required to solve are mainly three: (1) to determine what crops can most profitably be grown under Barrage conditions in central Sind, and to breed types of such crops; (2) to find the best way of using the water in the prevailing conditions and (3) to find out the effect of perennial irrigation on the soil. Experimental work on all these problems was started at the station in 1926.

Demonstration and propaganda.—Two difficulties in the way of introduction of agricultural improvements in the past have been the illiteracy of the people and the want of proper finance. The close co-ordination of the departments of Agriculture and Co-operation in Sind is helping the solution of the question of finance. Since 1922, the carrying out of agricultural propaganda in northern and central Sind has been entrusted to the Assistant Registrar. The general control of the work is in charge of a divisional board composed of six members of whom four are non-officials and two officials—the Deputy Director of Agriculture, and the Assistant Registrar. Taluka development associations have been particularly successful in Sind, and there are fourteen such associations now in existence. They have demonstrated

the value and extended the use of improved seed, implements, and modern methods of cultivation, have distributed large quantities of cotton and wheat in many areas, and are becoming an essential part of agricultural propaganda in the country.

Agricultural education.—As there is no provision for the imparting of higher agricultural education in Sind, scholarships have been given since 1907 to enable students from Sind to go to the Poona Agricultural College. Selections are made by the Commissioner, and each scholar signs a bond that he will work in the Agricultural Department for five years after graduation if his services are required by the department. From 1918 to 1922, these scholars were sent to the Punjab Agricultural College at Lyallpur instead of to Poona; but since 1923, the scholarships have again been transferred to Poona, as the Punjab authorities demanded the full cost of their training. The number of scholarships awarded at present is six per annum. Besides these scholarship-holders, there are a few private students from Sind at the Poona Agricultural College.

In 1912, a school for imparting vernacular agricultural education to boys belonging to cultivating classes was opened at Mirpurkhas with the object of enabling them to improve their own lands, to manage the estates of zamindars, or to enter agricultural service. The school never became popular and was closed in 1922. Since 1924, nine agricultural bias schools have been opened in Sind.

The cost of the department in Sind last year was Rs. 1,55,908. This is exclusive of the cost of the Sakrand farm, for which the amount budgeted was Rs. 1,35,000.

Livestock—Cattle breeding and dairying.—Sind is the home of three breeds of cattle of considerable merit:

- (1) the Red Sindhi or Karachi, the best milking breed in India;
- (2) the White Sindhi or Thar Parkar, a good milker and an efficient draught animal;
- (3) the Bhagnari from the borders of Baluchistan, one of the best draught breeds in India.

The department has started a farm close to Karachi for the maintenance and breeding of the Red Sindhi. This farm contains the best milking stock in the country. A few Thar Parkar animals also are kept on it but a proposal is under consideration to start a separate farm for that breed in the Thar Parkar country. There is no provision for a similar provision for the Bhagnari breed of cattle. A small herd of Murrah or Delhi buffaloes is kept at Sukkur.

Cattle breeding in Sind is under the control of the Livestock Expert who works in co-operation with the Deputy Director of Agriculture. Premium bulls are given out by the department to selected cultivators on certain conditions and this system is now specially used for the provision of good Bhagnari bulls in upper Sind.

6. THE VETERINARY DEPARTMENT.

The Veterinary Department in Sind is independent of the department in the presidency. Sind has a separate Superintendent who is also in charge of Ajmer-Merwara. His staff consists of two veterinary inspectors

and 21 assistant surgeons, 18 of whom are in charge of dispensaries and 3 are on reserve duty. Of the 18 assistant surgeons in charge of the dispensaries, one is a local board servant.

The number of veterinary dispensaries is 18; the total number of patients treated at these dispensaries last year was about 26,500; medicine and advice were also given in the case of 3,800 other animals not brought to the dispensaries. The dispensaries are under the control of the district local boards, the assistant surgeons in charge being supplied by Government.

Besides supervising the work of the dispensaries, the Veterinary Department is also engaged in the prevention and cure of contagious diseases, among which rinderpest is the most common. Other prevalent diseases are foot-and-mouth disease and hæmorrhagic septicæmia. Anthrax and black-quarter also occur at times. The number of animals inoculated in 1926-27 was nearly 13,000.

