

alternative money crops which could be grown successfully in this tract. This question has assumed greater importance in view of the extremely low rates prevailing for cotton during the past three seasons. The most likely alternative money crops to cotton, in the kharif season, are the leguminous oil-seeds, e.g. soya beans, ground-nuts, etc. Special investigations into the economic possibilities of the cultivation of oil-seed and pulse crops in the Barrage areas have been started in the botanical section at the Agricultural Research Station, Sakrand, where an "Oil-seed Branch" has recently been established for this work. Numerous varieties of these crops, e.g. ground-nuts, sesame, castor, niger seed, sunflower, etc., were obtained from different parts of India and tested under Sind conditions. The most promising types were retained for further trial and, in addition, samples of their produce were sent to commercial firms in Karachi for valuation in order that the economics of their cultivation on a field scale could be forecasted. Several types of rabi oil-seed crops, viz. torio, jamsho, rape, mustard, linseed, safflower, castor, sunflower etc. were tested at Sakrand by the "Oil-seed Branch" last rabi season and field results, supplemented by trade reports and valuations, indicate that several of these crops will give greater profits to the cultivators in the rabi season than they can obtain from wheat-growing. In addition, the systematic cultivation of rabi oil-seed crops would enable full use to be made of the irrigation supply available from the Barrage Canal Systems from October to December. This important work is being financed by a grant generously contributed by the Trustees of Sir Sassoon David Trust Fund and the results obtained therefrom should be of the greatest value to the cultivators in the left bank Barrage areas. As a corollary to this research work, the Agricultural Department has organised an "Oil-seed Growers' Association" to encourage the cultivation of oil-seed and pulse crops in the Barrage areas and to assist growers in the marketing of these crops.

81. *Soya beans*.—Soya beans are rapidly becoming of first rate importance in international trade. The total quantity of these oil-seeds shipped from the East in 1932 was 22,04,000 tons, compared with 1,705,990 tons in 1930. Shipments to Europe were increased by 47,600 tons, viz. 1,517,600 tons during 1932 compared with 1,470,000 tons during 1931. The great bulk of this import was from Manchuria and the Far East.

The profitable cultivation of this valuable crop in the Barrage areas of Sind is under investigation at the Agricultural Research Station, Sakrand. Last year, extended trials of Punjab and Pusa types of soya-bean were made in the districts and the results obtained show that this crop can be successfully grown in Sind. A number of varieties from South Africa and the United States of America are now being tested at Sakrand with the object of obtaining early, high yielding types with high oil content. Unfortunately, the prevailing market price (about Rs. 2-4-0 per maund) is not sufficiently high to justify the yearly extension of soya-bean cultivation in the Barrage zone until superior quality, high yielding varieties are available for distribution. The work is being continued and developed in the current year and valuations of Sind-grown soya-beans received from London indicate that they compare very favourably with the Manchurian product. It may be pointed out that, in addition to its value as a commercial crop, the cultivation of soya-bean would benefit the cultivator as an excellent leguminous crop in a rotation and as a cleaning crop on weedy lands.

82. *Berseem*.—The Royal Commission on Agriculture drew special attention to the value and importance of berseem. This is a leguminous crop from Egypt which adds to the fertility of the soil and improves its texture. It provides a very valuable fodder and is particularly useful in connection with the reclamation of alkaline lands. Berseem can be grown luxuriantly anywhere in Sind but seed does not set well in Lower Sind. In Central and Upper Sind, however, satisfactory yields of good seed are obtainable. Berseem occupies a very important position in the Sakrand rotations which deal with the reclamation of *kalar* land and the maintenance of soil fertility under perennial irrigation and high intensity of cultivation. Experiments in connection with the seeding of berseem at Sakrand have given good results and the seed produce found a ready market at Rs. 20 per maund. Imported seed of the same quality costs Rs. 45 per maund, so the extension of seed production locally is of great importance if this crop is to be adopted in general cultivation in the Barrage areas. The effects of phosphatic manuring on the seed production of the berseem crop are under investigation at Sakrand and the results so far obtained indicate that applications of super-phosphate to the land before sowing, or bone-meal manuring of the preceding jowar crop, tend to increase the yield of berseem seed and improve its quality.

and germinating capacity. Trials of different varieties of berseem imported from Egypt are also in progress.

83. *Miscellaneous crops*.—Experiments in connection with the cultivation of potatoes and onions have shown that there is a wide scope for the profitable introduction and extension of these crops in the Barrage areas. The yields obtained at Sakrand have been remunerative and profits of Rs. 60—Rs. 130 per acre have been obtained. Improved methods of cultivation are under trial and the effect on out-turn of manuring with sann hemp, either as a green manure or after composting, is being studied. The area under these crops is bound to increase upon the advent of cheap perennial irrigation and their cultivation on scientific lines will be most profitable. Trials of different varieties of sugarcane, imported from all the main cane-growing tracts of India, are also in progress in the agricultural section where experiments on sowing-date and manuring of the cane crop are also being carried on. Among fodder crops, considerable success has attended the cultivation of oats and the introduction of mangolds as a root crop, especially on *kalar* land, has given good results. Other fodder crops under trial include cowpeas and mung in kharif and tangie pea in rabi. Varietal trials of tobacco and chillie crops have been laid down. As regards tobacco, it has now been proved that high class varieties e.g. Gandiu No. 6 for “bidi” manufacture and Madras types for the cigar and cigarette industries, can be grown in Sind. The fermenting and curing processes on scientific lines under local conditions remain to be studied in order that a high quality leaf may be obtained. Special attention is being given to maintaining accurate costings of the cultivation of these miscellaneous garden crops so that the economics of their cultivation on a field scale can definitely be determined and made available to the cultivators in the Barrage areas.

The Agricultural Department in Sind is now working on definite programmes of research and investigation in connection with all the miscellaneous crops mentioned above, and, in addition, numerous new crops are being imported into Sind and tested at Sakrand to determine their suitability for cultivation on an extended scale in the Barrage areas. Leaflets, in both vernacular and English, on the cultivations of berseem, potatoes, groundnuts, onions, oats and castor have been issued by the department and widely distributed.

(3) *Soil and Irrigation Research.*

84. *Introductory.*—The soil and irrigation research work of the Agricultural Department in Sind is centred in the chemical and agricultural sections at the Agricultural Research Station, Sakrand. The main problems under investigation relate to the prevention of the formation of *kalar* land under conditions of perennial irrigation, the reclamation of *kalar* lands, the maintenance of soil fertility under Barrage conditions of agriculture and irrigation and the water requirements of various crops. The alluvial soils of Sind are so varying in their physical and chemical characters that investigations into soil problems and the practical application of results obtained therefrom are necessarily of extreme complexity. A soil and sub-soil survey has been carried out by the Development and Research Division of the Irrigation Department and the investigations have been completed in the whole of the Barrage command, some 11,600 sq. miles. The field data obtained during the past two seasons are being worked up. Maps have been prepared showing the positions of the sand belts under the surface of the ground and the salinity of the sub-soil water. All the work in connection with sub-soil investigation by the Research Division is being done in full co-operation with the Agricultural Department. The Research Division of the Irrigation Department in Sind has obtained considerable data with regard to *kalar* occurrence and intensity, sub-soil strata and water levels over very large areas. This information is proving to be of the greatest value in dealing with local problems of water-logging and seepage. The research work at Sakrand has resulted in definite treatments, irrigational, chemical and cultural, for the prevention of *kalar* and the reclamation of *kalar* lands, being devised. The next step forward is obviously to test these treatments over a very wide area and to endeavour to correlate the results obtained with the data which have been obtained from the sub-soil survey work conducted by the irrigation authorities.

Co-ordination between the research activities of the Agricultural and Irrigation Departments has been achieved by the formation of a Sind Research Committee, upon which both departments are fully represented. The main functions of this committee which is presided over by the Commissioner in Sind are to settle the main policy of research and to allocate different problems requiring investigation to the organization most suitably equipped with staff

and material to carry them to a successful solution as early as possible. The Research Committee also receives and considers from time to time reports on the results achieved by research workers of both departments and considers the best means of utilising such results to the practical benefit of the Sind cultivators.

85. *The Kalar problem: Progress of experimental work.*—The methods which have been adopted at Sakrand in dealing with this problem may be classified as (a) mechanical, (b) chemical, and (c) agronomical. The mechanical method consists of leaching the affected lands with heavy doses of irrigation water which percolate down to the lower layers of the soil carrying in solution the injurious salts. This method is only applicable by itself where no impervious layer exists near the soil surface and is generally effective where the upper layers of the sub-soil consist of sand or coarse silt. Once improvement by this method is effected, it is most desirable that the land should be frequently cropped. Better and more lasting results have been obtained by the agronomical method, i.e. the cropping of *kalar* lands under a system of rotation which includes a high percentage of crops known to be resistant to *kalar* and which have a beneficial effect on the physical texture of the soil and on the maintenance of its fertility constituents. At Sakrand, most success has attended the use of berseem in this connection though several other salt-resistant leguminous crops are under trial. In Sakrand "A" system, on very bad salt lands, berseem is grown over the whole cropped area every rabi season and records indicate that reclamation under this system is now practically complete. The chemical method of dealing with *kalar* areas consists of the application of dressings of certain chemical substances to the *kalar* land with the object of improving its physical texture and thus increasing the rate of percolation and facilitating the washing out of injurious salts or of neutralising and off-setting the effect of such injurious salts on plant growth. In general, this method is expensive and is unlikely to be economically profitable except on small persistent areas of *kalar* where it could be applied with advantage. The solution of the problem of the reclamation of large *kalar* areas will most certainly be found in a combination of the agronomical and mechanical methods whereby the effects of injurious salts on plant growth will be gradually diminished by their being washed down into the deeper layers of the soil and the general fertility of the land maintained

by the establishment of better physical and chemical conditions in the upper soil layers as a result of good cultivation and cropping under a well-balanced "fertility" rotation of crops.

The experts at the Rothamsted Experimental Station, England, and at the soil physical and chemical laboratories at Groningen, Holland, who were consulted expressed the opinion that the present work being carried out at Sakrand in connection with *kalar* reclamation was on the right lines and suggested additional experiments which are now being undertaken.

86. *The maintenance of soil fertility.*—Under perennial irrigation from the Lloyd Barrage and with a much more intensive system of agriculture, the maintenance of soil fertility in the Barrage areas is a subject of the greatest importance. Hitherto the fertility of cultivated lands in Sind has been kept up by a system of "fallows". The "fallows" must be considerably reduced under post-Barrage conditions of irrigation and agriculture. The main lines along which this problem is being investigated by the Agricultural Department in Sind are (a) the adoption of crop rotations in which restorative crops occupy a large proportion, i.e., "fertility" rotations, (b) by conserving crop residues and waste organic matter and converting them into useful manures, e.g. compost, and (c) by the use of green manure crops and artificial manures.

During 1932-33, the "fertility" rotations under trial in the Agricultural Section of the Agricultural Research Station, Sakrand, were continued in accordance with the cropping schemes originally laid down. These rotations aim at maintaining the fertility of the soil under post-Barrage conditions of perennial irrigation and more intensive cultivation, by the cultivation annually of a percentage of the cropped area with leguminous crops, e.g., ground-nut, guar, berseem, pulses, etc. Such rotations have the additional advantage of providing a regular supply of green fodder for cattle throughout the year and thereby enable the cultivator to increase his manure supply to the advantage of the more exhaustive crops grown on the holding. On the actual area under experiment with "fertility" rotations of Sakrand, the general fertility of the land is being fully maintained and indeed improved by the rotations under test.

Another important method of maintaining soil fertility under the new conditions of agricultural practice in Sind is by green-manuring. In 1931, the Government of Bombay granted an important concession to the cultivators of Sind in permitting green-manure crops, i.e., sann-hemp, guar and indigo, grown for the purpose of green-manuring and ploughed into the soil before the 15th September, to be cultivated free of assessment. This concession is unfortunately not being taken full advantage of owing largely to the existing relations between zamindar and "hari" in Sind, whereby the actual cultivation of the land is left almost entirely to the latter. Intelligent and progressive zamindars will realize that the cultivation of green-manure crops will increase the productivity of their lands and, accordingly, they should encourage their tenants, by financial help or easier terms of tenancy, to adopt this cultural practice wherever possible. The effect of green-manuring with sann-hemp on potatoes and onions at Sakrand and with guar on cotton at Oderolal and Mirpurkhas has definitely shown the value of this method of maintaining soil fertility. Leaflets, dealing with the subject, have been issued by the Agricultural Department.

At Sakrand, manurial experiments, included the trial of crushed bone-meal on cotton, bajri, jowar, wheat, berseem and sugarcane and, in co-operation with Imperial Chemicals (India) Limited, trials of different applications of nitrogen—in the form of ammonium sulphate—*plus* organic manure to the cotton and wheat crops. As these experiments have only been in progress for two seasons, it is not yet possible to express any opinion on the treatments under trial.

