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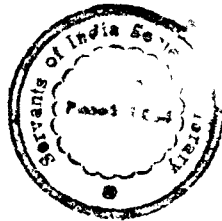
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Government of Bombay  
Public Works Department

Rare section

**Report**  
of the  
**Irrigation Inquiry Committee**  
appointed by the  
Government of Bombay  
1938



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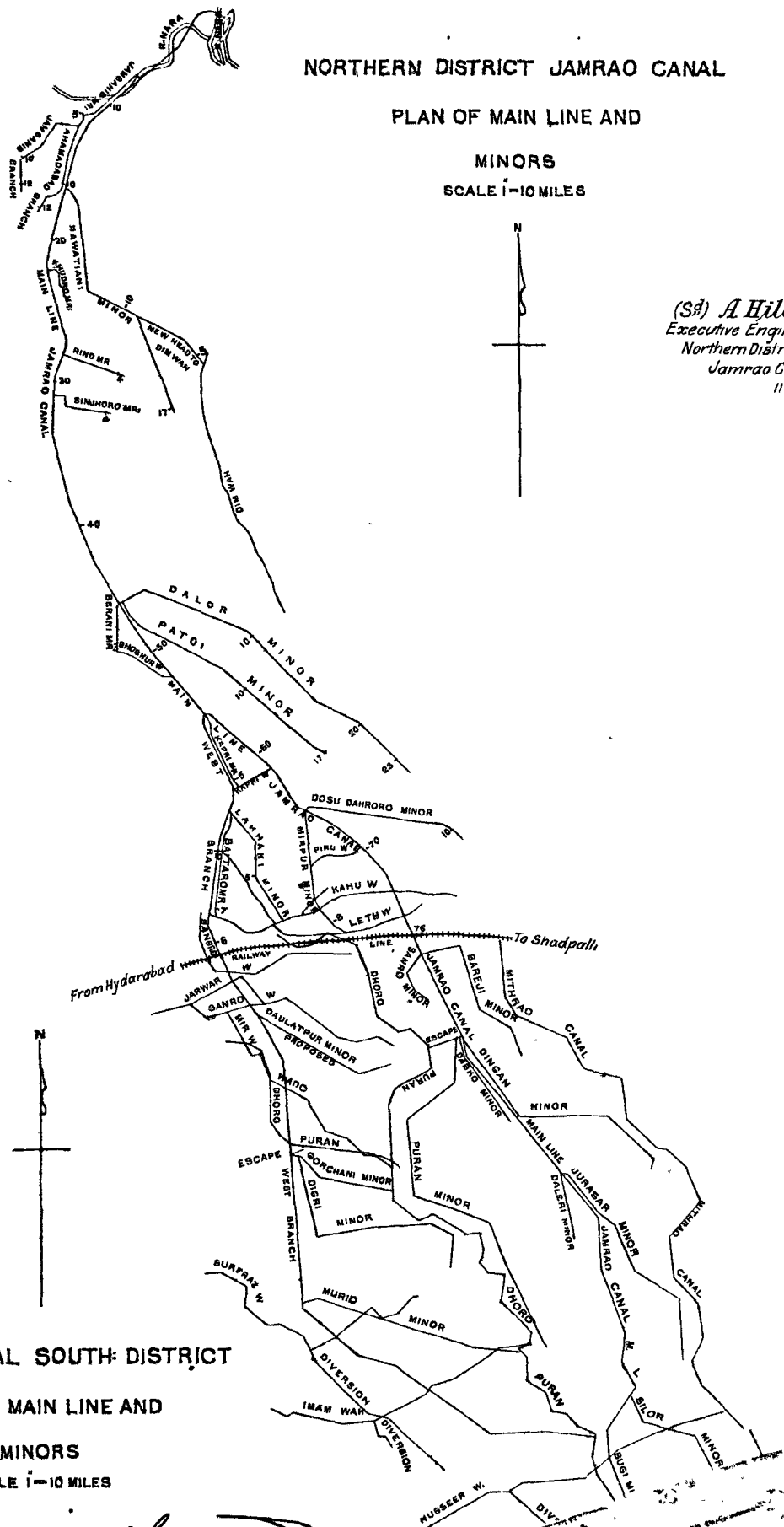
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NORTHERN DISTRICT JAMRAO CANAL

PLAN OF MAIN LINE AND

MINORS

SCALE 1"=10 MILES



(Sd) A.H.W.  
Executive Engineer  
Northern District  
Jamrao Canal  
11-5-00

JAMRAO CANAL SOUTH DISTRICT

PLAN OF MAIN LINE AND

MINORS

SCALE 1"=10 MILES

*A.H.W.* L.C.E.  
Executive Engineer  
S. District

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BOMBAY GOVERNMENT RESOLUTION, PUBLIC WORKS DEPARTMENT,  
No. 1985/36, DATED THE 28TH DECEMBER 1937.

On 23rd November 1937 the Government of Bombay issued a Press Note stating that they were considering the necessity of examining the whole question of Irrigation policy and allied matters. On 28th December 1937 they published Government Resolution, No. 1985/36 in the Public Works Department appointing a Committee with the personnel given on the next page. The following are extracts from the Resolution dealing with the Terms of Reference to the Committee :—

“(1) What should the general irrigation policy of Government be as regards the supply of water to owner irrigators, tenant farmers and industrialised undertakings, such as sugar factories, and also in regard to the supply of water for non-agricultural purposes, e.g., water supplied to Municipalities, Mills, Railways, etc. ?

(2) If the present policy is suitable, is any revision of the water rates and canal rules necessary, taking into consideration the cost of the water and the value of the different crops ?

(3) If any other policy is recommended, what should be the basis of the assessment on account of the irrigation facility provided ?

(4) What steps should be taken in the case of land and villages damaged by water-logging ? ”

“ The Committee is requested to complete its investigations and submit its report as soon as possible.”

BOMBÁY IRRIGATION INQUIRY COMMITTEE.

*Chairman.*

Sir M. VISVESVARAYA, K.C.I.E., LL.D.

*Members :*

Mr. J. W. SMYTH, C.S.I., C.I.E., M.A. (Cantab.), I.C.S., Commissioner, Central Division.

Mr. W. J. JENKINS, M.A., B.Sc. (Edin.), I.A.S., Director of Agriculture.

Mr. N. B. BAXTER, I.S.E., Superintending Engineer, Central Circle.

Mr. C. E. AITKEN, B.Sc. (Edin.), I.S.E., Superintending Engineer, Deccan Irrigation Circle.

Mr. J. G. MORE, B.A., LL.B., M.L.A., of Pandharpur.

Mr. LALCHAND HIRACHAND, M.L.A., of Ravalgaon.

Mr. R. B. GIRME, M.L.A., of Kopergaon.

Rao Sahib G. G. SHEMAKAR, of Baramati.

Mr. JABIR A. ALI, B.A. (Cantab.), Dip. Ag. (Camb.), of Chembur, and

Mr. V. N. VARTAK, M.A., L.C.E., I.S.E. (Retired), of Poona.

*Secretary.*

Mr. W. X. MASCARENHAS, B.E., I.S.E., Deputy Secretary to the Government of Bombay, Public Works Department.

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**REPORT OF THE IRRIGATION INQUIRY COMMITTEE,  
GOVERNMENT OF BOMBAY**

**CHAPTER I**

**INTRODUCTORY**

The Government of Bombay appointed our Committee in their Resolution, Public Works Department, No. 1985/36, dated the 28th December 1937. The members met for the first time in Bombay on 6th January 1938. After preliminary consultation among ourselves and with some of the principal Government officers associated with irrigation we proceeded to draw up a detailed questionnaire. At the same time we began recording oral evidence, and the questionnaire, when ready, was issued to all irrigators' associations, sugar companies and representative individual irrigators and to such officials and non-official gentlemen as were in our opinion likely to throw light on the problems referred to us for inquiry.

In addition to written replies to the questionnaire the Committee received a number of notes and representations from both official and non-official sources, embodying views and suggestions, criticisms and recommendations regarding present day irrigation policy and practice. The Committee took the oral evidence of official and non-official experts, irrigators' associations, sugar companies, and many leading cultivators closely associated with irrigation. The cultivators who met us in mofussil centres were invited, some individually and many collectively, to supplement the evidence given by their representatives, and they responded to this invitation in large numbers.

2. In the course of their tours the Committee visited several centres of irrigation, namely, Kopergaon and Belapur in Ahmednagar District, Poona, Padegaon, Phaltan, Malsiras, Dharwar and Ahmedabad. The places visited afforded opportunities for the inspection of major and minor canal systems and tank irrigation and included four sugar factory areas and several areas damaged by water-logging and salt-efflorescence. At all these centres the Committee were able to discuss local irrigation problems with representative public men and cultivators.