The Veterinary Department in Sind also supervises horse breeding operations. There are nine stallions in the province towards whose maintenance Government contributes half the cost.

The total cost of the department for last year was about Rs. 1,84,000 out of which Rs. 90,000 came from provincial revenues and Rs. 94,000 from the local authorities. The latter amount includes a sum of Rs. 24,000 paid by the Wadia Trust.

7. IRRIGATION.

Practically the whole cultivation in Sind depends on irrigation by canals from the river Indus. The inundation of the river, which begins in May and subsides in September, depends on the melting of the snows in the Himalayas and, to a large extent, upon the rainfall in the Punjab and the consequent accretions to the Indus flood from its five tributaries in that province. The water carried by the river varies from 20,000 cusecs in February to 950,000 cusecs in August. The water is gauged at several points and, when the level reads above 13 feet at Bukkur and 17 feet at Kotri for the greater part of the three months June, July and August, the canals receive an adequate supply. If the level of the river rises to this height in May and does not fall below it till September, the cultivating season is prolonged and the harvest is bountiful, but such years are rare.

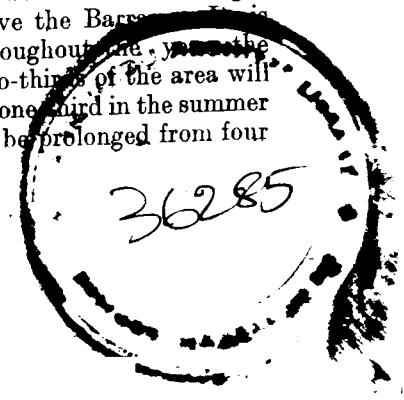
For some 400 miles from Kashmir in the north to below Tatta in the south, the river is confined by almost continuous earthen embankments; the height of these embankments varies from ten to twenty feet according to the height of the bank of the river; it is only at rare intervals that the bank is so high as to require no embankment. When the river level rises above 16 feet at Bukkur or 22 feet at Kotri, there is serious danger of breaches in the embankment and of grave damage by flood. As the Indus runs through soft alluvial sand in most places it is liable to change its course by several miles in rapid movements and the task of protecting the embankments calls for constant vigilance, and involves heavy expenditure by the State. These embankments have been constructed and gradually improved and strengthened in the last fifty years: at dangerous points, the earth wall is faced with brick or stone.

The system of irrigation from inundation canals existed before the British assumed control of Sind in 1843. These canals have been continuously extended and improved and new canals have been constructed so that, at the present date, 7,925 miles of canals are under the administration of the Irrigation Department. The supply of water is controlled by masonry head works. For the most part, the water runs on a higher level than the surrounding fields and flows on to them through distributaries which are also controlled by masonry outlets. Dams and regulators are constructed at suitable intervals to raise the height of the water in the canals. In certain tracts, particularly in the centre of Sind on the left bank, the land is higher than the canals and the water has to be raised by lift. The method commonly adopted is that of the Persian wheel worked by bullocks or camels.

In order to guard against the erosion of the embankments, a channel several miles wide has been left for the swings of the Indus and, in this tract, considerable areas are cultivated on the moisture left in the soil after the subsidence of the inundation. These are the winter crops, wheat, oil-seeds and pulses. Of the total present cultivation of Sind, 72 per cent is *kharif* and 28 per cent is *rabi*.

The irrigation system in Sind is now in process of being converted from an inundation to a perennial basis by the construction of the Sukkur Barrage and of a new system of canals which will run from the Sukkur Barrage on both sides of the river; on the right bank to the west for 132 miles until the Kohistan hills interpose a barrier close to Sehwan; on the left bank to the east over 205 miles past Hyderabad to the Rann of Cutch and to the elevated sand-hills of Thar Parkar. It is estimated that this scheme will alter the irrigation of two-thirds of the present irrigated area of Sind, rendering water available for the whole twelve months of the year instead of for the short inundation period of four months. The system will also supply water by flow to large tracts now irrigated at considerable expense by lift. It will also provide water to 3.5 million acres which now have no available supply for irrigation. The area commanded by this scheme is 7.5 million acres, of which it is anticipated that 5.5 million acres will eventually be cultivated annually. This area of 5.5 million acres cultivable by this scheme exceeds the present culturable area of Egypt by 500,000 acres.