87. *The water requirements of crops.*—With the establishment of a system of an assured and perennial supply of irrigation water under the Lloyd Barrage Canal Systems and a greater intensity of cultivation, especially in the rabi season, the general adoption of scientific and economical methods of irrigation are of very great importance. The water requirements of the various crops grown in Sind have been studied in much detail at the Agricultural Research Station, Sakrand. In the annual reports on the work done under the agricultural section during the years 1931-32 and 1932-33 in Sind, will be found details of the irrigational treatments which have been found to be most economical and profitable in the production of all the main crops grown in the dry crop areas under Barrage

conditions. Unfortunately, similar data with regard to rice cultivation are not yet available as similar experimental facilities in the rice-growing tracts have not been provided. Work is now in progress to determine the effect of varying the irrigation intervals within a fixed "delta" on crop yields, both on *kalar* and sweet lands.

The results of the first year's working of the Barrage Canal systems have emphasized the great importance of the early utilization of irrigation water for the preparation of lands for sowing and for sowing operations in both the kharif and rabi seasons. With very few exceptions, late sown crops have suffered much more severely from insect pests, fungus diseases and adverse climatic conditions and have given considerably less yields in comparison with the early sown areas. Particularly in the rabi season, over-irrigation was prevalent and the tendency of the cultivators to excessive watering of dry rabi crops, e.g. wheat, must be corrected by propaganda and education in the districts.

C—AGRICULTURAL PROPAGANDA.

88. *The Advisory Committee of 1923 and the development of agricultural propaganda in the Barrage areas.*—The Advisory Committee of 1923 considered fully the question of strengthening the Agricultural Department in Sind to enable it to deal satisfactorily with a greatly extended programme of propaganda and demonstration work in the Barrage areas. The Committee stated that they consider "that the organization of agricultural propaganda had lagged far behind its experimental work and that, at present (i.e. in 1923), the majority of the zamindars in Sind are not aware of the full extent of the activities of the Agricultural Department. This is largely due to the fact that the staff of the Department has never been really developed in this direction." The Advisory Committee considered that an immediately increased provision of Rs. 75,000 per annum for this purpose was necessary. It has however as yet been possible to give effect to this recommendation only to the extent of additional staff for propaganda purposes costing Rs. 14,575 per annum and the provision in 1930-31 and 1931-32 of a grant of Rs. 5,000 for the establishment and organisation of a touring propaganda party in the Barrage areas. The work of this party is being continued in the present year.

89. *Co-ordination of the work of the Agricultural and Co-operative Departments and the association of non-officials in agricultural propaganda and demonstration work.*—Government accorded sanction to the establishment of a Provincial Board of Agriculture in Sind to fulfil the same functions with regard to Sind as the Provincial Board of Agriculture in the Bombay Presidency does for the presidency proper. In addition, a local committee of the Provincial Board has been established to carry on the duties and functions formerly performed by the Divisional Board of Agriculture, Sind, which has been abolished. At a meeting of the local committee held in May 1933, reports on the progress of agricultural and co-operative propaganda work in the districts and programmes of future development were considered and fully discussed. In addition, the non-official members submitted several important subjects for discussion upon which useful decisions were made. The first meeting of the Sind Provincial Board of Agriculture, under the Chairmanship of the Commissioner in Sind, was held in October 1933.

In addition to the co-operation between non-officials and the Agricultural Department which the establishment of the Provincial Board of Agriculture and its local committee has ensured, orders have been issued to district propaganda workers of the department to frame their demonstration tours in consultation with local non-official bodies, e.g., district local boards, and to attend all periodic meetings of cultivators' organisations, e.g., taluka development associations, with the object of achieving a closer touch with local agricultural problems and requirements. The co-operation of the local officers of other departments of Government, e.g. Revenue and Irrigation, in agricultural propaganda work has been willingly given in the past and is being taken full advantage of in extending such work in the future.

Government has recently issued orders that periodic conferences should be held between the heads of the Agricultural, Veterinary and Co-operative Departments in Sind in order to secure co-ordination and unity of policy in these three departments.

90. *Formation of a touring propaganda party in the Barrage areas.*—Government, owing to financial stringency, was unable to provide the necessary funds to enable the proposals of the Chief Agricultural Officer in Sind for the reorganisation of agricultural propaganda and demonstration

to be given effect to in full. Accordingly supplementary proposals were submitted for the establishment of a touring propaganda party. These proposals were sanctioned by Government and the touring propaganda party has been operating in the Barrage areas during the past two cold weather seasons.

The touring party, consisting of a graduate lecturer, a non-graduate assistant, a clerk and fieldman, is equipped with a portable magic-lantern and screen, sets of slides illustrating the work of the Agricultural Department in agricultural improvement and a small exhibit of seeds of improved varieties of crops, improved cottons, wheats etc. and other agricultural materials. In 1932-33, the party commenced work on the 1st October 1932 and continued until the end of April 1933. During this period, the party visited twenty-three centres in Hyderabad district, twenty-one centres in Thar Parkar district, seven centres in Nawabshah district and fourteen centres in north Sind. In all one hundred and thirty-three towns and villages have been visited by the touring propaganda party in the past two cold weather seasons. The average attendance at the magic-lantern lectures and demonstrations has been approximately 170 and, in several centres, the lectures had to be repeated twice to accommodate all who wished to attend. At some of the above-noted centres, the visit of the touring party was arranged to coincide with important local fairs or cultivators' gatherings and, in such instances, demonstrations of improved implements, crops etc. were given prior to the evening lantern lectures.

The success of the party, judged by the size of the audiences obtained and the interest shown in the lectures and exhibits, cannot be doubted but there is still a considerable area to be covered by its operations. It is proposed to restart the work of the touring propaganda party in the cold weather season of 1933.

91. *Local Agricultural Shows.*—During the year 1932-33 local agricultural shows were organised by the department at seven centres in the left bank area, viz. Hyderabad, Sajan-Sawai, Bitshah, Matli, Tando Allahyar, Khan and Pitharo and at four centres in the right bank area, viz. Sehwan, Johi, Mithodero and Jacobabad. Many of these shows were organised at the time of local fairs when large numbers of cultivators were assembled from the surrounding districts. The various types of improved crops

and implements which the department are trying to introduce in the districts were demonstrated and special features were made of horticultural exhibits and technique and of improved varieties of cotton. In most cases, the shows were accompanied by magic lantern lectures on agricultural improvement. The organization of an all-Sind agricultural show, on the lines of the Bombay Presidency agricultural shows, held at Poona and Ahmedabad within recent years, is under consideration.

Vernacular leaflets.—Twenty-nine leaflets have now been issued on various important problems affecting agriculture in Sind.

D—ANIMAL HUSBANDRY AND DAIRYING.

92. *Report of the Sind Cattle Supply and Improvement Committee.*—In July 1928, Government appointed a Committee with the following terms of reference:—

(1) To examine the question of the sufficiency of cattle in Sind, with special reference to the changes in cultivation as a result of the construction of the Lloyd Barrage;

(2) To consider the measures necessary to increase their number and to improve their quality; and

(3) To make any other suggestions relevant to the subject.

The Committee has included in its report many valuable recommendations with regard to cattle improvement in Sind. They have urged the establishment of two Government cattle farms, one for the Thar Parkar breed and one for the Bhagnari breed and the extension of the premium bull system in Sind. Government has issued orders (*vide* Appendix III) on the recommendations of the committee which will form the basis for a definite policy of live-stock improvement in the Barrage areas.

93. *Mixed farming and dairying in the Barrage areas.*—The possibility of the development of a dairy industry based on fodder crops grown on irrigated land is also being investigated as suggested by the Royal Commission. One of the greatest problems which will confront the agriculturist in Sind under perennial irrigation will be to find manure for his land, and an important way of providing this need is through some form of stock farming, such as dairying. Experiments made on the Sukkur Farm show that, if land

is sown with jowar in the kharif season and berseem in the rabi season, it will support the largest type of milch buffalo at the rate of one buffalo per acre of the best land and two acres of inferior land. As the land upon which the Sukkur Farm is situated will not come under the Barrage canal system, the Farm has been closed down and the buffalo herd transferred to the Agricultural Research Station, Sakrand, where further work on the economics of dairying combined with mixed farming under the new conditions is being conducted. Among other fodder crops tested at Sakrand, oats have given a high yield of green fodder and bid fair to be a valuable introduction as a rabi fodder crop in Sind. Enquiries with regard to the establishment of dairy businesses under a system of mixed farming are being made by prospective zamindars and attention is being given to investigating and obtaining the necessary data for the carrying capacity of a unit holding under Barrage conditions.

94. *Future of the development and improvement of live-stock in Sind.*—The Advisory Committee of 1923, emphasised the need for the appointment of a special officer for work on cattle-breeding and live-stock improvement in the Barrage areas. No action in this direction has yet been taken and the activities of the Agricultural Department have hitherto been confined to the improvement of the Red Karachi (Sindhi) breed at the Willingdon Cattle Farm, Malir. This breed is, however, predominantly a milch breed and of comparatively little value for drought purposes. As a result of the recommendations of the Reorganisation Committee, the Willingdon Cattle Farm, Malir, was closed down in 1933 as a measure of retrenchment but scientific breeding work on the red Karachi herd is being continued at the Government Fruit Farm, Mirpurkhas, to which centre the best of the animals have been transferred. The question of the steps necessary to secure the scientific breeding and improvement of the Thari breed, a valuable dual purpose breed for the Barrage area, is receiving attention. Work on the improvement of fodder crops and on the introduction of new fodder crops suitable for the Barrage areas is being undertaken at the Agricultural Research Station, Sakrand, and also at the Seed Farm and Fruit Farm, Mirpurkhas.

E—AGRICULTURAL ENGINEERING.

95. *The need for an Agricultural Engineering branch of the Agricultural Department in Sind.*—The necessity of

appointing a duly qualified Agricultural Engineer has been recognised for a long time by Government. With the advent of perennial irrigation under the Lloyd Barrage and the consequent extension of cultivation in Sind, numerous important problems have arisen relating to mechanical cultivation, design and improvement of field implements, water lifts and drainage systems, etc.

During the year 1932-33, a considerable advance in the development of agricultural engineering in Sind was made when Mr. J. Cumming, Executive Engineer, Mechanical Division, was appointed Mechanical Engineer (Irrigation and Agriculture) in Sind. The appointment is for the period of one year in the first instance.

96. *The development of mechanical cultivation in the Barrage areas.*—In the past, both the Bombay and Karachi Chambers of Commerce have emphasised the importance of extending the use of mechanical cultivation in the Barrage areas of Sind. A resolution, stressing the importance of investigating the possibilities of development in this connection, was moved at the annual general meeting of the Associated Chambers of Commerce of India and Ceylon, held in Bombay in December 1929. There are peculiar difficulties in such development in Sind, where, even on the larger estates, the expenses of cultivation are considered to be mainly the concern of the actual cultivator but some progressive zamindars are already experimenting with mechanical cultivation on their own lands. Certain firms, interested in agricultural machinery, are also making a close study of the difficulties and problems relating to this aspect of agricultural development. At present, the main obstacle to more rapid progress is the depressed condition of the cultivating classes and the lack of capital to invest in expensive agricultural machinery. Tractor ploughing tests have been carried out by the Agricultural Department in Sind in co-operation with the Burmah Shell Company (India) Limited on the new areas under development as Government "Auxiliary" Farms in the Barrage areas.

F—"AUXILIARY" OR DEMONSTRATION FARMS.

97. *The Sir Farm Scheme of "Auxiliary" Government demonstration farms in the Barrage areas.*—The Advisory Committee laid great stress on the necessity for establishing a number of separate areas throughout the Barrage zone whereon the results of research work carried out at Sakrand and other experimental stations could be

tested on a large scale and demonstrated to the cultivators. That is to say, that, when a satisfactory result has been obtained from research work, it should be tried out on separate "auxiliary" farms on an "operational" basis. These "auxiliary" farms would also have a useful part to play in any organization for the production and extension of the seed of improved varieties of crops. In 1930, Government sanctioned a scheme for the establishment of six such "auxiliary" farms in the Barrage area, three on the Right Bank at Dadu, Shahdaskote and Nasirabad and three on the Left Bank at Oderolal, Lundo and Pad Idan.

98. *Progress of development under the "Six Farm Scheme" of auxiliary demonstration farms in the Barrage areas.*—The establishment of the six new demonstration farms under the "Six Farm Scheme" was completed in 1932-33, only the farm buildings at the Shahdaskote site remaining to be constructed in the following year. The objects for which these farms are being established were fully detailed in the report of the Department of Agriculture in Sind for the year 1930-31 which also gave a brief account of the system of cultivation and management which is to be adopted on these institutions. In short, these farms will be utilised to demonstrate under zamindari conditions the large scale introduction of agricultural improvements resulting from successful research work of the Agricultural Department at Sakrand and other research centres. They will also be utilised as centres for the training of zamindars and haris in improved agricultural methods and for the stocking and distribution of improved seeds, implements, etc. In addition it is hoped that these farms will enable accurate "costings" of farm operations and farm production under post-Barrage conditions of agriculture and irrigation.