We were greatly impressed by the strength and unanimity of opinion of the general body of irrigators, especially under the major canals, regarding the complexity of the canal rules and the rigidity with which they are at present, enforced. On a few occasions it was brought to our notice that irrigation procedure had now become so complicated and burdensome that it had almost become a deterrent to the use of water by cultivators. Several official witnesses also admitted that the rules were excessively complicated and that it was inevitable that their rigid application should result in difficulty and harassment to many individual irrigators.

There was also a general demand among irrigators for a reduction in water rates, more especially in the rates for seasonal crops on irrigation works for which capital and revenue accounts are kept.

We noticed a certain amount of misapprehension among irrigators with regard to the object and scope of our inquiry. Wherever, in the course of our tours, we met large numbers of cultivators, some disappointment was caused when we informed them that our object was not to deal with specific individual grievances but to investigate local difficulties and complaints with a view to understanding the underlying causes and arriving at a correct policy and practice for the future.

3. The main objects which we have had in view throughout our inquiry are those specified in the Government terms of reference, viz., to search for the true causes of existing defects and deficiencies in the working of the irrigation systems, to suggest changes in canal rules, water rates, etc., where they were necessary, and to formulate and recommend a sound policy and practice for the future administration of irrigation works in the Province. Our aim was to ensure that irrigation facilities should be so distributed on a permanent basis as to give crop outturns of the highest value to the cultivators, while reducing to a minimum the risk of damage to land through excessive use or waste of water. At the same time we have not been unmindful of the benefits which will accrue from an increase in canal revenue which must in the natural course follow any improvement in the productive power of irrigation works.

4. The work of the Committee—tours and collection of evidence—continued almost without interruption between the 6th January and 9th March 1938. On the latter date the Committee adjourned for the compilation of the draft report. On account of the large amount of evidence and other material which had to be examined and digested this work took about seven weeks. The Committee finally met on 26th April 1938 after the Easter Holidays, to complete the report for submission to Government.

One Member of the Committee, Mr. N. B. Baxter, I.S.E., ceased to attend our meetings upon his appointment as Chief Engineer and Secretary to Government, Public Works Department. He furnished his views in the shape of brief notes before relinquishing his duties as a member of the Committee.

5. The Committee wish to express their obligations to both Mr. T. A. Andrew and Mr. N. B. Baxter, the former and the present Secretaries to Government in the Public Works Department, for lending the services of the trained staff of the Public Works Secretariat and in other ways affording the Committee every help needed in the course of their investigations.

Mr. W. X. Mascarenhas, B.E., I.S.E., performed his duties as Secretary to the Committee while holding in addition his permanent office of Deputy Secretary to Government in the Public Works Department. His arrangements for our tours and meetings were carried through without a hitch and his clear grasp of irrigation problems, his close association with the Public Works Department, his intimate knowledge of canal administration and his untiring energy and tact have been of special value to us. We wish to record our high appreciation of the ability and success with which he conducted his duties as Secretary to the Committee.

For collecting statistical and other information and data relating to irrigation projects and the present day working of the canals, Mr. N. B. Gadre, B.E., I.S.E., Executive Engineer, was appointed as Officer on Special Duty with the Committee with effect from 3rd February 1938. This officer's trained practical knowledge of the day-to-day working of the canals specially qualified him for the duties entrusted to him which he discharged with commendable industry and thoroughness.

Two Assistant Engineers and other staff from the Deccan Irrigation and Central Circles, and one Junior Assistant from the Public Works Secretariat were attached to the Secretary's office. All of them worked overtime and on holidays and rendered very efficient service.

We also desire to express our indebtedness to the large number of officers and public men who gave evidence before us or who favoured us with notes and memoranda in the course of our enquiry. Our acknowledgments are also due to the numerous officers and private gentlemen to whom the Committee members are indebted for accommodation and hospitality during their tours. In this respect our thanks are especially due to the Phaltan Durbar and to those members of our own Committee who belong to the parts of the country which we visited.

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## CHAPTER II

## THE PLACE OF IRRIGATION IN THE ECONOMIC LIFE OF THE PROVINCE

6. Map No. 2 shows that the Province can be divided into four distinct tracts from a topographical and climatic point of view. They are—

- (1) The steep, inclined and narrow strip of coast land of the Konkan broken by sea creeks.
- (2) The basaltic valleys of the Deccan.
- (3) The plains of Gujarat.
- (4) The laterite plateau of the Karnatak.

8. The soil of the Konkan is for the most part shallow and poor, but the rainfall is copious and timely. No Government irrigation works have been provided in this tract.

The Deccan receives an uncertain rainfall and in particular the eastern parts of it roughly following the line of the railway from Manmad to Dhond and thence through Sholapur and Bijapur Districts are liable to periodic famines. The country falls away gradually from the water-shed of the Western Ghats towards the Bay of Bengal and this configuration has rendered possible the construction of a large number of storage works in the narrow valleys leading down from the hills. From the lakes so constructed the rivers and the canals draw a perennial supply of water with the result that the bulk of the irrigated land of the Province is to be found in these Deccan districts where the need of the protective function of irrigation is keenly felt.

In Gujarat and the Karnatak the rainfall on the whole is not so scanty, but its distribution is uncertain and it is apt to fail towards the end of the season. As a result of this an enormous number of small village tanks and subsidiary water channels are to be found dotted about the country. They are of great use for the final waterings. In Western Gujarat the weir canals of Hathmati and Khari Cut and the bandharas in the tail reach of the river Khari supply these waterings for the small area around Ahmedabad. The Gokak and Dharma Canals in the Karnatak serve a similar purpose though the former system is mostly used for the irrigation of rabi crops.

It is only the nineteen British Districts with which we are concerned in this report, the mosaic of Indian States in and around them being excluded as beyond the scope of our enquiry. The seven Deccan districts constitute almost half the gross area of the Province. Gujarat with five districts claims only about one-seventh and the Konkan and Karnatak a little less than one-fifth each in four and three districts respectively.

7. The old expedient of tapping the sub-soil water by wells in order to supplement the rainfall and to facilitate the cultivation of perennial crops is commonly resorted to throughout the Province. In addition cultivators in the Nasik and West Khandesh districts have developed what is popularly known as *bandhara* irrigation, consisting of a system of successive weirs and tiny canals constructed generations ago on small perennial rivulets.

Another type of irrigation work is the petty tanks in the dry parts of the Deccan and Gujarat, the construction of which is often undertaken to provide work for famine labour. These tanks in addition to reinforcing well irrigation and providing drinking water in the valleys immediately downstream, also make some direct flow irrigation possible in normal years. Tanks of this nature have also been constructed from loan funds and some are quite large, but in years of famine they are apt to fail as their catchments lie within the same dry area as the tracts served.

8. Despite all these types of irrigation works, however, Bombay ranks only ninth among the Provinces in respect of the actual irrigated crop areas. Even within the Province itself the area irrigated constitutes only 4.2 per cent. on the total area cropped. The actual acreage irrigated annually is a little over a million acres, out of which three-fifths depend on wells, one-fifth on Government Canals, and the remaining one-fifth on tanks, private canals, etc. About 85 per cent. of the area irrigated by Government Canals lies in the Deccan tracts, the balance being equally distributed between Gujarat and the Karnatak.

*8. Crops Irrigated.*—The main irrigated crops are rice, jowar, wheat, bajri, maize, ground-nut, tobacco, cotton and sugarcane. The last four may be classed as commercial crops. Perennial fodder crops like lucerne and fruit and vegetable gardens have been established on some of the canals. These forms of irrigated farming have been found to be very profitable in many areas.

10. *Soil and Climate—(i) Deccan.*—The climatic conditions are in general uniform. The average minimum temperature reached usually in January varies from 52° to 62° F. Frosts are uncommon and, if they do occur, generally affect the Pravara and Godavari canal tracts only. The maximum average temperature varies from 102° to 107° and generally occurs in April and May. Humidity varies considerably in different regions of the Deccan area and at different times of the year. The rainfall in the canal tracts is somewhat unevenly distributed and uncertain, the annual average precipitation being between 18" and 25". In a normal year the first rains are followed by a break in August. September is a wet month, and the first part of October is dry. The final rains usually coincide with the Divali festival. There was no famine in the Deccan between the famine in Ahmednagar district in 1921–22 and the acute scarcity in Bijapur, Sholapur and Ahmednagar districts in 1936–37. At the present time scarcity conditions still prevail in Bijapur.