The project is estimated to cost nearly Rs. 20.25 crores, of which 5.5 crores are debited to the Barrage and 14.75 crores to the new canals. The Barrage is located three miles below the gorge of the river Indus between Sukkur and Rohri. It is to be equipped with movable gates which will be raised when the inundation rises and will be lowered when it falls so that the level of the water may be retained at a height sufficient to fill the canals which take off above the Barrage. It is anticipated that with the supply of water throughout the year the cultivating season will be largely altered and two-thirds of the area will be brought under crops in the winter season and one-third in the summer season. The cultivating season for cotton will be prolonged from four



months to eight months, enabling the substitution of long staple cotton for the less valuable short staple varieties. It is also anticipated that wheat and oil-seeds will also be substituted for the less valuable crops of millet, while the area under rice will remain unchanged. The main difficulty of the cultivator at the present time is the lack of employment for many months of the year and it is hoped that, in this tract, this difficulty will be wholly relieved.

The plain of Sind is so level, having an average slope of six inches to the mile from north to south, that there are few natural drainage channels; and the problem of supplying drainage in conjunction with the new irrigation scheme is receiving the attention of the engineers.

8. FORESTRY IN RELATION TO AGRICULTURE.

The area in charge of both the Forest and Revenue departments is only 1,171 square miles. The forests which are situated along the banks of the Indus run in narrow strips from a quarter of a mile to two miles in breadth. They are liable to erosion and are seriously affected by changes in the course of the Indus.

The indigenous trees consist of *babul* (*Acacia arabica*), *kandi* (*Prosopis spicigera*), *bahan* (*Populus euphratica*) and two kinds of tamarind. A valuable tree, sometimes found, is the *tali* (*Dalbergia sissoo*).

Babul trees produce wood suitable equally for building, fuel and ploughs; seed pods useful for feeding cattle; bark for tanning; and leaves and thorns as a favourite fodder for camels and goats; within the limits of central Sind they are a host for the lac insect. *Bahan* yields light soft wood for building purposes.

The number of cattle admitted to grazing in the forests in 1925-26 was nearly 100,000, equally divided between horned cattle and sheep and goats. About 2,000 camels were also admitted to browsing. The average expenditure on the forests in Sind for the last quinquennium came to Rs. 3.75 lakhs, while the revenue was Rs. 6.85,000.

Besides the State-owned forests mentioned above, it is not uncommon in Sind for zamindars to have private groves of their own. These are known as *huris* which are well preserved and are a source of appreciable profit to their owners.

9. GENERAL EDUCATION.

Educationally, Sind is very backward: the percentage of literacy for all communities is 4.1 only; but in the case of Muhammadans it goes down to 2.7 and amongst the advanced communities rises to 12.6. The fact that the population is widely scattered is a great obstacle in the spread of literacy. The main reason, however, is the general apathy to education of the Muhammadans who form three-fourths of the total population. Recently, however, this community has shown greater interest in educational matters, and more rapid progress may be expected in the near future.

The educational system in the province is identical with that of the presidency proper. The superior staff of the department in Sind

consists of an educational inspector, an inspectress for girls' schools, a senior deputy inspector for each district except Thar and Parkar where there is a deputy inspector and a special deputy inspector for Urdu and Mullah schools.

The changes in the administration of primary education which have been made by the Primary Education Act of 1923 have been described in the introduction to the volume of evidence for the presidency proper. All the district local boards in Sind, with one exception, have taken over the control of primary education in accordance with the terms of the Act.

Institutions for higher education are confined to:—

- (1) two arts colleges at Karachi and Hyderabad;
- (2) a special Medical School at Hyderabad, where men are trained for the subordinate medical service;
- (3) an engineering branch of the Arts College at Karachi; and
- (4) a Law College at Karachi.

Sindhi students also attend the institutions in the presidency proper.

The total number of students in primary schools in 1925-26 was a little over 100,000, of whom girls numbered one-fifth. Thus about 21 per cent of the school-going population was at school. There is the same wastage in primary schools in Sind as in the other parts of the presidency, the attendance falling rapidly in the upper classes. Of 100 students attending primary schools, less than nine reach the upper primary (vernacular middle) standards.