During the year 1932-33, the construction of all farm buildings, except at Shahdaskote, the lay-out of water-channels, drains and plots and the preparation of the land for cropping was practically completed on all farms. Rotational cropping schemes for both the departmental and haris' areas were drawn up and haris were settled on the portion of the farm sites, set aside for tenant cultivators on the "batai" system under departmental supervision. Cropping was carried out in both the kharif (1932) and rabi (1932-33) seasons on all the farms although, in most cases, it was not possible to reach the full intensity of cultivation as levelling and laying-out of plots were still in progress. The farms

attracted considerable attention from the cultivators and organised demonstrations of improved agriculture were held at Dadu and Oderolal Farms and were largely attended. The work done, during the year, though only a beginning, has shown that this type of farm can have much educative value in the districts. It is the aim of the Agricultural Department that these farms should ultimately become self-supporting as far as possible and if this object can be achieved after full development of the areas, the educative value of these institutions must be considerably enhanced. These auxiliary farms are already taking an important part in the multiplication of pure seed of improved crops under the re-organised departmental seed multiplication schemes.

G—AGRICULTURAL EDUCATION.

99. *The Advisory Committee of 1923 and agricultural education in Sind.*—The Advisory Committee of 1923 considered the question of the development of higher agricultural education in Sind and recommended the establishment of an agricultural college at Nawabshah in the centre of the left bank Barrage areas. Pending the initiation of such a scheme, the Committee advocated the more liberal provision of scholarships for Sind scholars at the Poona Agricultural College. The prevailing financial stringency has prevented any action being taken towards the establishment of a college for higher agricultural education. Twelve scholarships of Rs. 20 per month are available for Sind scholars tenable at the Agricultural College, Poona.

100. *Future development of agricultural education in Sind.*—In the year 1918, the tenure of scholarships for higher agricultural education of Sind scholars was transferred from Poona to the Punjab Agricultural College at Lyallpur. This change was made as the conditions under which training was given at this latter centre approximated more closely to those prevailing in Sind. In 1922, the scholarships were retransferred to Poona owing to a demand from the Punjab Government that the full cost of the training of such scholars should be paid by the Bombay Government. Under post-Barrage conditions of agriculture and irrigation in Sind, the training given at Lyallpur would be more suited to Sind scholars and the Royal Commission on Agriculture suggested the revival of the arrangement made in 1918 with the Punjab Government. The Reorganisation Committee when recommending the closure of the

Poona College have also suggested that Sind students should be sent to Lyallpur. The idea of closing the College has now been abandoned, and the question of sending Sind students to Lyallpur does not now arise. With regard to the proposal of the Advisory Committee for the establishment of an agricultural college at Nawabshah the present financial situation does not warrant any development on the scale proposed by the Committee, i.e., a capital expenditure of Rs. 7,50,000 and a recurring expenditure of Rs. 1,50,000. Apart from the development of facilities for higher agricultural education in the Barrage areas, it is most essential that technical instruction in separate branches of practical agriculture, e.g. dairying, farm management, horticulture, market gardening, etc., should be arranged for as the demand for the services of men possessing a sound practical training in such specialised subjects is likely to increase considerably in the near future.

H—MISCELLANEOUS.

101. *Horticulture*.—The Advisory Committee laid considerable stress on the development of fruit-growing. For this purpose, the Mirpurkhas Farm is now solely utilised as a Fruit Farm and the work has been placed in the hands of a specialist horticultural officer appointed in October 1925. The work on the farm has been considerably developed and special attention is being devoted to citrus, grapes and date varieties as these fruit trees have very great possibilities in Sind under the new conditions. Probably the most important function of the fruit farm under post-barrage conditions will be the production and supply of reliable fruit stock to zamindars desirous of establishing commercial plantations. During 1932-33, about 8,000 grafts, budded stocks and cuttings were issued to the public from the Fruit Farm, Mirpurkhas and Rs. 2,875 were realized as receipts from this source. The Horticulturist has over 23,000 seedlings, etc., of various improved fruit varieties for issue in 1933-34. As the demand for such material is already considerably in excess of the supply available, arrangements have been made for the extension of this side of the farm's activities, and the co-operation of several zamindars has been obtained in the establishment of commercial nurseries in the districts to facilitate the supply of young fruit trees to intending growers in the Barrage areas. In addition arrangements have been made for the supply of varieties of fruit trees from other parts of the world where environmental conditions approximate to Sind and such varieties are being tested at Mirpurkhas

to ascertain whether they could be profitably introduced into cultivation in the Barrage areas. A sub-station in north Sind for work on date palm culture may eventually be necessary when funds permit, as the tract round the Government Fruit Farm at Mirpurkhas is not suited for this form of horticulture. Arrangements are being made for the establishment of a sub-station for horticultural work in Larkana to serve the North Sind districts.

102. *Central Research Station for Right Bank areas.*—The Advisory Committee recommended the establishment of an experimental station on the right bank of the Indus at Larkana. This station is intended to provide for jowar, wheat and cotton as well as rice, as these crops are likely to become quite as important as rice in this tract. The problems on the right bank are fundamentally different from those on the left bank where conditions of soil and climate are quite different. Such problems as the necessity for the practice of utilising "pancho" water, as followed by the rice-growers at Larkana, the possibilities of early transplanting of rices and the water requirements of the rice crop under post-Barrage conditions of irrigation, require investigation by the Agricultural Department as solutions of these matters are of extreme economic importance. Hitherto, however, the lack of funds has made it impossible to establish this station.

103. *Entomological research work into the major insect pests of crops in the Barrage areas.*—With the extended cultivation of a variety of crops under the new conditions it is necessary to provide against the danger of their damage or destruction by crop pests. In order to deal with some of the crop pests like boll-worm, it is necessary to collect information by local observation during different periods of the season. Similarly, control measures must be devised to deal with the damage caused by white ants to valuable crops in the Barrage areas. Accordingly, establishment of a crop pests section at Sakrand, with an adequate and trained staff, is desirable, when funds permit.

104. *Completion of equipment of Agricultural Research Station, Sakrand.*—The equipment of the Sakrand Station is not yet complete. At present, there are no quarters available for the Assistant Agricultural Engineer at the station and several of the graduate assistants are residing in cooly lines and katcha quarters. The accommodation for the clerical staff is also inadequate. The three small rooms used as laboratories for the chemical, botanical and physiological

sections require to be supplemented and additional storage accommodation for the various materials used on the farm and for its crop products is also required as difficulty is experienced in the separate storage of different varieties of crops, e.g. cotton, which is essential at a Research Station. In addition, the extension of the experimental work under the different sections and the commencement of new research on oil-seed cultivation, tobacco, etc., has necessitated an early expansion of the station area.

I—EXPENDITURE ON AGRICULTURAL RESEARCH AND PROPAGANDA.

105. *Departmental Expenditure.*—The financial information contained in the July 1929 issue of this pamphlet and subsequent information are tabulated below :—

Serial No.	Name of section.	Proposed expenditure.		Expenditure incurred up to August 31st, 1933.(*)	
		Capital.	Recurring.	Capital.	Recurring.
		Rs.	Rs.	Rs.	Rs.
1	<i>Sakrand Station—</i>				
	As proposed by the Advisory Committee ...	1,53,400*	.....	2,61,369†	...
	Completion of the equipment as per paragraph XXII on page 28 of the White Book published in July 1929 ...	84,925	5,000‡	45,560	...
	Further requirements ...	52,000	8,000	...	...
	Agricultural Engineering section ...	1,00,000	25,000	...	...
	Dairy section ...	20,000	15,000	...	...
	Crop Pest section ...	10,000	10,000	...	...
	Total expenditure since the inception of the scheme .	.....	.....	...	6,11,422
2	<i>Fruit Farms—</i>				
	Mirpurkhas Fruit Farm ...	5,000	.....	...	...
	Horticultural Operations (nurseries and sub-stations) ...	.....	10,000	...	...
	Live stock section ...	1,00,000	60,000	...	...

Serial No.	Name of section.	Proposed expenditure.		Expenditure incurred up to August 31st, 1933.(*)	
		Capital.	Recurring.	Capital.	Recurring.
		Rs.	Rs.	Rs.	Rs.
3	<i>Other Farms—</i> Six demonstration farms (to be also seed farms) ...	2,50,000	4,50,000	2,17,828	1,21,909
	Research Station at Larkana ...	1,50,000	75,000	...	...
	Research Station in East Sind ...	2,00,000	1,00,000	...	...
	Depôts for seeds and implements ...	.....	1,00,000	...	...
4	<i>Propaganda Operations</i> ...	.....	2,50,000	...	1,78,916
5	<i>Agricultural Education</i> ...	7,50,000	1,50,000	...	...
6	<i>Chief Agricultural Officer</i> ...	.....	26,700	...	70,710
	Chief Agricultural Officer's establishment.	.....	{ 10,650\$ or 20,000¶ }	...	29,379 ||
	Additional T. A. ...	.....	.....	...	6,659
	Contingencies ...	.....	3,000	...	3,163
	Total ...	17,21,925	13,07,700	5,24,757	10,22,158

(*) Since the inception of each item shown in columns 1 and 2.

* This is one-third estimates excluding the cost of land as proposed by the Advisory Committee for three stations.

† This consists of Rs. 1,41,132 spent by the Public Works Department and of Rs. 1,20,237 spent by the Agricultural Department.

‡ For minor works.

§ Staff as proposed by the Committee excluding the existing establishment of the Deputy Director and the posts of Price Inspector, Auditor and Artist, etc.

¶ Staff of Chief Agricultural Officer as proposed on page 30 of the White Book published in July 1929.

|| Includes the pay of establishment of Deputy Director of Agriculture in Sind now merged in that of Chief Agricultural Officer in Sind.

Some of the schemes involve a large capital expenditure and therefore definite continuity of policy in the interest both of economy and of efficiency is essential. In 1932-33, the expenditure on agriculture in Sind, including the Sakrand Farm, under the major head "34-Agriculture" was as under :—

	Rs.
A-4—Agriculture in Sind ...	3,04,621
Six Demonstration Farm Scheme ...	1,00,350
Total ...	4,04,971

The cash receipts during the same period were Rs. 44,862.

In the financial year 1933-34, the total budget provision is Rs. 4,16,000, including a special provision of Rs. 91,092

for the Six Demonstration Farm Scheme. Of this special allotment, Rs. 11,400 are for capital expenditure (land, dead-stock, and live-stock), Rs. 71,092 for recurring expenditure (pay and contingencies) and Rs. 8,600 for works (construction of buildings).

A new phase of rural development in Sind has been entered upon and the next few years will constitute a critical period in the agricultural history of the province. The reorganization of the Department in Sind to meet changing conditions has already been taken in hand and various schemes and proposals for the extension of agricultural activities in the Barrage areas are under the consideration of Government, but the extreme financial stringency does not admit of any large amounts being made available for such requirements.

(b) *Subsidies and grants.*—With effect from July, 1927, the Indian Central Cotton Committee, Bombay, has been financing the work of the cotton physiological research scheme, carried on at the Physiological Section, Agricultural Research Station, Sakrand. The actual amount of subsidy received during 1932-33 for this purpose was Rs. 24,745. This scheme was sanctioned by the Committee for a period of five years, i.e., till July 1932, but has been extended for a further period of five years, i.e., till July 1937, and a total subsidy of Rs. 1,62,854 granted to finance the scheme during the period of extension.

In addition, the Indian Central Cotton Committee granted in July 1931, a subsidy of Rs. 31,000 per annum for a period of three years, i.e., Rs. 93,000, to assist in the extension of the cultivation of improved varieties of cotton in the Barrage areas of Sind. The Committee has recently sanctioned a further subsidy of Rs. 2,96,540 to finance this work for a further period of five years, i.e., from 1st April, 1934 to 31st March, 1939.

The under-noted amounts were received from the Trustees, Sir Sassoon David Trust Fund, Bombay, for work on pathological research into rice crop diseases in North Sind during the years 1931-32 and 1932-33:—

		Rs.
1931-32	...	8,071
1932-33	...	4,000
		<hr/>
Total	...	12,071

Out of this amount, Rs. 8,823, viz., Rs. 5,538 in 1931-32 and Rs. 3,285 in 1932-33, have been spent leaving a balance

of Rs. 3,248 which was refunded to the Trustees. In addition, the Trustees sanctioned a grant of Rs. 9,132 during 1932-33 for investigation into the technique and economics of oil-seed and pulse crop cultivation to be carried on in the Barrage areas. This amount was fully spent during the year.

J—PUBLIC INTEREST IN AGRICULTURAL DEVELOPMENT OF SIND.

106. *Trade organizations and agricultural development in Sind.*—Since 1923, when the Barrage scheme was sanctioned, very considerable interest has been shown by organized trade bodies in Karachi and Bombay in the agricultural development of Sind. The Karachi Chamber of Commerce has set up a sub-committee to deal with agriculture and has made many valuable suggestions in connection with agricultural development. The Chief Agricultural Officer in Sind has been appointed an Honorary Member of the Chamber. The Karachi Indian Merchants' Association and the Buyers and Shippers Chamber, Karachi, have likewise evinced a very keen interest in the work of the Agricultural Department in Sind and the development thereof under the Lloyd Barrage and Canal Systems. Representatives of these trade organizations—and of the Karachi Chamber of Commerce—have paid visits to the Agricultural Research Station, Sakrand, where they evinced the keenest interest in the work in progress and made many valuable suggestions, especially with regard to trade and market requirements in various crops, which have been most helpful in deciding the policy of the work especially in the botanical section. Three trade exhibitions, one of improved wheats and two of improved cottons, being handled by the Agricultural Department in Sind have been organised in Karachi. These exhibitions were well attended by trade representatives and roused much interest in the work of the department in crop improvement.