The soils in the Deccan Canal tracts are volcanic in origin and are mostly formed *in situ* by the decay and disintegration of the rock commonly known as Deccan trap. Along the courses of rivers and nallas deep deposits of alluvial soils are to be found. The soils in the irrigated areas vary very considerably ranging from the heavy deep black soils mentioned above to light shallow and stony soils on the higher elevations. Generally the colour, depth and richness of the soils increase as one proceeds from the canals—on the ridges—towards the rivers and nallas in the lower lying lands. Broadly speaking the Deccan Canal tract soil types may be roughly classified in percentages as under :—

Kind of soil	Nira Left Bank Canal Tract	Nira Right Bank Canal Tract	Pravara and Godavari Canal Tract
	Per cent.	Per cent.	Per cent.
Light 18" and less in depth	40	60	20
Medium 1½' to 4' deep	30	25	30
Heavy over 4' deep	30	15	50

*(ii) Karnatak.*—The Gokak Canal tract in the Karnatak has an average rainfall of 25", a considerable proportion of which falls in the rabi season. The temperatures range from 59° F minimum to 103° F maximum. The soil is red and sandy. In the Dharma Canal tract, paddy is the main crop and the rainfall averages 32", mostly in the kharif season. Temperatures are more moderate than in the Gokak tract. The soil is a reddish or greyish black clay.

*(iii) Gujarat.*—In Gujarat the irrigated tracts have a hot and sultry climate, the maximum temperature rising to 110° F in April and May. The average rainfall is 34" nearly half of which falls in July and August. The soil is either *besar* or medium black on which rice is mostly grown—or a sandy loam where other crops are usually cultivated. Frosts sometimes occur in December and January and it has been stated that they have been more frequent since 1925.

11. *Economic condition of the Population in the Irrigated Tracts.*—It is not possible within the scope of this report to analyse in detail the actual economic position of irrigators in all the irrigated tracts of the Province. In the main canal irrigated areas of the Deccan, however, conditions for some years after the canals were opened were very favourable to the cultivators. Prices continued to rise steadily after the War. However, the world-wide depression which set in in the United States of America in 1929 began to affect this country in 1930–31 and since then prices have generally shown a downward tendency. The irrigators have

suffered accordingly. In order to estimate the effect of the continued slump in prices on the position of the irrigators some factors which should be taken into account are :—

- (a) values and rents of lands ;
- (b) the cost of cultivation and yield of crops together with the prices realised from their sale ;
- (c) the area under irrigation and the condition of the gul market ;
- (d) demand and arrears of irrigation revenue ; and
- (e) debts.

Land values in the Deccan Canal tract have in general shown a definite downward tendency since 1932-33. The same applies to rental values. The cost of cultivation of cane, the main money crop of the tract, varies from Rs. 400 to Rs. 500 per acre, with an average outturn of 35 to 50 pallas of gul per acre. This outturn valued at present prices is about Rs. 400 to Rs. 575 and thus there is a very small margin of profit : a state of things which supports the contention that at the present time gul manufacture has little attraction for the ordinary cultivator.

With regard to the area under irrigation in general, and under sugarcane cultivation in particular, evidence shows that it is steadily decreasing as irrigated farming becomes less profitable. This is borne out by the decline in gul manufacture. Arrears of irrigation revenue have been increasing on the four major canal systems since 1927-28. It is difficult to ascertain with any degree of accuracy the indebtedness of the irrigators. Statistics collected from one village, Gunavdi in Bhimthadi taluka of Poona district, indicate the incidence of debt to be about Rs. 550 per khatedar. It would be dangerous to draw general conclusions from such a figure, but we are disposed to believe that this case is typical of the general conditions that prevail. The main conclusion to be drawn is that the irrigators have been badly hit by the fall in prices due to world economic conditions. On the other hand, the cost of living has been steadily decreasing during the past fifteen years.

12. *Prices of Principal Commodities.*—During the last twelve years the prices of agricultural produce have fallen considerably from the high levels reached after the War. Up to 1931 the lowering of prices was gradual, but in that year a precipitate fall took place from which no marked recovery has yet been made. In the irrigated tracts gul reached its maximum in 1920 and slowly declined in price till 1923 when a slight, but temporary, improvement, ensued for two or three years. The prices weakened again in 1926 and fell heavily in 1931. Apart from a slight temporary improvement in 1935 low rates have continued to prevail. Jowar, the main food crop of the cultivators, fell gradually in price from 1922 till it reached its bottom level (27 seers per rupee) in 1931. A gradual recovery in price has since taken place. The trend of bajri prices has been similar. The prices of rice were highest in 1919-20 and by 1931 had dropped by about 50 per cent. Low prices ruled till 1935 when a slight improvement set in. The prices of wheat have also shown a gradual upward tendency during the past two years. Cotton prices have fallen considerably and are now ruling at very low levels. Ground-nut prices have deteriorated since 1931 but have been fairly steady during the past two years.

13. *Protective value of Irrigation Works.*—Despite the depressed conditions prevailing at the present time it is to be remembered that the irrigator has not the yearly fear of famine staring him in the face as has the cultivator who depends entirely upon rain. The canal systems of the Deccan were primarily designed to protect the country against famine and they have succeeded in doing so in the areas served by the canals. The very great fall in the expenditure on famine relief since the opening of the canals can very reasonably be attributed to their existence and to the protection which they have afforded to those parts of the country against famine. It has also been ascertained that in 1933-34, on the Pravara and Godavari Canals alone, nearly 44,000 acres were cultivated, and thanks to the existence of irrigation they produced crops worth approximately Rs. 36 lakhs. But for irrigation, these crops would not have been worth more than about Rs. 8 lakhs. Such data prove conclusively the protective value of these irrigation systems.

## CHAPTER III

## PRESENT POSITION OF IRRIGATION WORKS

14. Statement No. 2 gives for a few representative years the gross, culturable and cropped areas in each of the four tracts comprising the Province mentioned in the preceding chapter, and the area irrigated from Government works old and new, private wells and other sources. The following is an abstract of the relevant statistics for 1935-36 :—

Item	Acres	Percentage
Gross area of the Province .. .. .	48,720,915	100
Culturable area .. .. .	34,548,788	72
Area cropped in 1935-36 .. .. .	29,373,045	60
Area irrigated—	Acres	
New Irrigation Tanks and Canals (Government) ..	236,649	
Older Tanks and Canals (Government) ..	223,060	
Wells (Private) .. .. .	732,367	
Other sources .. .. .	28,402	
	<u>1,220,478</u>	2.5

The figures show that the irrigated area forms 4.2 per cent. of the total cropped area of the Province. Of the irrigated area again only about 20 per cent. is from new Government reservoirs and canals and roughly another 20 per cent. is from the older works which are also under Government supervision. The remaining 60 per cent. is from private wells and other sources. Another striking feature apparent from Statement No. 2 and easily understood from what has been said in Chapter II, is that about 85 per cent. of the area irrigated from Government canals is situated in the Deccan tracts, i.e., in the Central Division of the Province.

The older works comprise many small village tanks in Gujarat and the Karnatak, and *bandharas* (weirs) and channels which are situated mostly in the districts of Nasik and West Khandesh. These latter pay an annual irrigation assessment which is consolidated with the land revenue, and whenever special repairs are necessary they are executed at the expense of Government.

15. All the Government works mentioned above fall under two classes :—

(1) Works for which capital and revenue accounts are kept—

- (i) Major Canal systems,
- (ii) Minor Works.

(2) Works for which neither capital nor revenue accounts are kept (Second Class Works).

The term "Second Class Works" is commonly used for works for which neither capital nor revenue accounts are kept. We have, however, included in this group even small tanks and *bandharas* which are not formally declared under section 73 of the Irrigation Act. For the sake of clearness we propose to refer to all works for which capital and revenue accounts are kept as "First Class Works". In what follows, therefore, all Government irrigation works will be considered under three heads :—

- (1) First Class Major Works,
- (2) First Class Minor Works,
- (3) Second Class Works.

A complete list of First Class Works, i.e., works for which both capital and revenue accounts are kept, and a complete list of Second Class Works, i.e., works for which neither capital nor revenue accounts are kept, are given on Map No. 1 accompanying this report. The results of the operation of the former during 1936-37 are given in Statement No. 5. The following is an abstract of the results of each kind of work :—

Item	Capital Outlay	Gross Receipts	Working Expenses	Percentage of net return
	Rs. lakhs	Rs. lakhs	Rs. lakhs	
6 First Class Major Works .. .. .	903	25 29	14 43	1 20
37 First Class Minor Works .. .. .	172	5 38	2 87	1 46
Second Class Works .. .. .		7 18	6 43	..

It will be seen that the receipts on Second Class Irrigation Works are only slightly in excess of the working expenses, while those on First Class Works leave a small margin towards meeting interest charges on the capital outlay.

16. *Six Major Canals (First Class Major Works).*—The six Major Canals which will hereafter be termed First Class Major Works account for about 85 per cent. of both the capital expenditure and yearly gross revenue. We propose, therefore, to treat them as a class by themselves, and deal with them in detail. Sections (i) and (ii) in Statement No. 6 give the irrigable area, revenue, and percentage of net revenue on capital outlay as estimated in the latest revised projects of the respective canal systems. To facilitate comparison the actual results are given for 1936-37, the latest year for which such information is available. This year was one of scarcity. The results include the effect of the development of factory irrigation up to the end of that year.