As Sind is predominantly a Muhammadan province, special reference may be made to education amongst that community. The number of Muhammadan pupils receiving instruction in Sind last year was 66,818 of whom about 17 per cent were girls. Fifty-four thousand of these were in primary schools, 2,700 in secondary schools, 86 in colleges and 365 in special and training schools. Of the students in primary schools, about 36 per cent were in Mullah schools, in which, under the control of religious teachers, religious instruction as well as secular is given to Muhammadan boys. These schools are recognised by the State and receive grants graduated according to their efficiency. There are now 724 of these schools, and the grants-in-aid amounted to Rs. 3.25 lakhs. The expenditure on Muhammadan education in Sind was roughly estimated at Rs. 22 lakhs out of which Rs. 12 lakhs were met from the provincial funds. The total expenditure on education in Sind last year was Rs. 50 lakhs, out of which Rs. 27 lakhs were contributed from provincial funds.

10. CO-OPERATION.

The co-operative movement in Sind is of comparatively recent growth. Attempts at the formation of societies started with the passing of the Co-operative Credit Societies Act of 1904. Little progress was, however made until a separate Assistant Registrar for Co-operative Societies was appointed in 1918. Up to that date, only 65 societies had been organised,

which had a membership of about 3,000 and a working capital of Rs. 1,63,000 only. Many of these societies existed only in name and did little work. The Assistant Registrar, on his appointment, carried on vigorous propaganda, secured the co-operation of all classes of agriculturists, revised the constitution of existing societies, and drafted by-laws to suit the existing conditions in Sind. The by-laws were modelled on those in force in the Punjab where conditions were more or less akin to those prevailing in Sind. The chief difference in the constitution of the societies in Sind and those in the presidency proper is that the former are organised on a share basis—a system which is described below.

The difficulties in the way of organising societies were many. The Registrar of Co-operative Societies, in 1917, reported that the societies were still "at too elementary a stage to justify a prophecy that the movement will ever take firm root in Sind." The general illiteracy prevailing in the province, the aversion of the bulk of the population, which is Muhammadan, to the taking of interest, the predominating influence of the big zamindars, and the prevalence on a large scale of the *hari* system under which the cultivator has no direct interest in the land, as well as the absence of big villages were great handicaps in the rapid development of the movement, but, since 1918, the movement has developed rapidly in the province. The co-operation of the educated leaders of the people has assisted this development. The number of societies increased from 65 in 1918 to 481 in 1923. During the same period the membership and working capital increased from 3,000 and Rs. 1,63,000 to 19,000 and Rs. 38 lakhs respectively. At the end of March 1927, the corresponding figures were 863, 39,247, and Rs. 137 lakhs. The results of the working of the movement have been very striking. Not only are members financed for their current needs, but, in a very large number of cases, they have been freed from their debts. Mortgage bonds and conditional sale deeds have been redeemed, habits of thrift have been inculcated, and several members have purchased fresh plots of land out of their savings. Most of the members have severed their dealings with the moneylender altogether. A striking feature in the movement in Sind is the large percentage of owned capital of primary societies and the large amount of share capital of the members, showing how well the lesson of thrift has been inculcated. The by-laws of these societies provide that the minimum holding of each member shall be one share of Rs. 20 payable by yearly instalments of Rs. 2. But from the beginning each member has taken up a substantial number of shares, increasing his contributions from year to year. The result has been that in practice each member holds a considerable number of shares. It is a common thing in a society of five years' standing for a small zamindar to hold Rs. 150 to Rs. 300 and for a *hari* to hold Rs. 100 to Rs. 150 in shares. The reserve fund of the societies now amounts to nearly Rs. 4·5 lakhs. It has reached a substantial figure in the older societies. Some of the societies on the Jamrao Canal now have sufficient owned capital to meet the total needs of all without any outside borrowing.

The co-operative movement in Sind had until recently catered for the needs of the small zamindars only. The big zamindars in Sind, however, are as heavily in debt as the smaller ones. These, in two districts, have now been organised into two *zamindari* banks on the co-operative model. Although they have been in existence only for two years, these banks have now a working capital of over Rs. 5 lakhs and have been of substantial benefit to their members.