107. *The Indian Central Cotton Committee.*—Government recognising the advantages and desirability of consulting the Indian Central Cotton Committee on matters affecting the development of cotton cultivation in Sind, agreed to consult them when suitable opportunities occurred, especially in connection with the following points :—

- (1) Varieties of cotton most suitable for the trade.
- (2) Methods of control of ginneries.
- (3) Methods of marketing cotton.
- (4) Finance for research connected with cotton.

As mentioned in an earlier paragraph, the Committee, at its meeting in August, 1933, sanctioned a munificent grant of Rs. 2,96,540 for the extension and development of the cultivation of improved cottons in the Barrage areas under the "Sind Cotton Extension Scheme" which is now financially provided for until 1939. In addition, a grant of Rs. 16,030 for a period of three years and a half has been made by the Indian Central Cotton Committee, in conjunction with the Imperial Council of Agricultural Research for the purpose of conducting an economic enquiry into the cost of production of cotton in the main cotton-growing tracts of Sind. This work is part of a comprehensive scheme of enquiry into the cost of production of cotton and sugar-cane in India. In January, 1933, the Indian Central Cotton Committee held its half-yearly meeting in Karachi for the first time thus enabling its members to come in close contact with the cotton-growers and cotton-traders of Sind and with the activities of the Agricultural Department in agricultural improvement, especially in relation to cotton cultivation.

V. Forests.

(A) GENERAL DESCRIPTION.

108. The forests of Sind, approximately 1,150 square miles in extent, lie for the most part along the banks of the river Indus from the Punjab frontier to within thirty miles of the mouth of the delta. Inland forests, as distinct from the riverain forests, are mainly in the Sukkur and Larkana districts, while in other districts there are small outlying areas. All these forests were originally "inundation forests", that is to say, they depended for their periodical "water-supply" on the Indus floods which swept unconfined over the country before the protection bunds were constructed. Such inland forests as are now situated outside these bunds have since very materially suffered, especially in the Sukkur District, since no provision could be made for a sufficient supply of canal water in lieu of the flood water these forests received in the past. The forests which remain within the protective bunds receive an annual inundation of varying depths and duration from June to September, and they contain as a whole an excellent growth of trees.

109. The system of working the forests has varied from time to time until the present system of clear cutting, with

subsequent reboisement from seed in the case of babul and a combination of seed and coppice in the case of kandi, was adopted from about the year 1905, when formal "working plans" were introduced. These have been revised from time to time, and the appointment of a Divisional Forest Officer, Working Plans, has been sanctioned recently since further revision is now urgently required in consequence of the havoc wrought by the severe frost of 1929 in combination with the alterations brought about by the vagaries of the river Indus in the allocation of the different age classes.

110. The forest growth consists of very few species of importance, as the peculiar rigours of the Sind climate preclude the growth of any but the most hardy of trees. In the winter the temperature sinks below freezing point and in the summer temperatures of over 125° in the shade are recorded. With these extremes of climate is coupled the precariousness of the water-supply, certain areas are not inundated for several years together, while the rainfall is at the best scanty and always capricious in its incidence. These in particular are the difficulties which beset any attempt to grow the more valuable species of trees. Should the vast area to be brought under irrigation in Sind affect the climate, as it may, by reducing the rigours of the winter and raising the subsoil water level, it is possible that the composition of the forests will change considerably.

111. The major portion of the produce of the Sind riverain forests is fuel, babul being excellent for this purpose, kandi next in importance and tamarisk very fair. Babul also furnishes a very good timber, but the demand for it is not great, as it is very heavy and hard to work. Tali gives an excellent, though heavier, timber. Bahan, in recent years, has been profitably worked on a very short rotation for the production of small rafters. Recent investigation into its possible use as a match-wood has unfortunately proved its utter unsuitability for this purpose. Kirir (*Capparis aphylla*) also yields a supply of small rafters. The principal markets for fuel and charcoal are Karachi and Quetta, and the export overseas to the Persian Gulf, Kathiawar and even so far as Egypt has been of considerable importance though suffering at present from the effects of world-wide trade depression.

112. Grazing, relatively to the number of cattle in Sind, is of small importance. Most of the cattle which graze in forests belong to professional graziers, or *maldars*, and only

a small proportion belongs to the villagers in the vicinity of the forests. In times of exceptional scarcity of rain, such as during 1931, large numbers of animals from Kohistan are allowed free grazing within forest limits, and very considerable damage to tree growth occurs in consequence as there is little or no grass and therefore innumerable babul trees are lopped to provide the necessary fodder for the starving animals.

113. The rate ordinarily payable by the Forest Department to the Irrigation Department for such supplies of water as are made available when the full supply level is maintained on the existing inundation canals is Re. 1-8-0 per acre of forest irrigated. Surplus supplies of water which are occasionally available for forest lands are generally free of charge, as is also the case for supplies of water for forest through sluices in the protective bunds.

114. The forest area actually irrigated by canal water varies very greatly from year to year according to the flood levels of the river, i.e. the forest area irrigated depends on whether the full supply level is maintained on the canals and also whether the Irrigation Department can spare water for the forests. A scheme for the creation of some 10,000 acres of irrigated forest plantations is now before Government, and under this scheme it is confidently expected that, due to the "assured supply" of water, continuity of management will be possible, and a very valuable forest property will be created and developed. No such scheme has been possible up to now owing to uncertainty of the water-supply.

115. The existing forests may be said to be in excess of the present needs of Sind so far as fuel is concerned. But fuel is an expensive article to transport over any distance and the necessity for creating and maintaining fuel-producing areas, at convenient centres for distribution, must be foreseen and provided for in view of the expected increase of cultivation which the Barrage canals must undoubtedly bring about. Sind being a particularly sparsely populated country, the needs of the existing inland population for fuel have been easily met from the scattered tree growth in the vast areas of revenue waste. With the advent of the Lloyd Barrage Canals and the foreshadowed consequent increase in population, and corresponding decrease in the area of revenue waste lands, the fuel supply

of these inland regions will undoubtedly constitute a very difficult problem. Sind is, at present, a fuel exporting country, and save in abnormal times, such as the period of the Great War, very large stocks remain on the hands of the merchants, neither the export nor the local demand being sufficient to absorb them. The grazing area is, at present, more than ample.

(B) THE FUTURE OF THE SIND FORESTS.

116. It is now necessary to examine the point whether the existing forests will be adequate to supply the needs of the future under the new conditions, i.e. whether further land should be taken up or whether any land now under forest can be relinquished for cultivation. Under this head the following four schemes require consideration :—

- (1) Afforestation in the Thar Parkar District.
- (2) The Ghotki Canal Project.
- (3) The Begari Canal Remodelling Project.
- (4) The Barrage Project.

117. (1) *Afforestation in Thar Parkar.*—The areas in this district notified under section 4 of the Forest Act, 1878, since 1891, comprise some 1,29,616 acres in the talukas of Sanghar, Khipro, Samaro and Umarkot, mostly along the Nara. These areas have never been declared Reserved forest and have always been under the control of the Collector of Thar Parkar. Of this area there was originally a very large area of some 73,629 acres known as the Makhi forest, which is outside the Lloyd Barrage influence but which has from time to time been reduced in favour of cultivation. Mr. G. J. Ramchandani of the Bombay Forest Service was deputed in 1929 to examine all these areas and report which areas should be retained and declared reserved forest and which areas could be relinquished. His recommendations which were based on an exhaustive examination of the whole situation were objected to by the Revenue Officer on financial grounds mainly, and the final conclusion arrived at was that the Forest Department should relinquish all except some 14,123 acres in the Sanghar and Khipro talukas, which should in due course be declared "Reserved Forest", together with some 39,000 acres, known as the Makhi forest which should also in course of time be declared "Reserved Forest". It is not at present contemplated to give any of these forest areas an assured supply of water from

the Barrage Canals, and the matter is not one of any immediate urgency. The Revenue Officer, it is understood, has already arranged to dispose of some of the areas relinquished by the Forest Department.

118. (2) *The Ghotki Canal Project*.—This scheme affects the whole of the inland forests of the Sukkur District on the left bank of the river. These areas, which years ago were subject to river floods from which the river bunds now shield them, are at present little more than scrub jungle. In order to make the Ghotki Canal project a paying scheme, Government have already approved of the proposals to disafforest rather more than half the total area of the existing forest land and a careful examination of all the areas is now being carried out.

The arguments against the wholesale disafforestation arise from the necessity for an adequate fuel supply and for ample grazing ground for cattle. The revenue from these forests is not insignificant. Under proper irrigation they would yield many times the present revenue, and it is very likely that the market will absorb all that the reduced area could supply.

The project is however unlikely to be taken in hand in the near future owing to the financial stringency.

119. (3) *The Begari Canal Remodelling Project*.—The two large blocks of forest in the Shikarpur Division of the Sukkur District, known as the Garhi-Yasin and Kot-Sultan forests, used to receive their periodical water-supply from the Indus river floods up to the time the Kashmore bund was built, and then for a period of about 40 years these forests were deprived of all except an utterly insignificant water-supply till the year 1930 when, owing to serious breaches in the Public Works Department bunds, most of these areas were flooded.

A number of irrigation projects have been considered in the past by which these two forests, or some portion of them at any rate, should receive varying supplies of water, but nothing much came of them. The situation at present is as follows :—

From the Sultan-Kot branch of the Begari Canal Remodelling Scheme, 11,875 acres of the Kot-Sultan forest is to receive an assured water-supply varying from 1 cusec per 120 acres for 5,052 acres, to 1 cusec per 240

acres for 6,823 acres, whilst 5,498 acres is to be disforested. Similarly, of the 12,706 acres of the Garhi-Yasin forest lying to the north of the Khirthar Canal, some 2,055 acres are to receive an assured supply at 1 cusec per 100 acres, 7,220 acres an assured supply at 1 cusec per 240 acres, whilst 3,431 acres are to be disforested.

If and when this Remodelling Project materialises, 8,929 acres of forest will be disforested out of both Kot-Sultan and Garhi-Yasin forests; and of the 21,150 acres remaining, the areas containing the better class soils will in course of time produce valuable forest and the rest will probably only be suitable for pasturage.

There still remain some 7,000 acres of the Garhi-Yasin forest south of the Khirthar Canal and for this area arrangements have already been made for a surplus water-supply from the Shahdadt branch and its two distributaries as well as from the Khirthar Canal, all of which are included in the Barrage Project.

120. (4) *Barrage Project*—(i) Proposals are under the consideration of Government for the creation of nearly 10,000 acres of forest plantations in the Larkana District, on the Punjab model, for which a regulated and assured supply of water will be possible from the Barrage Canals. These 10,000 acres constitute about 1/6th of the total inland forest area in the Larkana District and the location of the different areas which together amount to that figure has had to be governed chiefly by the capacity of the different canals of the Barrage system to provide the necessary supply of water.

(ii) Forest plantations proper cannot be created on an uncertain supply of surplus water, which, it is reasonable to suppose, must gradually diminish in course of time, as the area under cultivation increases. The necessity for a permanently assured supply has therefore been recognised by the Barrage authorities, who have, in addition, made arrangements for this assured supply to be given in 5 annually increasing instalments, the full supply being reached in the fifth year and continued thereafter. The Barrage authorities have accepted the following conditions governing the assured supply :—(1) that the Forest Department shall pay approximately Rs. 3 per acre per annum for an assured supply of 3-foot delta; (2) that all necessary water channels for the

distribution of such supplies shall be built by the Irrigation Department at the cost of the Forest Department; (3) that surplus water-supply (that is all water surplus to the requirements of cultivation) which the forests may receive, is to be free of cost, but that the cost of sluices for such supplies is to be debited to the Forest Department.

(iii) This is as equitable an arrangement as it is possible to devise, for the Forest Department could not afford to pay anything for surplus supplies of water in addition to meeting the heavy initial expenditure necessary to distribute such supplies over the whole area, without crippling its annual net revenue to a very appreciable extent. On the other hand the Irrigation Department would have either to find areas for the discharge of this surplus water or to close their canal Head Regulators, in which case no one would be any better off whilst the forests would suffer. Again, in so far as the assured supply of water is concerned, the Irrigation Department obtains the same price for its water from the Forest Department as it would from the cultivator, whereas the profits accruing from the forest plantations raised on this assured water-supply ultimately benefit the general revenues of Government.

The availability of surplus water supplies with development of irrigation is however a very uncertain factor. The question whether and, if so to what extent, this source of irrigation can be relied on for established inland forests is receiving further consideration.

(iv) In addition to the proposed forest plantations, other plantations may also be created along or adjacent to the canal banks, not merely to supplement the fuel and timber supply but to improve its accessibility and distribution, in accordance with the decisions arrived at by the Lloyd Barrage Standing Committee on the joint report prepared by the Chief Engineer, the Revenue Officer and the Conservator of Forests.

(C) SUMMARY.