Comparing figures in columns 7 and 9 in Statement No. 6 (we find that during 1936-37 the Nira Right Bank Canal irrigated only 47,957 acres as against 148,500 acres anticipated in the project and earned a gross revenue of Rs. 2.71 lakhs as against an anticipated Rs. 25.47 lakhs.) Section (iv) of the same Statement shows that (the total irrigated area on the other five Canals was 193,976 acres against 191,740 acres projected; and the revenue was Rs. 22.58 lakhs as against Rs. 35.39 lakhs in the project estimates. The Nira Right Bank Canal has thus been a serious handicap to the financial success of irrigation in this Province. The gross revenue collected on this canal has always been insufficient to meet even the annual working expenses) but we are informed that the assessment for 1936-37 has nearly overtaken the expenditure.

The remaining five canals have functioned fairly satisfactorily. During 1936-37 the gross revenue on the Mutha Canal exceeded that anticipated in the project, and that on the Girna Canal very nearly approached it. On the Pravara and Godavari Canals it fell short by 20 per cent. and 33 per cent. respectively. In working expenses, however, there has been a considerable increase all round, and this makes the net percentage return (column 12 of Statement No. 6) very much less satisfactory than it would otherwise have been.

17. The following are the more important characteristics or results of the working of each of the six major canal systems as revealed by the statistical and other information collected :—

(i) *Nira Right Bank Canal.*—This work has suffered from over-capitalization due to the high cost of construction during and after the War. Moreover, the canal was aligned with a low fall in order to be able to irrigate lands at a high elevation and at a great distance from its headworks. It was designed and constructed for a much larger discharge than it has been able to obtain from the existing storage works. After the canal was constructed, it was discovered that the prospects of irrigation under it were not bright; and in consequence the full storage contemplated by raising the Vir Dam was not provided. The canal now carries only 50 per cent. of what it was

designed to discharge. It is also now apparent that the high rates of assessment on which the anticipated revenue was based are not likely to be realised. If the demand increases appreciably in the coming year so as to justify the construction of the Vir Reservoir, the revenue prospects of this work may improve. Special reductions in assessment rates were sanctioned from 1931 to 1936 in the hope of stimulating development, but as they had very little effect, they have been withdrawn.

Two Sugar Factories have been established on the canal at Phaltan and Akuj and a third one, the Brihan Maharashtra, is also about to commence operations. The factories will help to stabilise the annual revenue, but two of them are situated about 100 miles from the headworks, and high transit losses are thus incurred in carrying water to them.

(ii) *Nira Left Bank Canal*.—This Canal began to operate in the year 1885-86. By 1899-1900 the net assessed revenue had risen to Rs. 85,197 and the proportion of net revenue on capital outlay amounted to 1.5 per cent. After the introduction of the block system and also due to an increase of the water rates the proportion of net revenue rose as high as 8 per cent. by the year 1920.

In 1922 the canal was included in the Nira Valley Development Project along with the Nira Right Bank Canal. The results of the year 1922-23 before the amalgamation and of the year 1936-37 after the amalgamation compare as under :—

Item	Unit	1922-23 (before amalgamation)	1936-37 (after amalgamation)
Storage utilised	M. cft.	4,223	10,750
Capital outlay	Rs.	66,20,885	1,44,41,052
Area irrigated	Acres	75,024	75,690
Net Revenue	Rs.	5,48,155	4,99,580
Percentage of net return on capital outlay	Per cent.	8.28	3.46

The figures show that in both years the area irrigated was over 75,000 acres and the total area irrigable was only 113,280 acres. The intensity of irrigation is thus very high and indicates that the area under the canal is receiving too much water. The material at our disposal is, however, not sufficient to enable us to form a sound judgment on the point. It is a local question and should be specifically examined as soon as possible. The true state of affairs should be accurately ascertained, before any programme of future operations is sanctioned.

The tail tank at Shetphal facilitates the storage of the surplus discharge during the monsoon. A sugar factory was established at Kalamb in mile 75 of the canal in 1933.

(iii) *Mutha Canals*.—These are two in number, one on either bank of the river, but only the one on the right bank is important. These are the oldest Major Canal systems in the Deccan, as they date from 1874-75. The financial situation is very satisfactory as the net revenue exceeds the interest charges, which is the case on no other Major Canal system.

The cane concentration on this Canal is extremely heavy, and yet on account of the excellent natural subsoil drainage the damage to soils is negligible. The block system of irrigation was not found necessary and was therefore not introduced. The Matoba tank at the tail facilitates the storage of the surplus discharge during the monsoon. There is scope for extension of irrigation if the storage can be augmented. The irrigators on this system not only have excellent marketing facilities, but the proximity of a large city like Poona provides a plentiful supply of town manure. The effluent from the sewage disposal works at Poona is pumped to Distributary 5 at Hadapsar, mixed with canal water, and distributed to the crops. It is charged for separately as a fertiliser.

(iv) *Pravara Canals*.—Nominally irrigation commenced on this system in 1909-10, but water from Lake Arthur Hill at Bhandardara became available only from 1919-20. Like the Nira Right Bank Canal this system has suffered from high construction costs due to the War, but irrigation has developed more quickly. Two very progressive sugar companies (Belapur and Maharashtra) are established on the Left Bank Canal, and both of them have expressed their desire for substantial extensions. The factories are situated at a distance of only 30 to 40 miles from the canal headworks, and the transit losses are therefore low. The irrigation of cane other than by the sugar companies and of *bhusar* crops is at present not very popular owing to the low commodity prices, but if a way of utilising regularly the whole of the storage could be devised, there would be every prospect of this system becoming self-supporting. In addition to the head available at the dam there is an abrupt fall of 150 feet in the river bed about five miles below it and both of them could be harnessed for the generation of electric power.

(v) *Godavari Canals*.—Like the Mutha and Pravara this system also has one canal on either bank of the river. Both canals are practically of equal importance. The system was constructed prior to the War. The soil is good and rainfall very deficient, but irrigation has not prospered. The damage due to water-logging is heavy, and sugar companies have not been attracted to these canals, although the requisite facilities have been available. It is desirable to investigate the causes of the slow progress made and to adopt special measures to stimulate development.

(vi) *Girna Canal*.—This is a small canal only 19 miles long on the left bank of the River Girna near Malegaon in Nasik District with a fair amount of storage at Chankapur. Though irrigation commenced as early as 1909-10, the canal not only showed a deficit during the boom period, but actually failed to meet working expenses up to 1918-19 and again from 1924-25 to 1931-32. Since the establishment of the Rawalgaon Sugar Factory, however, conditions have improved and the system now pays a net revenue of about 2 per cent. on the capital outlay. The conditions as regards storage on this canal are in no way different from those on the other major canals, but presumably because the soil is shallow and the tract somewhat undeveloped, the rates charged are very low. They approximate to the rates on second class irrigation works.

18. *Summary of the situation*.—The situation on the six major canals may be summed up as follows:—

(1) Irrigation is optional and the rates and rules are not at present attractive. This has reduced the demand and prevented the storage from being fully utilised.

(2) Irrigation is scattered and cultivators have no inducement to use water economically. This increases loss and waste, and reduces the area irrigated and consequently also the revenue.

(3) The financial situation is very unpromising on the Nira Right Bank Canal. On others, however, there should be a great improvement if the full storage is utilised every year, and if water is also used economically.

(4) The working expenses on every one of these systems seem heavy and a serious attempt should be made to effect reductions.

## CHAPTER IV

## PRESENT POSITION OF IRRIGATION WORKS—(Continued)

19. *First Class Minor Works.*—Like the six Major Canal systems a large number of these Minor Works is situated in the Central Division. Only one-eighth of the total capital outlay on new minor irrigation works is invested in works in Gujarat and about the same amount in the Karnatak. Statement No. 5 shows that during 1936-37 the Minor Works in the Central Division paid about two-thirds of their interest charges; Minor Works in the Southern Division paid about two-fifths; while those in the Northern Division failed both individually and collectively to meet even their working expenses. There is a considerable amount of perennial irrigation on Minor Works in the Deccan, but almost none either in Gujarat or in the Karnatak.

The main defect of most of these Minor Works, as of nearly all the Second Class Works, is that their catchments are situated in the same kind of tract as the area irrigated. Consequently they fail in times of scarcity and famine, i.e., when they are most needed. The prevailing optional system of irrigation has an even worse effect on the return in the case of these works, than it has in the case of the major canals, as the failure of supply is more frequent and long term leases are not readily accepted.