The progress made would have been impossible of achievement, had arrangements for financing the movement through the organisation of central banks not been made. Till 1918-19, the societies obtained finance from the Bombay Provincial Co-operative Bank. Since then, central banks have been established in Sind itself. The first to be established was the Central Bank at Karachi. At present not only is there a bank for every district, except the Upper Sind Frontier, but the Karachi Bank, besides acting as a central bank for the district of Karachi, also serves as an apex bank for the whole province. There is now a complete network of central financing institutions in the province, and there is no difficulty in getting sufficient funds to finance the primary societies. The total working capital of the six central banks in Sind was Rs. 64 lakhs last year.

The ideal of spreading agricultural improvements through co-operative societies has also been fulfilled to a considerable degree in Sind. There are eleven seed societies organised for the distribution of improved varieties of seed. The main work of improvement, however, has been done through taluka development associations, and the few simple but substantial improvements which the associations have been able to demonstrate have been largely adopted by the members of co-operative societies. Amongst the improvements introduced may be mentioned the distribution of improved varieties of wheat (Pusa 12) and cotton (27 W. N.), the large distribution of the Egyptian plough, and the introduction of the Raja and monsoon ploughs, the Archimedean screw and various clod-crushers. The work of these associations is done almost entirely through members of co-operative societies. They appoint *kamgars* and supervisors to visit villages, to hold demonstrations of improved seed, implements, and modern methods of farming. Experiments are also being made to get the associations and supervising unions to indent for the agricultural and other domestic requisites of agriculturists and to distribute them amongst their members. So far, the experiments have proved very successful.

The whole work is done, under the general supervision of the Registrar of Co-operative Societies, by the Assistant Registrar stationed at Hyderabad. He has a deputy working under him and also six auditors. The Assistant Registrar is helped in the work of organisation and supervision by honorary organisers as well as by the supervising unions into which the societies are now being organised. The Bombay Provincial Co-operative Institute has also a divisional branch in Sind, which has been doing valuable work in the way of carrying on co-operative propaganda, holding conferences, and training classes for

members, secretaries, and honorary organisers, and conducting a co-operative magazine. District branches of the Institute are also being established.

11. COMMUNICATIONS AND MARKETING.

In 1851, Sir Bartle Frere found in all Sind "not a mile of bridged or metalled road, not a masonry bridge of any kind; in fact, not five miles of any cleared road." The sandy nature of the soil, the difficulty of getting metal, the liability to inundation make the construction and upkeep of roads a very difficult and expensive matter; and, in consequence, even now Sind is badly served in the matter of roads. There are no doubt recognised routes by which traffic is carried in the dry season between large towns; *e.g.*, from Karachi to Shikarpur and from Hyderabad to Jodhpur and Multan. These routes, however, were, and still are, mere tracks suited to the camel but bad for wheeled traffic. In north Sind, the use of carts is more common, but in the other parts camels, pack bullocks, donkeys and horses form the usual means of transport. Where carts are used, they are very heavy and primitive and are a great strain on the bullocks.

Before the advent of the railway, the river was one of the chief means for the carriage of produce over long distances and it is still used for that purpose. It was under the charge of a special government department known as the Indus Conservancy Department which, however, was abolished in 1906. It is now under the charge of the Indus River Commission. Although the navigation of the river has engaged the serious attention of Government since the time, nearly a century ago, when it was necessary to use the river for the passage of troops to Multan and Afghanistan, the conservancy of the river really commenced only with passing of the Bombay Act I of 1863 which provided for the registration of vessels and the levy of pilotage fees, the sums so realised to be expended in removing obstructions on the river and improving its navigation.

Sind is now connected by rail with all parts of India and through Baluchistan up to the Afghan and Persian borders. By sea, there are regular services to Bombay and to the Persian Gulf; while passenger steamers leave the port of Karachi regularly for Europe. Karachi is now becoming a port of call for air traffic.

The main arteries of traffic are now the railways, the most important of which is the North Western Railway which connects Karachi with the Punjab. A new broad gauge connection with Delhi through Rajputana is again under consideration. The first railway to be started was on the right bank of the Indus. As this line was frequently breached, an alternative line on the left bank was constructed and this has now become the main route to the Punjab. A line was opened from Hyderabad to Badin in 1904, and an extension is now proposed across the Rann of Cutch to meet the Bombay-Baroda and Central India Railway at Viramgam, thus affording through communication, without break of gauge, from Sind to Bombay. At present there is a meter

gauge connection from Hyderabad to Ahmedabad by the Jodhpur-Bikaner Railway.