121. The existing forests in Sind are considerably in excess of its present needs as regards fuel, timber and grazing facilities. They contain, apart from supplies from private "huris", zamindari lands, Government waste lands and from Khairpur and Bahawalpur States, a large margin

to meet expansion in the near future, always provided that the centres of such additional demand are accessible by railway or other economical forms of transport.

In order to reap the fullest advantage of the various irrigational projects and at the same time to make them pay, it will be necessary, especially in connection with the Ghotki and the Begari Remodelling Projects, to disafforest some of the land and bring it under cultivation. This policy must, however, be pursued with discrimination in order to maintain and supplement the supply of forest produce and grazing grounds, so that such may not fall short of the larger demand which must result from any extensive development under the Barrage. The possibility of a considerable reduction in the yield from riverain areas of the Karachi and Hyderabad districts, which at present depend for their existence on the height of the annual flood water, must also be taken into consideration, as there appears to be some likelihood of future flood levels in Lower Sind being much lower than was the case in the past, on account of the volume of water taken off by the Barrage Canals, consequently much area which now receives such water will be left high and dry and incapable of producing new tree growth.

It must however be admitted that the "take off" by the Barrage Canals during the *abkalani* season of 1932 did not apparently affect the flooding of the forests in these two districts, a much larger area having received water than for the past several seasons, judging from the gauge readings at Kotri which passed the 22-foot mark.

VI. Administration.

122. (i) All the districts in Sind, except Karachi, are directly affected by the construction of the Barrage, inasmuch as the new canals will flow through them. The Upper Sind Frontier District and the Sukkur District are only affected to a small extent, but in Larkana, Nawabshah, Hyderabad and Thar Parkar the large areas that will become available for cultivation will throw a heavy additional burden upon every branch of the administration. Accordingly the question of the creation of new districts and talukas was under the consideration of the Commissioner in Sind in consultation with the Chief Engineer of the Barrage and the Revenue Officer, and a scheme was drawn up for the creation of two new districts

to be named Dadu and Guni, the former on the right bank of the Indus and the latter on the left bank, and ten new talukas. While recognising the desirability of the whole scheme Government have been unable, in view of the present financial situation, to accept it in its entirety and they have undertaken for the present the creation of only one new district with headquarters at Dadu and of an additional taluka with headquarters at Garhi Khairo in the Upper Sind Frontier District. This has involved the reorganisation of certain districts in the manner shown below :—

	Talukas.
<i>Upper Sind Frontier</i> (2 sub-divisions): Jacobabad,	5
Garhi Khairo,* Thul, Kandhkot, Kashmor.	
<i>Larkana</i> (2 sub-divisions): Kambar, Warah,	7
Shahdadkot, Miro Khan, Larkana, Rato Dero,	
Labdarya.	
<i>Dadu</i> (2 sub-divisions): Mehar, Kakar, Dadu,	7†
Sehwan, Johi, Kotri and Kohistan.	
<i>Karachi</i> (2 sub-divisions): Karachi, Tatta, Mirpur	9
Sakro, Ghorabari, Ketibandar, Mirpur Bathoro,	
Sujawal, Jati, Shahbandar.	

123. (ii) The estimated average annual cost of the new revenue establishments required for the new districts and talukas was calculated at Rs. 6,10,060 and a rough estimate of the cost of the revenue buildings required was Rs. 10,35,000. But the average annual cost of the revenue establishment actually sanctioned by Government on account of the creation of the Dadu District and Garhi Khairo Taluka comes to Rs. 1,30,100. The new district on the right bank came into existence on 5th October 1931.

The following is a summary of the cost of buildings both revenue and police sanctioned by Government and now practically completed.

<i>Headquarters: Revenue Buildings.</i>				Rs.
Collector's kacheri and subsidiary buildings	...	...	...	1,68,099
Collector's bungalow	...	...	...	46,645
Garhi Khairo Taluka Kacheri	...	...	...	46,611
		Total	...	2,61,355
			...	9,196
Land compensation	...	...	...
		Total	...	2,70,551

* New taluka.

† The creation of the new Sita Taluka has been postponed and Manjhand Mahal has been included in the Kotri Taluka.

Headquarters : Police Buildings.

	Rs.
District Superintendent's bungalow and office ...	30,417
Deputy Superintendent's bungalow and office ...	19,259
Headquarters lines and quarters for Sub-Inspectors ...	2,89,967
Total ...	3,39,643
Police lines at Garhi Khairo ...	21,025
Total ...	3,60,668

124. (iii) When it is decided to create the new district on the left bank, the following headquarters buildings will be required :—

	Rs.
Collector's kacheri and treasury ...	2,00,000
Three District Deputy Collectors' bungalows ...	50,000
One District Superintendent of Police's bungalow ...	35,000
One District Superintendent of Police's office ...	19,000
One Deputy Superintendent of Police's bungalow and office ...	20,000
Headquarters Police lines ...	2,87,600
Total ...	6,11,600

Further, the creation of eight new talukas in the three districts of the left bank will involve an expenditure on buildings of Rs. 8,50,500. The total expenditure on buildings will be Rs. 14,62,100, and the recurring expenditure on establishment will be :—

	Rs.
Revenue establishment ...	3,40,446
Police establishment ...	1,06,000

The consideration of these questions has been deferred in view of the present financial position.

125. (iv) In 1930, two Committees were appointed, called respectively, the Lloyd Barrage Standing Committee and the Lloyd Barrage Advisory Committee, to assist Government in the prosecution of the Lloyd Barrage Project Scheme.

The Lloyd Barrage Standing Committee was composed entirely of officials, the heads of the principal departments in Sind, with the Commissioner in Sind as its Chairman.

The object with which this committee was appointed was that any major proposals affecting the project or requiring the orders of Government may reach them in a form giving the considered opinions of all the local heads of the responsible departments.

Owing to the completion of the project, the need for such a committee no longer exists, and it has therefore been abolished.

The Lloyd Barrage Advisory Committee was composed entirely of non-official gentlemen, eight from Sind and four from the rest of the Presidency. The functions of this Committee were

(1) to advise Government generally on all matters connected with the Barrage Project; and

(2) to offer advice on any matter referred to it by Government or by the Lloyd Barrage Standing Committee.

As regards the budget this committee was intended to perform the same functions as the Finance Committee of the Legislative Council does, i.e., to advise as to the attitude which the Legislative Council is likely to take on new items in connection with the scheme.

The term of the members of this Committee appointed in 1930 expired on 31st March 1933. The last Committee held six meetings during its term of office and three joint meetings with the Standing Committee. Government have now appointed a new committee consisting of the following non-official gentlemen :—

Chairman.

Mr. Jamshed N. R. Mehta.

Members.

- (1) Sir Shah Nawaz Khan Ghulam Murtaza Khan Bhutto, Kt., C.I.E., J.B.E., M.L.C.
- (2) Khan Bahadur Allahbaksh Haji Muhammad Umar.
- (3) Rao Bahadur Tharumal Bilaram.
- (4) Mr. Darshansing Maluksing Bakhshi.
- (5) A representative of the Karachi Chamber of Commerce.
- (6) A representative of the Indian Merchants' Association, Karachi.
- (7) Seth Haji Abdullah Haroon, M.L.A.
- (8) Khan Bahadur M. A. Khuhro, M.L.C.
- (9) Sardar Gangadharrao Narayanrao Mujumdar, M.L.A.
- (10) Khan Bahadur Abdul Latif Haji Hajrat Khan, M.L.C.
- (11) Mr. Ellis Jones, M.L.C.

126. (v) *Constitution of Sind as a Separate Province.*—Sub-Committee No. IX of the Indian Round Table Conference dealt with the question of constituting Sind as a separate Province and, with two dissentients, accepted the principle of separation. The Sub-Committee noted however that no detailed examination of the financial consequences of separation had been made, and observed that on the figures available to them they were unable to express an opinion on the financial aspects of the question. They therefore recommended that an expert committee in India should examine carefully the probable revenue and expenditure of a separated Sind and the security of the debt on the Lloyd Barrage, and should also recommend an equitable adjustment of the financial commitments for which Sind might properly be considered liable. The Government of India accordingly appointed Mr. Miles Irving, C.I.E., O.B.E., Financial Commissioner, Punjab, and Mr. D. G. Harris, C.I.E., Consulting Engineer to the Government of India, as the Sub-Committee to make the necessary enquiries. This Committee known as the “Sind Financial Enquiry Committee” signed their report in September 1931 after an enquiry lasting from July 13th. The report showed that a separated Sind would enter upon its new career with a deficit of Rs. 110.42 lakhs. On the 1st of December 1931 in his statement made at the close of the second session of the Round Table Conference the Prime Minister announced :—

“His Majesty’s Government also accept in principle the proposition which was endorsed at the last Conference, that Sind should be constituted a separate province, if satisfactory means of financing it can be found. We therefore intend to ask the Government of India to arrange for a conference with the representatives of Sind for the purpose of trying to overcome the difficulties disclosed by the report of the expert financial investigation which has just been completed.”

In accordance with the above announcement of the Prime Minister, a committee known as the “Sind Conference” was constituted by the Government of India for the purpose of trying to overcome the difficulties disclosed by the report of the expert financial investigation made by the “Sind Financial Enquiry Committee.”

This Conference was composed of the Hon. Mr. A. F. L. Brayne, C.I.E., I.C.S., as Chairman, Mr. H. Dow, C.I.E., I.C.S., representing the Bombay Government, and the following non-official gentlemen as members :—

The Hon'ble Mian Ali Bakhsh Muhammad Hussain,
 Sir Shah Nawaz Bhutto, Kt., C.I.E., O.B.E., M.L.C.,
 Mr. Lalchand Navalrai, M.L.A.,
 Seth Haji Abdullah Haroon, M.L.A.,
 Mir Bandahalikhan, M.L.C.,
 K.B. Muhammad Ayub Khühro, M.L.C.,
 K.B. Allahbakhsh Muhammad Umar, M.L.C.,
 Professor H. L. Chablani,
 Professor H. R. K. Batheja,
 Mr. Hoshang N. E. Dinshaw,
 D.B. Murlidhar Jeramdas Punjabi,
 Mr. E. L. Price, C.I.E., O.B.E.,
 Qazi Abdur Rahman.

The conference sat at Karachi from 25th April to 17th May 1932, and the Report of the Chairman of the conference which was submitted to the Government of India on 6th June 1932 has since been published.

According to the opinion of the Chairman of this conference the probable initial deficit of Sind as a separate province would amount to Rs. 80.65 lakhs.

According to the proposals of His Majesty's Government contained in the document known as the "White Paper" which was published on the 18th March 1933, Sind is to be constituted as a separate Governor's Province and the Governor of Sind will be declared to have *inter alia* special responsibility in respect of the administration of the Lloyd Barrage.

Accordingly with the object of investigating certain administrative questions which will arise in the event of Parliament accepting the proposal of His Majesty's Government that Sind should be created a separate province and, in order to prevent possible subsequent delay, the Government of India have with the approval of the Secretary of State set up a committee under the chairmanship of Mr. Dow to examine these questions during the coming cold weather.

The Committee has been asked to consider and make recommendations as regards the accommodation required at Karachi for a Government House, Council

Chamber, Secretariat and residences for senior officials; the administrative arrangements that will be necessary to secure the effective supervision and co-ordination of work of the Sukkur barrage project; whether and, if so, what affiliation should be made with the existing High Court, University, medical, scientific, veterinary, forest, engineering, agricultural and other institutions in the Bombay Presidency; whether a self-contained cadet should be maintained for the Services in all departments and more particularly for the All-India Services and any other matter that may be referred to the committee by the Government of India.

VII. Financial Summary.

127. The Barrage proper has now been completed but the canals dependent on it will not be finally completed till 1934. So that up to and including that year there will be heavy capital expenditure both upon the project and upon its consequent developments and that expenditure will be in excess of the receipts from land sales.

It will be convenient if an attempt is made at this point to summarise the financial effect of what has been presented in the preceding sections of this memorandum.

128. (i) *Loan-money borrowed for main project including interest.*—In the irrigation section it has been stated that the latest estimate is that the whole project will cost Rs. 20,03 lakhs. Of this Rs. 36 lakhs are indirect charges, namely, land revenue abatement, and audit and accounts charges and Rs. 19,67 lakhs are direct charges for which Government borrow. This is the cost exclusive of the interest charges on the money which has been or will have to be borrowed for the project. Up to 1930-31 nearly Rs. 10 lakhs per annum of the interest charges have been provided from other sources, mainly from the famine fund excess. After allowing for this it is estimated that the amount borrowed for the direct charges up to the end of 1934-35 will be Rs. 26 crores roughly.

129. (ii) *Lower Sind Canals.*—The liability in sight on account of commitments to landholders in respect of canals in Lower Sind, whose water-supply will be affected by the construction of the Barrage, amounts to Rs. 1,31 lakhs. The Fuleli and Kalri Remodelling Schemes are already in progress. The probable expenditure to end of the current financial year on these Projects is estimated at

Rs. 42.42 lakhs (including all charges) and about Rs. 18.26 lakhs will be required till their completion in 1935-36. The commencement of the remaining projects in these divisions will depend on the financial situation. This does not include Rs. 1.25 lakhs, required for canals north of the sphere of the Barrage, and so unaffected by it, and Rs. 26 lakhs for the Mehrani Canal Project in the Fuleli Canals Division of the Hyderabad District, which, although it is in Lower Sind, is not a commitment and need only be taken up on the basis of its merits as a productive project.