20. *Minor Works, Central Division (Deccan).*—Fourteen tanks and eight weir canals are classed as First Class Minor Works in the Deccan. The aggregate irrigated area under them in 1936-37 amounted to 37,883 acres, or about one-fourth of that anticipated in the project estimates. Four tanks (Ekruk, Asthi, Mhaswad and Pathri) and six weir canals (Krishna, Panjhra, Kadwa, Yerla, Shahada and Jamda) irrigate more than a thousand acres each and bring in more than Rs. 10,000 of gross revenue. The Ekruk Tank and the Shahada Canal are classed as productive works and they functioned as such during 1936-37. The Krishna and Panjhra Canals also show a net profit though classed as unproductive. A detailed examination of the results over a number of years shows that the Krishna Canal is an ideal work as regards its remunerative character as compared with other works of the same class. With a capital of under Rs. 10 lakhs, its annual gross revenue is about Rs. 70,000 whereas in the case of the Girna Canal with a capital outlay of Rs. 20 lakhs the gross revenue was scarcely Rs. 50,000 before the establishment of the Ravalgaon Sugar Factory. The Ekruk Tank derives a large part of its revenue from the supply of water to Sholapur Town and the Mills, and is consequently in a favourable financial position.

21. *Minor Works, Northern Division (Gujarat).*—The chief irrigation system in Gujarat comprises canals taking off from weirs on the Hathmati and Khari Rivers and the Bokh Reservoir (storage 300 million cubic feet), which is filled from the Hathmati Canal and feeds the Khari Cut Canal when necessary. A number of minor tanks (the largest being the Chandola Tank, storage 100 million cubic feet), is also filled from the Khari Cut system during floods, and these are drawn upon for the few last waterings to rice which is extensively grown in these parts. The other irrigation works consist of five small tanks. As already mentioned above none of them met during 1936-37 even its working expenses, and arrears of interest are continually accumulating. The Meshwa weir and canal project, estimated to cost about Rs. 12 lakhs, which we understand is being investigated by Government, will meet the needs of the rice lands in several villages in the Ahmedabad and Kaira Districts and will release the Khari waters, now serving the Kalambandhi villages in Kaira, for use on the Khari Cut Canal. There is a keen demand in Gujarat for large storage works that would ensure perennial irrigation, but considering the meteorological conditions and the existing high intensity of cropping without irrigation in this region, it is a matter of doubt whether the increase in the value of crops raised and the revenue expected would justify the outlay.

22. *Minor Works, Southern Division (Karnatak).*—There are seven minor tanks and two weir canals in the Karnatak. One of the latter, the Gokak Canal, has a storage of about 1,500 million cubic feet at its weir. The total area irrigated by all works during 1936-37 was 16,196 acres as against the projected figure of about 44,000. Two of the minor tanks, Mavinkop and Gadikeri, have been classed as productive works, and the second of these two has functioned as such with conspicuous success.



The Gokak Canal would have paid handsomely but for the fact that under an agreement of 1884 binding on Government for 99 years an average discharge of about 68 cusecs is reserved for 8 months for the Hydro-Electric works of the Gokak Mills, Ltd., who have purchased the right from the Gokak Water Power and Manufacturing Company Ltd. This discharge is equivalent to the total storage capacity of the weir, but the Mills pay only about one-seventh of what the same volume of water would fetch if used for irrigation. Even so the canal almost pays its way, but the irrigators are dissatisfied and there are strong complaints on account of the complete stoppage of water for irrigation after 15th December.

The Dharma Canal is not a remunerative work, but the cultivators on the Canal have been pressing for the construction of a storage reservoir which is estimated to cost about Rs. 5 lakhs. The necessity for this work should, we suggest, be carefully investigated, but their other demands for special repairs and arrangements for the efficient control of supply on the existing canal estimated to cost about Rs. 31,000 should, in our opinion, be met immediately.

✓23. *Summary of situation on Minor Works.*—Any substantial improvement in the financial prospects of these minor irrigation works is, we are afraid, not possible but a reduction of working expenses and better arrangements for the regular utilisation of all available supplies should improve the situation considerably and should be aimed at. Both in Gujarat and the Karnatak the number of First Class Works is small and an appreciable increase in their number seems desirable. The financial prospects may not be very encouraging, but the utility of the works to the tracts in which they are situated is high on account of their protective value and the general benefits which they confer on the local population.

✓24. *Second Class Works (Works for which neither Capital nor Revenue Accounts are kept).*—As will appear from Statement No. 2 the area irrigated from Second Class Works is equal to that from all First Class Works, both Major and Minor. These works, though their revenue is small, are of considerable importance to the local population. The great advantage that these works possess is that the distribution of water is attended to by the cultivators themselves and without outside interference and consequently the supply available is used very economically to the mutual advantage of all concerned. Outside interference is always unpleasant, and its necessity on the First Class Works is responsible for the multitude and complexity of the Canal Rules, which have raised such a storm of complaints. Another advantage is that there are no crop measurements and no assessment papers, as the charge for water is consolidated with the land revenue, and is collected every year irrespective of the irrigation actually employed. A third advantage following from the second is the reduction in the cost of administration, both actual and overhead.

On many of the *bandharas* in Nasik District the *phad* system of irrigation has been practised for generations. The basis of this system is a mutual agreement between the irrigators under which the whole of the area to be irrigated is divided into three or four sections or *phads*, each *phad* as a rule providing for a proportionate share of each owner's total holding. Every year the whole of one *phad* is allotted to sugarcane, another to rice, a third to wheat and the fourth one to bajri or gram; and these crops are changed in cyclic order from year to year. The result is that in each period of three or four years, as the case may be, there is a complete rotation of crops. The system thus automatically ensures concentration of irrigation, a rotational scheme of cropping, and an even distribution of the available supplies.

The Second Class Works thus serve a very useful purpose and are an ideal method of utilising local water resources for irrigation. One serious disadvantage with these works, however, is that on account of their scattered condition—there are 11,693 such works in all—regular departmental supervision and maintenance is very costly. Timely repairs are not ordinarily attended to and large sums have to be spent periodically on special repairs. Some means should be devised in co-operation with local cultivators to maintain every work on which an irrigation rate is assessed in a fit condition irrespective of its size.

✓25. *Present unsatisfactory position of irrigation works in general.*—The irrigation works in the Province have been constructed principally for purposes of protection against scarcity and famine. In recent years owing to a fall in the prices of

commodities and to the favourable character of the monsoons there has been diminishing demand for water, and irrigation on both major and minor works has failed to come up to expectations. The result has been that frequently an appreciable portion of the storage in reservoirs has remained unutilised at the end of the season. Considerable areas under the Nira Left Bank and other canals have also steadily deteriorated from the effect of water-logging and salt-efflorescence. The effect of all this is reflected in the financial position.

The annual deficiency in the net revenue available to meet the interest charges on capital every year was less than Rs. 5 lakhs up to 1914, and less than Rs. 20 lakhs up to 1924 ; but since the latter date it has risen to Rs. 30 lakhs, and it reached the record figure of Rs. 39 lakhs in 1931-32. During 1936-37 the deficiency was Rs. 28·5 lakhs. The reaction of Government to this precipitate decline in revenue would appear to have been to stiffen the canal rules with a view to reducing the damage to the lands and to raise the water rates with a view to increasing the revenue. This has had the result of making the cultivators rely more and more on rainfall only, and to apply for irrigation very grudgingly and only as a last resort.

A committee known as the Deccan Canals Financial Improvements Committee, under the Chairmanship of Mr. B. S. Kamat, B.A., M.L.C., was appointed in 1931 to suggest ways and means to improve the financial aspect of irrigation works in the Deccan, and largely as a result of this Committee's recommendations and also of the protection afforded to the white sugar industry in the country seven sugar factories were established under the Major Canals. The sugar companies have prevented a fall in the area of sugarcane, but at the same time they have created new responsibilities for the canals and new problems for Government, and these will need increasing attention in future years both from Government and from the cultivators.

The position now is that the sugar companies are pressing for more land and more water for growing cane. Individual irrigators are clamouring for a reduction in rates and a simplification of the canal rules and procedure. Non-agricultural consumers who even now are paying much higher rates for water used by them than those paid for irrigation are opposed to any further rise in the rates : they require an increase of supply, and they also desire that it shall be assured to them. The damage caused by water-logging calls for prompt remedial measures.

## CHAPTER V

## CHANGES PROPOSED—EQUITABLE DISTRIBUTION OF IRRIGATION FACILITIES

26. *Changes needed in the Operation and Administration of Irrigation Works.*—Having described at some length the present position of irrigation works in the Province we now proceed to indicate certain fundamental modifications which we consider to be urgently called for in the operation and administration of six of the largest canals of the system. Since the expenditure on these six works amounts to about 85 per cent. of that on all capital account works and also the area irrigated by them is approximately 82·5 per cent. of the total area under canal irrigation in the Province it will be sufficient for the present to concentrate all attempts at reform and development on them. Corresponding reforms on the Minor Works may be taken up as soon as experience is gained on these Major Works.

Since irrigation was started on the major canals in the Deccan in the early sixties of the last century the cultivators have had the option of taking water for their crops whenever it suited them. Presumably this practice arose because irrigation policy in those days was directly controlled by the Government of India, who favoured the system current on the Northern India canals with which they were more familiar. In the United Provinces and the Punjab the staple farm crops always benefitted by artificial waterings, and therefore the cultivators in these provinces readily took to irrigation and needed no special inducements to do so. A similar position exists in Sind.