There are a number of feeder lines in Sind which connect important marketing places and carry a large part of the export produce of the country. These are the Hyderabad-Badin, Mirpurkhas-Khadro, Mirpurkhas-Jhudo, Larkana-Shahdadkot, and Jacobabad-Kashmor lines.

Marketing.

Crops are ordinarily sold in the field. The trader goes round to collect the cotton, wheat, rice or oil-seeds and brings it by camel load to the nearest market or railway centre. Rice is purchased locally from producers, husked and parboiled in the chief local centres like Larkana, and then exported. A large number of rice mills have now been erected in all the rice growing centres. No grading is done for the internal trade, but traders sometimes grade for their own benefit or under pressure from the ultimate buyers.

The chief hindrances to proper marketing are the bad condition of the roads, the lack of carts, the want of standardised weights and measures, and the lack of storage accommodation.

12. LOCAL SELF-GOVERNMENT.

Local self-government in rural areas dates from the year 1884. The proportion of elected and nominated members on local boards was originally fixed at two-thirds and one-third respectively. The system established by the Local Boards Act of 1923 for the Bombay Presidency holds good for Sind, and the description need not be repeated here. The income of all the boards in Sind in, 1925-26 was Rs. 34.25 lakhs, while their expenditure was Rs. 32.5 lakhs. Income from local rates came to Rs. 10 lakhs, the grants from Government amounted to Rs. 16 lakhs of which Rs. 9.5 lakhs was for education, Rs. 50,000 for medical purposes, and Rs. 5.25 lakhs for civil works. The total expenditure on education was Rs. 12.75 lakhs; on hospitals, dispensaries, etc., Rs. 2.75 lakhs; on veterinary charges Rs. 42,000, and on communications Rs. 6.75 lakhs.

The greater part of the revenue is usually spent by the district local board on works of general utility to the whole district; but each taluka local board has funds at its disposal to enable it to carry out and maintain works of purely local utility for which it is primarily responsible. At least one-third of the revenue derived from the one-anna cess must be spent on education.

Local boards are bound, so far as their funds permit, to make adequate provision for education, water supply, construction and maintenance of roads, hospitals, dispensaries and markets. They have also the discretionary power to spend money on the establishment and maintenance of model farms, the improvement of breed of cattle, and the advancement and improvement of agriculture and local industries generally.

13. PUBLIC HEALTH AND SANITATION.

Malaria is the most prevalent disease in Sind. The proportion of deaths ascribed to this cause in Sind is greater than in the presidency. While the death rate from malaria for the presidency as a whole in 1926 was only 2·83, in Sukkur, it was 15·13 and, in Thar and Parkar, 14·50. In that year, all districts in Sind suffered heavily from malaria owing to the high floods and heavy rainfall. Quinine can be obtained through post offices and is also distributed free to school children. The efficacy of quinine in the prevention and cure of malaria is now well recognised in the province and the free distribution of the drug is popular.

Other prevailing diseases are small-pox and cholera. The latter as well as plague, which used to take a large toll at one time, have now been brought under control and Sind has practically escaped from them during the last few years. Small-pox, however, often occurs. The attacks during each of the last two years from this disease were between 5,000 and 6,000 each year and the deaths varied from 1,100 to 1,200.

The birth rate in Sind in the years 1925 and 1926 was 20·58 and 21·32 per thousand respectively, the figures for rural areas being 21·69 and 17·80 respectively. Faulty registration as well as the nomadic habits of part of the population make the figures unreliable. The death rate in the same two years was 19·29 and 16·96 respectively as compared with a rate of 15·20 for the quinquennial period. The urban rate (29·97) greatly exceeds the rural death rate (17·37), but this again is probably due to faulty registration. Infantile death rate is very high, 185 for 1,000 registered births.

Every district except the Upper Sind Frontier has a Civil Surgeon. For sanitation and vaccination there is an Assistant Director of Public Health for the province who has his own staff of inspectors and vaccinators. There are several hospitals in the district towns and numerous charitable dispensaries in the smaller towns. Vaccination has made satisfactory progress.