130. (iii) *Agriculture*.—Under this head the proposed expenditure and that hitherto incurred are as follows :—

Proposed expenditure.		Expenditure incurred up to 31st August 1933.	
Non-recurring.	Recurring.	Non-recurring.	Recurring.
17.2	13.1	5.2	10.2

The figures of recurring expenditure include no provision for repairs to or replacement of the various buildings and other items included under non-recurring expenditure. The proposed expenditure on seed-farms and depôts for agricultural requisites will be largely set off by receipts.

131. (iv) *Administrative*.—The new district on the right bank of the Indus came into existence on 5th October 1931. On this account plans and estimates of Revenue and Police buildings estimated to cost Rs. 7.1 lakhs have been sanctioned and up to the end of March 1932 expenditure to the extent of Rs. 6.3 lakhs had been incurred. The average annual cost of the Revenue and Police establishments actually sanctioned by Government on this account comes to Rs. 1.3 and Rs. 0.7 lakhs, respectively.

132. (v) *Roads*.—As stated on page 21 the question of Sind Communications has engaged the attention of the Government of India who have appointed an officer with a small staff for a period of six months from November 1933 to conduct an enquiry and to bear the cost of the enquiry.

133. (vi) *Recoupment of cost in Baluchistan and Khairpur*.—Terms have yet to be arranged with the Government of India regarding the Khirtar branch in the Nasirabad tehsil in Baluchistan. A settlement to which the Government of India have agreed is that the Central Government should reduce the debt of the local Government by the proportionate share of the cost of the Nasirabad section of the Khirtar Branch and take the whole receipts accruing from it, less the

cost of management. The Government of India have asked for a self-contained memorandum embodying the precise terms and conditions for the extension of Irrigation from the Khirtar Branch in Baluchistan. The memorandum is under preparation. It is estimated that this branch will have cost about one crore of rupees inclusive of interest and indirect charges and the total borrowings from the Government of India will be reduced correspondingly. A similar question has to be settled with the Khairpur State in regard to its share of the cost of the Lloyd Barrage, but it is proposed to allow the State to repay its share over a period of years.

134. (vii) *Water Courses*.—Government will have to incur an additional cost of Rs. 204 lakhs on account of water courses and rectangulation charges. In so far as new lands are concerned such charges will be recovered as part of the occupancy price. But as indicated in Section A of Chapter I about three-fourths of the land concerned consist of land already occupied. And, as there stated, the Irrigation Act has been amended to provide for the recovery from existing owners of their share of the cost of water courses and two-thirds of the cost of rectangulation charges. The money will be borrowed and most of it recovered, with interest.

135. (viii) The total irrigational expenditure may be summarised as at 1st April 1935, as follows :—

	Lakhs of rupees.
Outstanding debt for Lloyd Barrage and Canals	
Construction	26,08
Less—Amount to be paid by the Government of India	—1,00
Outstanding debt for Lower Sind Canals ...	1,30
Total ...	26,08

This includes no provision for the agricultural research and propaganda necessary for the project nor for any other expenditure other than that on the Barrage and Canals.

136. (ix) Estimates of realisations, both from land-sales and from increased land revenue, were framed when the project was inaugurated, and have since been revised. But a complete forecast of the financial results is impracticable in the present state of trade, and will be attempted only after conditions and prices show signs of greater stability than at present. A provisional forecast of the expected receipts from land sales in the Barrage area is given in Appendix II on page 99 of this publication.

VIII. Development of Sind under the Barrage conditions.

137. This memorandum brought up to date has been prepared in order to state in a connected form the existing situation and the various problems that await solution in connection with the development of Sind under Barrage conditions. In each principle branch of administration the position is summarized below under the following heads:—

A. Important work done and important changes, developments and economies effected during the past five years.

B. Matters which have been partly considered or dealt with.

C. Questions to be taken up in the near future.

D. Matters the consideration of which has been postponed.

I—IRRIGATION.

A.—(a) IMPORTANT CHANGES AND DEVELOPMENTS AND ECONOMIES CARRIED OUT DURING THE PAST FIVE YEARS.

(i) *Lloyd Barrage and Canals Construction Scheme.*—The Barrage, including the Divide Walls, and the Head Regulators of the main canals, has been completed, and also the excavation of practically all the channels, big and small, except a few minors which have subsequently been found necessary. The total expenditure incurred up to the end of September 1933 is Rs. 23·05 crores (including Rs. 393·57 lakhs for interest up to the end of March 1933 and excluding indirect charges and *pro-rata* charges on account of establishment and tools and plant from the 1st of April 1932), which is well within the estimate.

(ii) *Research work.*—With a view to observe the effect of the new canals on the sub-soil water level and inquire into other kindred problems, the Central Designs Division, which was created to work out the most economical designs of masonry structures, was converted into a Research Division on the 1st of October 1930. This division has by now collected most useful data, which will be extremely helpful in taking measures to guard against water-logging.

As a measure of economy the Indus River Gauging Division was subsequently merged into this division on the 26th October 1931; since then the functions of the Gauging

Division are also being performed by the new division which has been renamed "Development and Research Division".

(iii) *Establishment*.—In order to effect saving on establishment in the Public Works Department, the Sind Public Works Department and the "Barrage" administrations were amalgamated on the 15th December 1931. To start with, the posts of two Chief Engineers were maintained and only the office of the Chief Engineer in Sind disbanded. From the 1st of April 1933, however, the post of one Chief Engineer, who was working as Joint Chief Engineer, was also abolished.

Substantial economy was also obtained by reducing the scales of pay of temporary Assistant Engineers and other staff on the completion of the Barrage works, which had entailed very hard work, in consideration of which high scales of pay had been allowed during the construction period.

Effect has also been given to the recommendations of the Thomas Committee, wherever possible.

(iv) *Drainage Division*.—A special Drainage Division is now (November 1933) being opened to deal with the preventive and protective works found necessary as the results of investigations conducted into the effect of the Barrage irrigation on the sub-soil water levels and the tendency to water-logging.

B.—MATTERS WHICH ARE NOW UNDER CONSIDERATION OR HAVE BEEN PARTLY DEALT WITH.

(i) *Remodelling of the canals of lower Sind*.—As already stated under Chapter I (C), the whole of the "Fuleli Canal System Project" has been completed except the Mirwah Talhar project and the construction of modules along the remaining canals. The former project is ready, but as several objections to it have been raised by the zamindars concerned, it is being further examined. Plans and estimates for modules are in hand and the work will soon be taken up.

As regards the canals in the Karachi district, the position has been fully explained under paragraph 32 (vi) above.

(ii) *Canals in Upper Sind*.—The position as regards these canals, which are not affected by the Barrage, has been described under Chapter I (B). A small project costing

Rs. 1,05,704 has since been sanctioned by Government for the excavation of two new distributaries out of the Begari Canal and the construction over it of two Cross Regulators which are very urgently required. These works will be commenced during the current financial year.

(iii) *Amendment of the Bombay Irrigation Act.*—A radical amendment of the Bombay Irrigation Act is necessary. The amendments which have been proposed are under the consideration of Government.

(iv) *Settlement with the Khairpur State in regard to the recovery of the share payable by the Durbar towards the cost of the Barrage.*—The question was discussed at a Conference held at Simla where the representatives of the Government of India, the Government of Bombay, and the Khairpur State were present; and it was decided that the question of the exact implications of the understanding between the Bombay Government and Khairpur State as to participation in the Barrage scheme should be further examined.

(v) *Settlement with the Government of India in regard to the recoupment of the cost of the extension of Barrage canals into the Nasirabad Tahsil.*—The memorandum on the subject required by the Government of India is under preparation.

II—COMMUNICATIONS.

(i) *Extension of the Railways.*—A programme for the extension of Railways has been drawn up. Of these the Sind Left Bank Feeder Railways have already been completed and opened for traffic. Any further construction work has been held over due to the existing financial stringency.

(ii) *Roads.*—Information in connection with the progress made on the provincial roads has been given under Chapter II.

The Government of India have under consideration a proposal for the development of roads from loan funds, and in this connection a special officer has been appointed by the Government of India to conduct an enquiry in respect of the roads in Sind with a view to preparing a complete programme of development of roads in that province. The report of this special officer is awaited.

III—LAND POLICY AND REVENUE.

A.—WORK DONE IN THE LAST FIVE YEARS.

(i) *Disposal of land*.—The disposal of Government waste lands has proceeded on the principles laid down in paragraphs 45-55 of the handbook; and these principles have been proved in the main to be sound. Up to the present the following areas of land have been disposed of :—

	Acres.
Free and concessionary grants (including free military grants, grants to Junior Talpurs, fallow-forfeited and mohag grants and other miscellaneous concessions)	1,22,000
Sales at full rates	2,55,000
Peasant grants	20,000
Leases	1,71,000
Total	5,68,000

The main item in the free and concessionary grants is the regrant of fallow-forfeited lands and mohag grants, for which it was originally estimated that $3\frac{1}{2}$ lakhs of acres would have to be reserved. As both of these kinds of grant are now practically completed, it will be seen that a large saving has been made on the estimated amount of land that would be thus absorbed. The balance is available for full rate sales and the financial aspect to that degree is improved. As regards sales at full rates, it has proved possible even during the depression current during the last few years, to sell more than the area programmed for sale, and to obtain approximately the prices estimated before the depression set in. This seems a clear indication that the original estimates were not unduly optimistic.

The sale of leases is a new feature in Sind land revenue administration, which has recently been extended into the non-Barrage areas. So far as the Barrage area is concerned, leases have become very popular, and there is strong demand for the lease of land at rates which are seldom less and often in excess of the land revenue rates, which have to be paid in addition to the lease money.

(ii) *Settlements*.—The resettlement of the whole Barrage area has been carried out, and new settlements introduced. Owing to that fact that settlement rates are based on a fixed proportion of the zamindar's net assets and that the introduction of the new settlements coincided with a great fall

in the prices of agricultural produce, the rates sanctioned were much lower than had been originally forecasted. The rates were therefore only sanctioned for five years with effect from July 1932, in the hope that prices may improve to the mutual advantage of zamindars and Government.

The indications are that security of water supply and the improvement of agricultural practice have increased outturns to an extent that has largely discounted the fall in prices, so that the new settlement rates are being paid without difficulty.

(iii) *Land acquisition*.—Practically the whole of the land required for head works, canals, distributaries, and all channels other than water-courses has been acquired and paid for. The land for water-courses has also been surrendered and the water-courses constructed and the zamindars are to be paid for the land by credit given to them against the amounts due from them for the construction of water-courses. The Bombay Irrigation Act has been twice amended in 1931 and 1933, in order to enable the cost of construction of water-courses to be levied.

(iv) *Rectangulation*.—

(a) The major rectangulation by the Survey of India has been completed.

(b) The original programme of sub-rectangulation of 1,500,000 of acres has been extended to 2,300,000 of acres, and will be completed in the current season.

(v) *Establishment*.—Certain economies have been effected in the establishment of the Revenue Officer and the District Officers, the more important of which are as follows:—

(a) Amalgamation of the temporary post of Survey Officer, Lloyd Barrage, with that of the Superintendent of Land Records in Sind.

(b) Abolition of the post of Chitnis to the Revenue Officer.

(c) Daftardars replaced by Chitnises.

(d) Huzur Deputy Collectors replaced by Huzur Mukhtiarkars.

(e) The post of Political Assistant to the Commissioner in Sind has been held in abeyance.

B.—MATTERS PARTLY CONSIDERED AND DEALT WITH.

The recovery of the cost of construction of water-courses has been legalised and a scheme for their collection has been worked out, but recoveries have not yet commenced.

C.—QUESTIONS TO BE TAKEN UP IN THE NEAR FUTURE.

(i) A review of the policy to be adopted in regard to the sale of lands, considering whether it is possible and desirable to accelerate sales, and whether lands at present held on leases of terms of years should be released or sold.

(ii) The extent to which sub-rectangulation should be extended in Class II and Class III lands, and the agency by which further sub-rectangulation should be carried out.

(iii) As the existing land revenue settlements expire in 1936-37, proposals for the new settlements will have to be initiated in good time.

IV—AGRICULTURE.

A.—The chief developments and economies which have been given effect to in the Agricultural Department in Sind during the past five years are as follows :—

(i) The unification of control of the Agricultural Department in Sind with the appointment of a Chief Agricultural Officer in Sind, financially and administratively independent of the Director of Agriculture, Bombay Presidency, and subordinate to the Commissioner in Sind, and the separation of the cadres of the Department in Sind from that in the Presidency.

(ii) The establishment of a Provincial Board of Agriculture in Sind and of a Local Committee of that Board, in lieu of the Divisional Board of Agriculture, Sind, to co-ordinate the work of the Agricultural and Co-operative Departments and the association of non-officials in agricultural development work.

(iii) The establishment of a Sind Research Committee, under the chairmanship of the Commissioner in Sind, to co-ordinate and control research work in Sind in all its branches as affecting agriculture and irrigation.