On the Deccan Canals, on the other hand, although crops raised on rainfall do generally benefit by timely irrigation, they nevertheless give fairly satisfactory yields in many seasons without it. Irrigation is only really prized during years of drought or famine. Moreover, the black-soil lands in the Deccan do not lend themselves as suitably for irrigation farming as do the alluvial lands of Northern India or the rice fields of South India.

Statement No. 4 shows how irrigation has progressed under each of the six major canals in the past, what prospects were held out when they were projected, and what has been the actual extent of irrigation and revenue from year to year between 1910–11 and 1936–37.

It is now proposed to re-distribute the irrigable area under each canal as equitably as possible by giving to each village, and as far as possible to each cultivator in it, just enough irrigable land and no more, so that the acreage available for irrigation may nowhere constitute a surfeit, and the cultivator, and also the village collectively, may show a better appreciation of the water advantages placed at their disposal. The cultivators will necessarily accord such appreciation if they know that they will permanently forfeit their claim to water, should they persistently neglect to make use of it. If the area of irrigable land given to each cultivator is suited to his resources and capacity, he may be expected to invest capital in it, use the proper amount of manure and good seed, and endeavour to get the best crop he can out of it.

27. *Crops grown under the Deccan Canals.*—As a result of the economic depression which set in, in 1928–29 the prices of nearly all agricultural products have gone down, and this trend has been aggravated by the reduced demand for these products for foreign export and by the diminished consumption in internal markets brought on by the lower purchasing power of the population.

The index number of wholesale prices for Bombay (base 1914) fell from 145 in 1929 to 99 in 1935 and 96 in 1936. Taking all-India prices for 39 articles, the general index number has fallen from 203 in 1929 to 127 in 1935 and 125 in 1936.

The principal commercial crop hitherto grown under the Deccan canals has been sugarcane. On account of the lowering of prices of sugar and jaggery which market competition from the United Provinces, Bihar, and other parts of India has accelerated, the cultivation of sugarcane, though still the leading money crop, has of late years not been as profitable or popular as it used to be.

Besides sugarcane, the crops commonly grown under irrigation are garden crops, cereals such as jowar, bajri, wheat and rice, gram and other pulses, oil-seeds,

cotton, fibres, condiments, and fodder crops. The ordinary cultivator is often tempted to risk raising the more ordinary farm crops on rainfall alone and thus escape the water rate, although he realizes that a higher yield is almost always obtained with the aid of irrigation.

According to agricultural experts, the varieties of crops selected for irrigation should be hardy, in constant demand from year to year, and flexible as regards the date of plantation. Progress in the adoption of the most suitable types would be stimulated if this aspect were examined by the Agricultural Department for each of the six major canals once a year, and its recommendations reviewed in the yearly Irrigation Administration Reports of the Province. It will take some time for the proper varieties of crops to become popular, if the selection is left to chance or to the uninformed judgment of the cultivators themselves. In this connection the necessity for an organisation for the ready and cheap supply of seed, etc. of the crop varieties recommended should engage the attention of Government.

28. *Quantities of water required to bring Crops to Maturity.*—In the course of our investigations questions relating to the varieties of crops cultivated under the major canals, their optimum relative proportion in cultivation, and the quantities of water required to bring them to maturity were discussed with canal engineers, agricultural experts, and experienced irrigators. The data and information so supplied lead us to the conclusion that the different classes of crops which may be grown with advantage, their relative acreages, and the approximate depths of water required in a year of normal rainfall to bring an acre of each of the crops to maturity—assuming reasonably efficient management—are as under:—

Class of Crops	Proportionate Acreage	Depth of water utilised from Storage (in inches)
Sugarcane .. .. .	1	96
Rabi Crops .. .. .	5	12
Kharif Crops .. .. .	1	....
Pre-seasonal Crops .. .. .	1	10
Perennial Crops .. .. .	0·3	40
Hotweather Crops .. .. .	0·3	16
Total ..	8·6	....

These figures show that for an area of 8·6 acres of mixed crops of the description given the quantity of water utilised at the field will be about two-thirds of a million cubic feet. Adding 50 per cent. to this for losses in transit it may not be far wrong to assume that in a year of normal rainfall one million cubic feet of storage would suffice to irrigate between 8 and 9 acres of such mixed crops in the proportion given above.

No account is taken of the water used for kharif crops because these crops are normally grown during the monsoon on the surplus supply of the stream or river.

It is necessary to add that the quantities of water consumed must vary greatly with the soil, rainfall, season and other local conditions. The figures given in the above table may be taken to represent the duties which can be secured on a Deccan canal in a normal season, wherever the distribution of the water is made with special care and economy. We shall, therefore, adopt these figures in estimating the average crop acreages which can be watered on the six major canals.

✓ 29. *Water Supply and Equivalent Crop Acreage.*—The water supply on the major canals is usually derived from flowing streams during the monsoon, and from the storage collected in reservoirs during the remaining eight months of the year.

From the known carrying capacity of a canal and the storage impounded in its reservoir at the end of the monsoon the discharges that can be advantageously maintained in the canal or canals in each of the three seasons—kharif, rabi, and hotweather—can be determined. These discharges will show what crop areas can be maintained on canal water in the three seasons and what the total acreage of all classes of crops should be in a year of average rainfall.

The acreage of the various crops which can be cultivated under the whole canal being thus determined, this acreage should be distributed by sections—each section representing, say, about 10 miles of the main canal. The crop areas in each section are in their turn distributed by villages, each village receiving 25 to 40 per cent. of the total cropped area of the village.

As stated at the beginning of this Chapter, the cultivators will select such crops as they can grow in each season with the greatest benefit to themselves, the selection depending upon the market demand for the products grown and the irrigators' own resources and enterprise.

30. *Intensity of Irrigation.*—A reasonable intensity of irrigation to be maintained on any of the six major canals would be to bring under irrigation regularly from year to year approximately one-third of the area commanded by the canal. The proportion may vary from canal to canal according to local circumstances, but it is desirable to fix a definite percentage for each canal and to carry out the distribution among villages and individual cultivators with strict impartiality.

The crop areas allotted to each village will have to be distributed equitably among the whole body of cultivators residing in it by an authoritative Government Committee whose personnel should inspire confidence in the cultivators. Share lists should be prepared for each village on the basis of the acreage of the holdings of individual cultivators.

The extent and nature of the crop areas given to each village and the shares allotted to individual cultivators in it being known, the grouping of the shares into blocks—sugarcane and two-seasonal—should be arranged by the committee with the consent and co-operation of the cultivators.

(Irrigation should be associated with intensive farming. Capital, manure, technical advice and skill are all essential for growing crops of the highest value. We anticipate that the cultivators will apply themselves with real zest to irrigation farming, if the average size of their holdings for which water is available is kept well within their capacity to finance the crop planted and to cultivate it with care and skill. The Deccan cultivator is poor; his holding is small; he is unable to appreciate at its full value the opportunity given to him of using large quantities of water. Only a few capitalist bodies like the sugar companies and enterprising professional irrigators like the Saswad *Malis* have hitherto taken the fullest advantage of the facilities available)

✓ 31. *Block System of Irrigation.*—It has been explained that the *bagait* or irrigable area allotted to a village should be about one-third of its total cropped area where the whole of it is under command of a canal distributary or distributaries, and that the total acreage allotted to the village should be distributed among its resident cultivators in proportion to the areas of their holdings in the village.

✓ Where irrigation is already well established, some concession should be shown to persons who have shown enterprise in the past and taken up land in blocks, though the area which they are irrigating may be in excess of what they are entitled to on the basis of their holdings in the village.

At present on the Nira Left Bank Canal and on the Nira Right Bank, the Pravara Right and Left Bank and the Godavari Canals, irrigation is sanctioned for a term of six years in two main classes of blocks, namely, sugarcane and

two-seasonal. It is proposed to extend these blocks, where necessary, so that all land to which water is given for eight months or twelve months may be *confined to them*.

✓ The sugarcane blocks will be three times the area of yearly cane cultivation in the village. The two-seasonal blocks will be of the same extent. Each of these two classes of blocks will constitute 50 per cent. of the total block area in the village.

✓ It is proposed that perennial crops such as fruit plantations, vegetables and garden plants should be allowed to be grown in the two-seasonal blocks, and that an appropriate extra charge should be levied for such crops. We consider it very desirable to give special encouragement to make this class of crops popular by sanctioning the concessions recommended in paragraph 70 (Chapter IX). Such encouragement is needed to benefit the rural population. The quantities of water consumed will be small and the loss to Government revenue due to the concessions inappreciable.

✓ The question of water rates will be separately dealt with in Chapter IX, but reference to one aspect of the rates is necessary in this connection. The present rate for sugarcane is Rs. 45 per acre, and for every acre of cane within the blocks there will be two acres of *bhusar* crops on which Rs. 6 per acre or Rs. 12 for two acres is charged. This gives an average rate of Rs. 19 per acre within the blocks. We consider it desirable to reduce this rate to Rs. 17 for a period of six years from the date of introduction of the new scheme.