(iv) The formation of a Sind Cotton Committee, upon which the interests of cotton-growers and cotton trade interests are fully represented, and to whom all matters relating to the future of cotton cultivation and marketing up-country will be referred for discussion and advice.

(v) The establishment of six new Government Auxiliary Farms under the "Six Farm Scheme" in the Barrage areas for demonstration purposes.

(vi) The complete reorganization of district propaganda charges in accordance with the new requirements of district work under post-Barrage conditions of irrigation and agriculture.

(vii) The closing down of the Government Farm, Sukkur, the Government Wheat Farm, Jacobabad, and the Willingdon Cattle Farm, Malir, as measures of retrenchment.

(viii) The organization of a special section of the Agricultural Department in Sind, i.e., the "Sind Cotton Extension Scheme" for intensive work towards the extension of the cultivation of improved varieties of cotton in the Barrage areas.

N.B.—The work under this scheme is financed by the Indian Central Cotton Committee, Bombay, who granted a sum of Rs. 93,000 for this purpose from 1931-34 and have extended the scheme for a further period of five years, i.e., till 1939 at an additional cost of Rs. 2,96,540.

(ix) The conversion of the Government Farm, Mirpurkhas, into a horticultural research station to deal with problems relating to fruit culture, etc., in Sind.

(x) The appointment for one year in the first instance of a Mechanical Engineer (Irrigation and Agriculture) in Sind for work on problems relating to agricultural engineering development and research.

(xi) The formation of a propaganda "touring party" with magic lantern slides, exhibits, etc., for propaganda work in the Barrage areas.

(xii) The issue of a new series of vernacular leaflets on agricultural subjects.

(xiii) The establishment of an "Oil-seed Branch" of the Botanical Section at the Agricultural Research Station, Sakrand, for investigation into the possibilities and economics of the extended cultivation of improved varieties of oil seed and pulse crops in the Barrage areas. (This work is being financed by grants from the Sir Sassoon David Trust Fund.)

B.—MATTERS UNDER CONSIDERATION AND MATTERS PARTLY DEALT WITH.

(i) The expansion and development of the staff and resources of the Department employed upon demonstration and propaganda work in the districts, especially in the

Barrage areas. A detailed scheme and estimates in this connection have been prepared and are being considered by Government.

(ii) The organization of an agricultural engineering section of the Agricultural Department in Sind, under a qualified and experienced Agricultural Engineer, to investigate agricultural engineering problems.

A small commencement has already been made in this direction by the appointment mentioned in item (x) of Section A above of the Mechanical Engineer for Irrigation and Agriculture. A detailed scheme for agricultural engineering development in Sind is now under the consideration of Government.

(iii) Experimental work on the reclamation of *kalar*, i.e., alkali, lands in Sind under post-Barrage conditions of irrigation.

In this case also a detailed scheme has been prepared which Government is considering.

(iv) The question of Supply and Improvement of Cattle was dealt with by a Committee under the chairmanship of the Revenue Officer. Their report has been printed. The decisions taken by Government thereon were summarised in a Press Note, copy of which is attached to this Review as Appendix III. Most of their recommendations have had to be held over owing to lack of funds.

C.—QUESTIONS TO BE CONSIDERED IN THE NEAR FUTURE.

(i) The establishment of a Research Station on the right bank to investigate the agricultural and irrigational aspects of rice cultivation on the Barrage canals and to conduct detailed scientific research into the soil and sub-soil problems of that tract.

(ii) The completion and development of the equipment and the extension of the facilities for research work at the Agricultural Research Station, Sakrand.

(iii) The establishment of sub-stations to investigate—

(a) the problems of rice cultivation and irrigation in Lower Sind.

(b) fruit culture in North Sind.

(c) the improvement of the Thar Parkar breed of cattle for general use in the Barrage areas.

(d) economic control measures against the major insect pests and fungus diseases on the main crops.

(iv) The organization of seed supply of improved varieties of crops, based on regular schemes for progressive multiplication of pure seed and the establishment of a series of storage and distributing centres, e.g., seed depôts, etc. (Seed multiplication schemes for improved varieties of cotton and wheat have been already started and are now in the third year stage.)

V—FORESTS.

A.—There is nothing to record under this head.

B.—MATTERS WHICH HAVE BEEN PARTIALLY CONSIDERED OR DEALT WITH.

(i) A scheme has been prepared and is now under the consideration of Government under which it was proposed to create some 10,000 acres of irrigated forest plantations in the Larkana Division, dependent on a regular water supply. Under this scheme suitable timber species would be grown in addition to "fuel producing" species. Some preliminary work has already been carried out by the Irrigation Department in so far as the "layout" of the irrigation system is concerned.

(ii) Minor forest irrigation schemes depending on surplus and unassured water supplies as opposed to regular and assured supplies have been prepared, but their further development awaits the decision on the scheme referred to at (i) above. The main difference between surplus water and regular water supply forest irrigation schemes is that the former are considerably cheaper than the latter, but returns on the money spent on the former take very much longer to realise.

(iii) The Thar Parkar district contains a very large area of "Section 4 Forests" under the management of the Revenue Department. What proportion of these forests should be permanently retained and declared Reserved Forest is now under consideration.

(iv) The revision of the Sind Divisional Forest Working Plans was commenced this year and the preliminary survey work and stock mapping work has been completed in the Hyderabad Division, and commenced in the Karachi Division. This will take at least three years more for the remaining three Divisions of Larkana, Shikarpur and Sukkur.

C.—There are no new questions to be taken up in the near future.

D.—MATTERS THE CONSIDERATION OF WHICH HAS BEEN POSTPONED.

(i) Owing to the indefinite postponement of the Ghotki irrigation project, due to lack of funds, no action can be taken at present to select forest areas within the limits of that project for plantation purposes and to submit proposals for the disforestation of the remaining areas, as until this project is taken up, it is not possible to cultivate these lands.

(ii) The provision of suitable accommodation for the forest protective staff has always been inadequate in Sind, and is now more so as a result of the damage done during the last few years by floods and rains to the existing buildings. But the consideration of this question must await a return to more favourable financial conditions.

(iii) The conversion of the posts of Forest Guards into those of Range Forest Officers where the charge of Rounds is held by the former. There are at least 28 such posts in the Sind Circle, but their conversion cannot be considered at present for lack of money.

VI—ADMINISTRATION.

A.—IMPORTANT CHANGES AND DEVELOPMENTS WHICH HAVE TAKEN PLACE IN THE PAST FIVE YEARS.

(i) The new district of Dadu has been inaugurated and the necessary headquarters buildings constructed.

(ii) The Irving Harris Committee and the Brayne Committee have reported on the financial aspect of the Separation of Sind.

B.—There is nothing to record under this head.

C.—MATTERS TO BE CONSIDERED IN THE NEAR FUTURE.

(i) The future organization of the Revenue Officer's department has to be considered.

(ii) The numerous and difficult problems of administration arising out of the proposed separation of Sind must also be considered in the near future. Many of them in fact are already being considered by the Sind Administrative Committee now sitting at Karachi (*vide* page 83).

APPENDIX I.

Recommendations of Advisory Committee of 1923 regarding development of Agricultural Department in Sind and action taken thereon up to end of September 1933.

Recommendation.	Action taken.
<p>1. The establishment of three experimental stations, viz. one for the area to be irrigated on the Right Bank of the Indus, the second for the area under the Rohri and associated canals on the Left Bank and the third for the area to be fed from the various canals dependent upon the Eastern Nara.</p>	<p>1. The Agricultural Research Station, Sakrand, was established in 1925 in the Nawabshah District of the area under the Rohri and associated canal systems. The establishment of a Right Bank Research Station is under examination.</p>
<p>2. The establishment of several subsidiary stations (five in number) to try out on a large scale and under different conditions the results obtained at the central experimental stations.</p>	<p>2. Government "Auxiliary" Farms have been established under the "Six Farm Scheme" at Oderolal, Lundo and Pad Idan on the Left Bank and at Dadu, Shahdadhkote and Nasirabad on the Right Bank.</p>
<p>3. The appointment of an Agricultural Engineer for all problems in connection with land development, pumping and other applications, of mechanical cultivation.</p>	<p>3. The appointment of an officer to hold the post of Mechanical Engineer (Irrigation and Agriculture) in Sind has been made by Government for a period of one year in the first instance.</p>
<p>4. The appointment of a Deputy Director of Agriculture for Animal Breeding specially for Sind.</p>	<p>4. No action has yet been taken owing to the difficulty of finding the necessary funds.</p>
<p>5. The opening of Government Cattle farms for the Thar Parkar breed of cattle, and possibly for the Bhagnari breed of cattle.</p>	<p>5. No action has yet been taken. This recommendation has been endorsed by the Sind Cattle Committee, and the matter is being examined by the Agricultural Department in Sind.</p>
<p>6. The Mirpurkhas farms should be devoted entirely to work on horticultural research and the development of fruit-growing under a horticultural specialist.</p>	<p>6. The Government Fruit Farm, Mirpurkhas, is now solely devoted to horticultural research and the development of fruit culture in the Barrage areas. A Horticulturist has been appointed and placed in charge of the work at this Farm.</p>

Recommendation.

Action taken.

7. With regard to agricultural propaganda and demonstration, an immediately increased provision of Rs. 75,000 per annum for the development of this branch of the activities of the Department is necessary.

7. Additional staff, etc., for district propaganda work have been provided at a cost of Rs. 14,575 per annum. Provision of Rs. 3,000 in 1931-32 and Rs. 5,232 in 1932-33 has been made for the organization of a touring propaganda party in the Barrage areas.

8. The location of an Agricultural College at Nawabshah to provide for the development of higher agricultural education in Sind.

8. No action has yet been taken. In view of the financial stringency it seems doubtful if a separate college for Sind will be possible. Alternative schemes for providing suitable facilities for agricultural education at less cost are under examination.

9. Pending the initiation of (8) above, six scholarships should be awarded annually to scholars from Sind tenable at the Agricultural College, Poona.

9. Six scholarships of the value of Rs. 40 per month were sanctioned in June 1925. The number was reduced to four and the value to Rs. 20 per mensem in February 1931.

10. The separation of the Agricultural Department in Sind from that in the Presidency proper the former being placed under the sole control of a local Director of Agriculture who would deal directly with Government and also with the Commissioner in Sind and the Chief Engineer, Lloyd Barrage and Canal Systems.

10. A Chief Agricultural Officer for Sind was appointed for a period of five years with effect from 1st June 1930. The Chief Agricultural Officer in Sind was made independent of the Director of Agriculture, Bombay Presidency, and subordinate only to the Commissioner in Sind.

11. The development scheme, based upon the recommendations of the Advisory Committee, should be reconsidered after a period of ten years.

11. Does not arise.

APPENDIX II.

*Provisional forecast of the expected receipts from land sales
in the Barrage area (in lakhs of rupees).*

	Sales at full rates.	Fallow forfeited and mohag.	Peasants.	Leases.	Total.
Up to					
1931-32 ...	6.07	6.37	.....	.14	12.58
1932-33 ...	18.33	11.12	.75	.70	30.90
1933-34 ...	27.84	4.78	1.50	4.00	38.12
1934-35 ...	36.60	.....	1.50	4.00	42.10
1935-36 ...	45.36	.....	1.50	4.00	50.86
1936-37 ...	54.12	.....	1.50	4.00	59.62
1937-38 ...	62.88	.....	1.50	4.00	68.38
1938-39 ...	70.64	.....	1.50	3.00	75.14
1939-40 ...	77.15	.....	1.50	3.00	81.65
1940-41 ...	83.41	.....	1.50	3.00	87.91
1941-42 ...	89.67	.....	1.50	3.00	94.17
1942-43 ...	87.60	.....	1.50	2.00	91.10
1943-44 ...	81.35	.....	1.50	2.00	84.85
1944-45 ...	77.85	.....	1.50	2.00	81.35
1945-46 ...	76.35	.....	1.50	1.00	78.85
1946-47 ...	73.85	.....	1.50	1.00	76.35
1947-48 ...	71.35	.....	1.50	1.00	73.85
1948-49 ...	68.85	.....	1.50	1.00	71.35
1949-50 ...	67.60	.....	1.50	1.00	70.10
1950-51 ...	67.60	.....	1.50	1.00	70.10
1951-52 ...	62.60	.....	1.50	1.00	65.10
1952-53 ...	56.84	.....	1.50	1.00	58.84
1953-54 ...	50.08	.....	1.50	.....	51.58
1954-55 ...	43.82	.....	1.50	.....	45.32
1955-56 ...	37.56	.....	1.50	.....	39.06
1956-57 ...	31.30	.....	1.50	.....	32.80
1957-58 ...	25.04	.....	1.50	.....	26.54
1958-59 ...	18.78	.....	1.50	.....	20.28
1959-60 ...	12.52	.....	1.50	.....	14.02
1960-61 ...	6.26	.....	1.50	.....	7.76
Total ...	1,588.77	22.27	42.75	46.84	1,700.63

APPENDIX III.

Press Note No. 248, dated 10th November 1932.