✓ The seasonal rates at present charged are Rs. 3 for *light* and Rs. 4-8-0 for *medium* kharif crops and Rs. 5 and Rs. 7-8-0 respectively for the corresponding classes of rabi crops, or Rs. 10 per acre on an average for eight months. We recommend that the rate for irrigation in the new two-seasonal blocks be reduced to Rs. 6-8-0 per acre from the date of their introduction.

✓ For purposes of perennial, two-seasonal and other classes of irrigation *every canal* will be divided into three sections. In the first of these to be known as the perennial section irrigation will be confined to two classes of blocks, namely, sugarcane and two-seasonal. In the second section there will be no cane blocks but water will be guaranteed for two-seasonal blocks only. In the third section water will be given to kharif crops during the rainy season. Irrigation in the third section will be extended to the limit, that is to the full capacity of the canal. The acreage of the seasonal blocks in the second section of a Canal should be determined after a local study of the needs of each tract.

32. *Why concentration is necessary.*—On the new canals the practice for a long time has been to allow each cultivator who had his land under the command of a distributary to take water for whatever area he wants. The area which has come within the blocks so far under the major canals is about 85,000 acres out of a total irrigated area of 259,253 acres in 1936-37. Outside the blocks water is taken to numerous fields in a village—some large, others small—by a reticulation of channels spread over the entire area of the village. This practice has led to losses of large volumes of water in transit from the canal to the fields and to water-logging and other evils.

✓ The object of the block system has been defined to be to distribute the benefits of an irrigation work over as large a number of villages as possible, and at the same time to concentrate the irrigation given to each village on areas or blocks of a specified extent and in selected soils and situations favourable to irrigation.

There may be three or four blocks in a village located in areas where the soil and slopes are favourable. The total area of the blocks should be of the full size necessary to give to every cultivator in the village the share to which he is entitled according to the rules of distribution sanctioned for the canal.

✓ The main advantage of the block system is that it removes opportunities for excessive use or waste of water. It also provides for crop rotation to maintain the fertility of the soil unimpaired. It enables suitable land to be selected for irrigation and set apart permanently as *bagait* land. It simplifies canal administration and reduces expenditure on canal maintenance.

33. In the course of our enquiry some witnesses advocated the adoption of the *phad* system of irrigation which has been practised for generations in the Nasik and West Khandesh districts. Speaking of the *phad* system in a Technical Paper (No. 16, issued in 1927), Mr. C. C. Inglis, I.S.E., Superintending Engineer, Irrigation Development and Research Circle, Poona, has explained why its introduction is not practicable. He writes:—

“... It was not proposed to divide the blocks into *phads* because it was realised that such a drastic distribution of holdings would be impossible, but it was anticipated that exchanges of land could be arranged between those with land outside the selected blocks who wanted to grow cane in the blocks and those with lands inside the blocks who did not want to grow cane.

“The cane areas were not concentrated into large blocks and practically the only alteration that took place was that cane areas were standardised by demarcation; but they remained scattered widely over large areas wherever there was a demand for them.

“The advantages which occurred from the introduction of blocks were, however, very great; because when the areas were standardised it was possible for the canal staff to distribute water much more economically; and the cultivators, having an assurance of water for a period of years, found it worth while to carry out improvements to their land.”

✓ In course of time the channels which lead water to a block or blocks tend to be made permanent and to become water-tight. It will be difficult to introduce the *phad* system on new canals because under it each cultivator in a village will have to carry on irrigation in four different blocks instead of in one or two only as is necessary under the block system.

✓ Incidentally it may be noted here that the Nira Left Bank Canal up to the 15th year of its operation gave a return of no more than 1.5 per cent. on the capital expended on it. But by the artificial stimulus given mainly by the Block System of Irrigation and by raising the water rates the area and revenue increased rapidly till the return on the capital at one time was as high as 8 per cent.

34. *Special Agency and Arrangements for Grouping Cultivators' Shares into Blocks.* ✓ The total calculated crop area under a canal is first distributed by villages. The area set apart for irrigation in a village should be approximately one-third of its total area. This one-third area should be distributed over land suitable for irrigation in patches or blocks of 60 to 300 acres in extent.

✓ The area of sugarcane permitted to be irrigated in a village sets the standard. The sugarcane block and the two-seasonal blocks will each be three times the area of sugarcane. In other words for every acre of cane given to a village five more acres of *bhusar* crops will be permitted.

✓ In the land chosen for blocks the owner of the land will not be permitted to irrigate more than the share allotted to him. On the rest of the land belonging to but not used by him he can only practise dry cultivation. Since he cannot make use of the land himself there will be every inducement for him to lease it to a neighbour either in exchange for a larger area of other land or for some other consideration to persons who may want land to utilise their share of the irrigation available.

✓ The contemplated exchange of land will be naturally distasteful to the cultivator and opposition must be expected. But we think that the necessary exchange can be effected and blocks formed with the aid of a Committee of two or three competent officers specially appointed to introduce the system. These officers would select suitable land, plan blocks, negotiate with the cultivators and endeavour to bring about a speedy understanding between them so that all who are eligible for a share in irrigation may find a place within the blocks.

✓ When the block system was introduced in 1903-04, a Committee of two officers, one an Engineer and the other a Revenue Officer, did such distribution work quite satisfactorily. Certain alterations which were a departure from the original scheme seem to have been made subsequently and weakened the scheme.

✓ The introduction of the new system could be expedited by the proposed Committee associating itself with a few leading cultivators or citizens as an Advisory Body who understand and appreciate the permanent benefits that will accrue from the new system to the lands as a whole, and whose advice is likely to carry weight with the general body of irrigators for whom blocks have to be formed and the land distributed.

## CHAPTER VI

## MEASUREMENT AND DISTRIBUTION OF WATER

35. *Measurement of Water.*—On the six major canals the quantity of water stored is approximately 42,000 million cubic feet and the cost of the canal systems themselves has been nearly Rs. 9.03 crores giving an average cost rate of about Rs. 1,850 per million cubic feet of water. If the unsuccessful Nira Right Bank Canal is excluded, this rate would go down to about Rs. 1,400. The interest on the capital expended without counting the charges for maintenance comes to somewhere between Rs. 50 and Rs. 100 per million cubic feet per annum. Since the greater part of the volume of water used for irrigation on the major canals is stored at considerable expense and conveyed over long distances by costly channels, it is desirable that an account should be kept of what the water has cost, what Government are realising for it, and what the value of the produce raised with its aid amounts to every year.

The supply admitted at the head of a canal and that drawn off at the more important distributaries are measured from day to day. This, we understand, is done as a safeguard against possible grave irregularities in water distribution, but not with any intention of maintaining a regular daily or weekly balance sheet of supply and consumption.

36. *Measuring Devices.*—The adoption of a more accurate system of measurements would lead to economies in the use of water, and the water saved by this means could be used for extending irrigation. For this purpose some expenditure will be necessary for providing the additional measuring devices and the staff for them.

The selection of the measuring devices—metres, modules, standing wave flumes, etc.—and their maintenance in proper working condition should be a matter of primary concern to the Canal Officer. It would be an advantage if the Research Executive Engineer were given a special staff to check independently the measuring devices used and measurements taken, from time to time, much in the same way as the Account Department audits the accounts of the Executive Engineer's Office.

The Research Engineer should specialise in the selection and maintenance of instruments and devices employed, and the system of measurement adopted should give satisfaction both to the cultivators and Government. He should be held responsible jointly with the Executive Engineer of the Division for the maintenance of a uniform system of measurement over all the canals as well as for the accuracy of the records. Rules will have to be framed to regulate his relations with the Divisional Executive Engineers in order to ensure the fullest and most effective co-operation.

37. *Units of Measurement.*—A record of the volume of water consumed by a crop may be obtained in terms of the total depth of water utilised to bring it to maturity. Each watering may be measured by the depth in inches of the volume of water poured on the crop, and the sum total of such depths would represent the aggregate volume of water utilised between planting and harvesting. It is important that detailed measurements and calculations should be maintained by the subordinate canal staff of the quantities of water supplied to each distributary and the duties obtained under varying conditions of crop, soil, rainfall and season. The results should be placed on record at the end of the year. The information will be more or less approximate, especially during the monsoon, but a record of such measurements in spite of its imperfections will materially assist in the judicious regulation of water.

38. *Duty of Water.*—Duty of water is a technical term used to indicate the area of crop watered and maintained by a given discharge in a canal or a distributary channel. The unit of discharge is usually a cubic foot per second termed for brevity's sake a *cusec*. One cubic foot per second in continuous flow for one day is approximately equal to two acre-feet.