In July 1928 Government appointed a Committee :—

(1) to examine the question of the sufficiency of cattle in Sind with special reference to the changes in cultivation as a result of the construction of the Lloyd Barrage ;

(2) to consider the measures necessary to increase their number and to improve their quality ; and

(3) to make any other suggestions relevant to the subject.

The Committee, under the chairmanship of the Revenue Officer, Lloyd Barrage and Canals Construction submitted their report to Government last year and a Press Note embodying the principal recommendations of the Committee was issued on December 5th, 1931.

The Government of Bombay have now passed orders on the report which have been published in a Resolution dated 13th October.

Government agree with the Committee's view that it will be of value to them to obtain correct figures of agricultural live stock by means of special establishment in one or two typical talukas and are prepared to give effect to the recommendation when funds permit.

Under the Barrage Canals system, owing to the comparatively small proportion of rabi, the Committee anticipate that at the outset there will be no difficulty in getting the cultivation done by the same cattle as are used in kharif and Government agree with the Committee's conclusion that in the first two or three years of the new conditions there are unlikely to be any difficulties on account of shortage of cattle.

The special deficiencies anticipated in the Rohri Canal Circle area can be partly met by an influx of cattle from areas which are better supplied. It is estimated that after the first ten years following the opening of the canals the next twenty years will show an increase in total cultivation of from 40 lakhs to 50 lakhs of acres or a percentage increase of 25. With the development of mechanical cultivation which the Committee expects over this extended period the percentage increase of cattle required will be somewhat less and if the more serious situation of the first ten years can be met the Committee consider that the less rapid development during the next twenty years should not bring any insuperable difficulties.

The Committee recommend that a number of small established breeders should be granted small holdings since they are likely to be crowded out as their present grazing lands are brought under cultivation. Government consider that the object aimed at

will be better achieved if co-operative cattle breeding societies are formed in convenient centres with the assistance of the Deputy Registrar of Co-operative Societies and small holdings allowed in a compact area so that the formation of cattle breeding societies can be readily organised and their working supervised and assisted. Experiments on these lines should be made as far as staff and funds at the present time permit. The Committee propose to develop two of the three well established breeds of Sind cattle, viz., the Thari breed of the Thar Parkar District and the Bhagnari breed of the Upper Sind Frontier, as dual purpose animals, viz., for milch and draught purposes, and suggest that two cattle farms should be established. The schemes appear to be sound but can only be taken up gradually as finances permit. They consider that a farm for the Thari breed is needed more urgently than that for the Bhagnari breed and the former should therefore be given preference when funds for the establishment of such an institution become available. Government accept the Committee's recommendation that Sind should obtain a more adequate share of the grants already available for the Premium Bull system; and that efforts should be made to encourage that system; which in their opinion is an important line of advance. They have under their consideration the revision of the Premium Bull Rules with a view to making the system more extensive in its scope by offering contributions towards the cost price of a Bull or a monthly premium and by granting facilities for loans under the Agriculturists' Loans Act to breeders who combine cattle-breeding with agriculture.

The Committee recommend that the Civil Veterinary Department in Sind should be expanded and that Government should consider the abolition of the present system of dual control over veterinary dispensaries by the Department and the District Local Boards and the assumption of full control by Government. Under present financial conditions Government are, however, unable to accept the additional liability which the acceptance of these proposals would involve.

Government have already given effect to the Committee's recommendation that in the Barrage settlements light rates should be imposed on those leguminous crops, grown either in kharif or rabi, which are valuable as fodder crops and which are, at the same time, useful in restoring the fertility of the soil. There is some misapprehension in the Committee's recommendation that the existing concession of growing natural grass at a light rate of annas 12 per acre should be continued and widely advertised. This concession has not been restricted to the districts of Hyderabad and Nawabshah but it has been extended to Thar Parkar and Sukkur districts.

Government accept the Committee's recommendation that grazing in Government unoccupied lands in the Barrage area should be free and uncontrolled, no fees being levied and no permit being required.

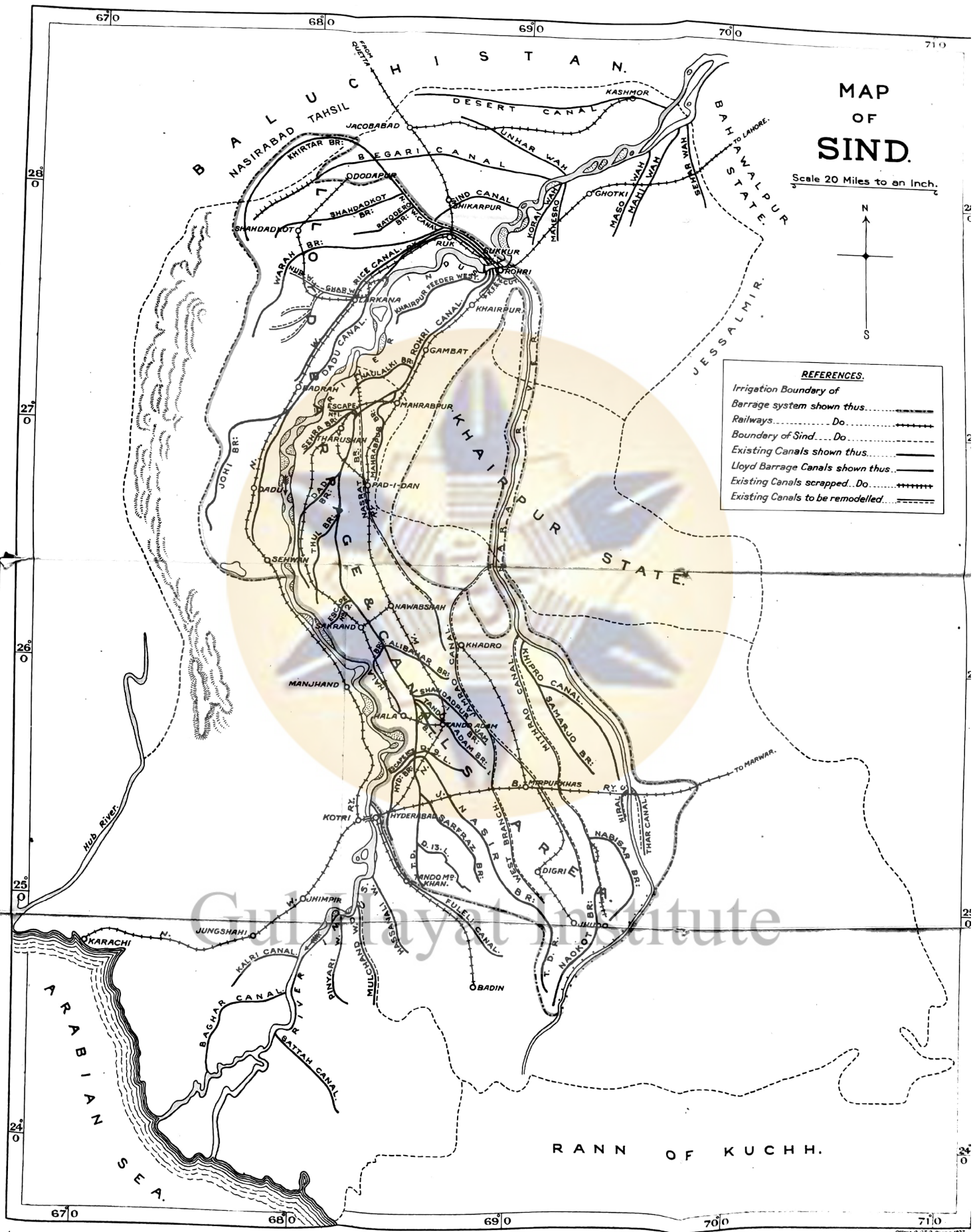
The Committee's recommendation that plantations should be made along canal banks and in the neighbourhood of inspection bungalows and regulators and should be maintained by the Public Works Department is under consideration separately.

The Committee's recommendation that the growth of private hiris should be encouraged by concessions, which is supported by the Commissioner, will be examined further. The Agricultural Department in Sind has taken steps in the direction of propaganda regarding the value of fodder storage, cheap form of chaff-cutters and experiments in cheap method of silage, suitable for the country.

Government agree with the Commissioner in Sind that conditions are not at the moment favourable for the extensive use of motor tractors in agricultural operations in Sind. Further light will no doubt be thrown on this by the data which are being collected by the Agricultural Department as a result of work done on the preparation of the land under the Six Farm Scheme. Encouragement to local bodies and associations to hold cattle fairs and agricultural shows is already being given within the limits of the grant allowed by Government for agricultural demonstrations, shows and exhibitions. In the present state of the finances it is not feasible to make any large increase in this grant.

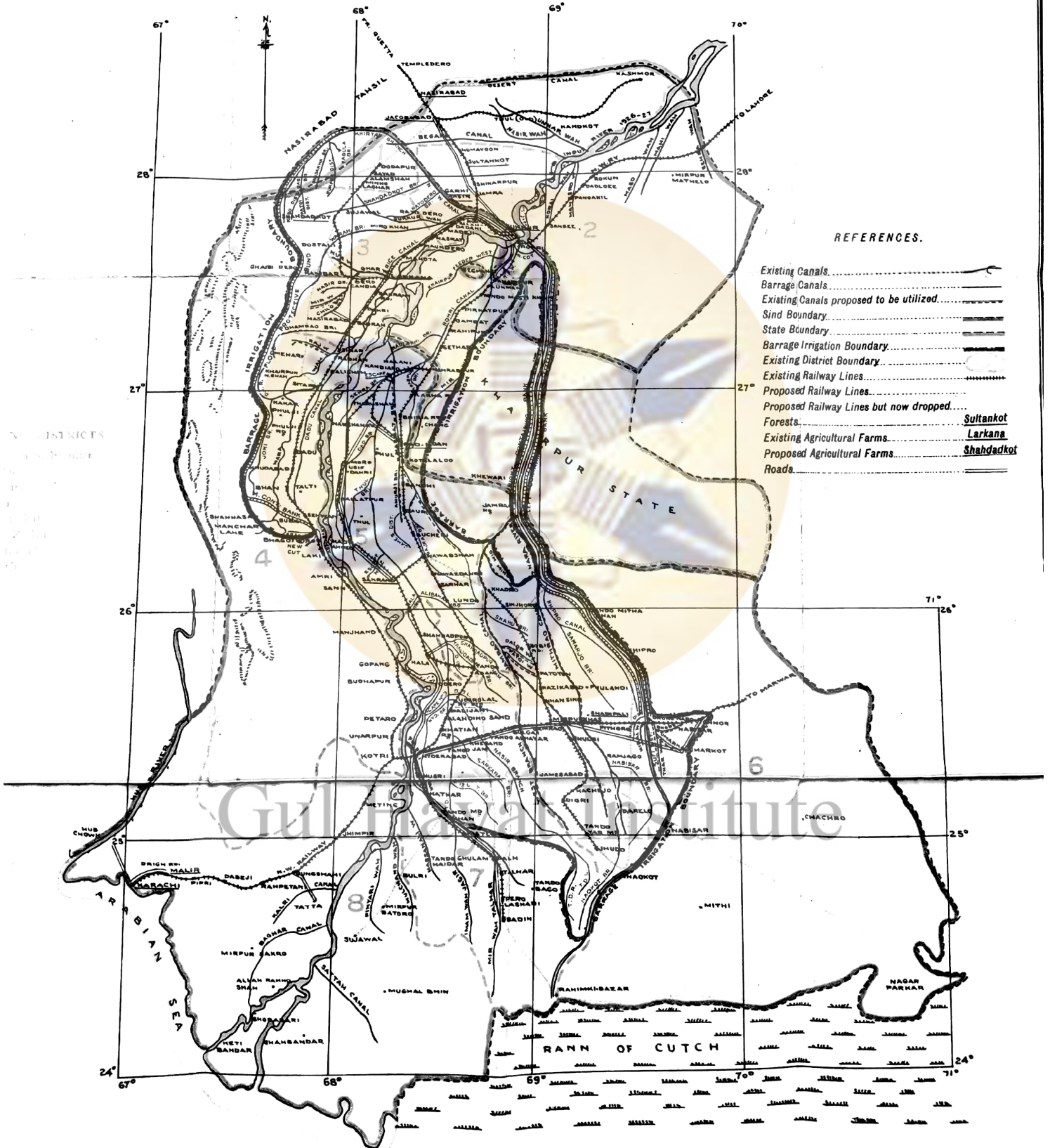
As regards the Committee's recommendation that the school readers of the elementary schools should be given a more definite agricultural bias the Director of Public Instruction is being requested to take up the matter in consultation with the Chief Agricultural Officer in Sind.

The Committee recommend that the propaganda staff under the Chief Agricultural Officer in Sind should be expanded and should be conversant with the work done for live stock just as much as for other agricultural improvements. Government have already fully considered the future requirements of Sind with regard to agricultural propaganda but regret that they are unable to provide additional funds for expansion in the near future. A Provincial Board of Agriculture in Sind, with a local committee, has recently been constituted which associates non-officials and officials in agricultural propaganda as well as in co-ordinating the activities of the different Government departments towards rural development.



MAP OF SIND

Scale:— 20 Miles = To 1 Inch.



Revised 16.6.22.