Under efficient management an average discharge of one cusec constantly maintained at the head of a distributary on a Deccan Canal may be expected to irrigate 50 to 60 acres of cane, 100 to 120 acres of garden crops or 160 to 200 acres



of rabi. The duty at canal head may be taken roughly at about 35 per cent. less, and at the field about 10 to 15 per cent. more than the above figures.

The quantity of water actually used on a crop may be expressed in million cubic feet, in acre-feet, or in depth measured in inches per acre of crop watered.

The depths of water required to bring the different seasonal crops to maturity on the Deccan canals have been given in paragraph 28. The duty assumed represents the waterings given in addition to the moisture derived from rainfall.

Under favourable circumstances the quantity of water actually utilised on a crop will be about two-thirds of that drawn from the reservoir or river at the head of the canal. The average loss between canal head and the distributary outlet may be taken at about 25 per cent., and that between the distributary outlet and the field crop at 10 per cent., together making a total loss of about one-third of the supply in transit. This estimate may hold true for canals up to 75 miles in length. For longer canals the losses will usually be greater.

39. *Water Distribution to Field Crops.*—The delivery of water to crops under distributaries and water channels is regulated by *patkaris* or watermen constituting the canal staff. There are complaints that regulation by this staff is not usually satisfactory, that corrupt practices are common, that generally the richer classes of cultivators are able to get sufficient water for their crops, and that the poorer cultivators are harassed and often have no remedy. Such complaints must be expected wherever a hired staff distributes the water, and especially where it is not paid and controlled by the users of the water.

One means of arranging for a just and efficient distribution of water would be to maintain a trained emergency gang, who at the word of command would be able to proceed to any given area and give waterings economically and expeditiously, and in a manner that would be of the greatest advantage to the crops. Such a staff should be employed from time to time to demonstrate to the cultivators the correct system of waterings and the good that can be done both to the crops and the neighbouring lands by practising economies in the use of water.

A correct knowledge of the discharges or volumes of water admitted at canal head sluices and delivered at distributary and, where possible, at outlet heads will enable the Canal Officer to retain a satisfactory control over the entire mechanism of distribution.

40. *Entrusting Crop Waterings to Irrigators.*—A trained gang such as that described above will be useful only for demonstration or check distribution. It would be too expensive for the regular work of day-to-day distribution, although one such gang might be employed with advantage for three or four (ten-mile) sections of a canal.

(We consider that the best course to adopt, in these circumstances, is gradually to entrust the regular distribution to the parties most interested, namely, the cultivators themselves. They should be invited to take over this responsibility wherever they are willing and able to do so.) In sugar factory areas, where there is a trained establishment, this is easily done, and the factory authorities are willing to take over the distribution. But elsewhere, some preliminary training of the cultivators or their employees will be necessary, and for such training and demonstration the disciplined gangs of watermen referred to above will be very serviceable.

The Irrigation Department should carry on propaganda by means of pamphlets, lectures, and demonstrations to train the cultivators in teamwork in this respect. This should be done by sympathetic officials who believe in the efficacy of such propaganda and instruction. The services of public-spirited leaders within the irrigating community itself should also be enlisted for this purpose wherever available.

41. *Water Panchayats.*—For the distribution of water to the cultivators it would be desirable to establish co-operative societies or water *panchayats* at the rate of, say, one for every ten-mile section of a canal. These *panchayats* should be composed of men chosen by the irrigators of all the villages which constitute a canal section. The actual canal length which will mark a section will depend on the topography of the country, the number of villages, the areas to be irrigated and their total population.

The *panchayats* may at first be given the services of *patkaris* at the cost of Government. But after a time they should be able to levy a small cess from the cultivators to pay the wages of a clerk or inspector and the necessary staff of *patkaris*. The *panchayats* may decide once a year the amount of cess to be collected and the rate of the cess in relation to the water assessment paid. The actual collection of the cess decreed by the *panchayat* may be entrusted to the Revenue Department which will collect and hand over the proceeds to that body to meet its establishment and other charges.

✓ 42. *Sale of Water on a Volumetric Basis.*—The present system of irrigation has come down from the past, when the rates were always on the land, and irrigation was regarded as an additional convenience to which the cultivator felt that he had an inalienable right. No thought was given to economy in the use of water.

Waste of water, while it is being supplied to crops, not only means loss of canal revenue but causes water-logging and other evils prejudicial to the interests of the cultivators.

✓ We consider that the ideal to be aimed at is that water should be received and paid for by measurement as is done in exchanging other commodities which have a price. The supply of water should as far as possible be on a volumetric basis and the cultivators of a village owning lands under a channel should be encouraged to work together as a body, to obtain delivery of water at the distributary head by measurement and to use it to the best advantage for the production of a maximum outturn of crops.

Where payment is on a volumetric basis, the interests of the canal should be safeguarded by charging a reasonable minimum rate during months of excessive or abnormal rainfall on account of the large canal supply which has to be kept in reserve whether actually used or not.

An account should be kept of every million cubic feet of water used and the crop outturn obtained by such use. This will lead to the production of crops of progressively higher value and to an increasingly correct knowledge of the best way in which the crops should be watered under any given condition of soil, climate and rainfall.

## CHAPTER VII

## FUTURE CONSTRUCTION PROGRAMME

43. *Three Classes of Works.*—As already stated all irrigation works for which Government are responsible may be grouped under the following three heads :—

- (i) *First Class Major Works.*—The 6 large canals in the Central Division for which capital and revenue accounts are kept.
- (ii) *First Class Minor Works.*—37 minor works, for which, also, both capital and revenue accounts are kept.
- (iii) *Second Class Works.*—There are 11,693 minor works for which only revenue accounts are kept.

At the present time the works under the first two heads are directly administered and operated by the Public Works Department. The second class works are repaired, and occasionally extensions or alterations are made to them by the Public Works Department either on the initiative of the officers of that Department or at the request of the Collector of the District.

44. *Regional Classification of Capital Account Works.*—The distribution of capital expenditure on works under the first two heads, results of such expenditure in acreage irrigated and the net revenue realized during 1936-37, the latest year for which information is available, are shown in the following table :—

Region	Number of Works of each class	Acreage Irrigated	Capital Outlay (Rs. lakhs)	Net Revenue (Rs. lakhs)
Central Division	6 (Major) ..	259,253	903.63	10.86
" "	22 (Minor) ..	37,883	117.14	2.38
Northern "	6 ( " ) ..	612	24.48	-0.15
Southern "	9 ( " ) ..	16,196	21.61	0.28
Total (including incomplete works) ..	43 ( " ) ..	313,944	1,075.12	13.37

The figures in the last column show that the return during 1936-37 on the total capital invested on all these works was 1.24 per cent.

It may be desirable to consider at this stage what new irrigation works, or improvements to existing works, are needed in each of the three administrative divisions of the Province.

45. *Six Major Works in the Central Division.*—We have suggested that the six major works should be treated as a class by themselves, because their administration and operation have to proceed on similar lines and their problems are the same.

When new works costing Rs. 20 lakhs or more are constructed in future in any of the three Divisions, they should also be classed as *major works*, and their supervision and control should proceed on the same uniform lines.

These six works in the aggregate have, as stated in Chapter V, cost between them Rs. 903 lakhs or quite 85 per cent. of the total capital outlay, and the area irrigated by them forms about 82.5 per cent. of the total on all capital account works.

In this report, we propose to give special prominence to these six works. Our suggestions primarily aim at placing them in a sound working condition. If they are rendered efficient and made to yield produce of the maximum value of which they are capable, the character and reputation of the whole irrigation system in the Province will improve. As a result of such improvement irrigation would come to be recognised as one of the real wealth producers in the Province.

46. *Nira Right Bank Canal.*—This canal is the largest and most important work in this group. It has cost nearly Rs. 412 lakhs or about 47 per cent. of the capital expended on the six major works and 39 per cent. of the outlay on all the capital works in the province. The canal is still in its infancy having commenced operation in 1924–25, but the results so far have been unsatisfactory.

Several questions, technical and administrative, have been raised with reference to this canal. The velocity of flow in the canal is said to be slow because it cannot run to full capacity. The proposal, once contemplated, to construct an enlarged weir at Vir seems to have been abandoned. A sugar factory has been allowed to be started in mile 79 thereby committing Government to the maintenance of perennial irrigation so far down the canal. Doubts have been raised as to the accuracy of the figures representing the storage in the Bhatgar Reservoir.

47. *Nira Left Bank Canal.*—The Nira Left Bank Canal was a very successful work at one time and paid, in some years, as high a return as 8 per cent. But largely on account of its subsequent association with the unsuccessful Nira Right Bank Canal its remunerative character has depreciated and it is giving a return of less than 4 per cent. at the present time.

Some surveys and investigations will be necessary before the proper utilisation of the Bhatgar storage between these two canals can be correctly determined. There are recent Government commitments to sugar factories, which require that water should be delivered throughout the year to points far down the canals. It is, therefore, desirable that, as soon as possible, the necessary surveys and investigations should be carried out, and a reliable programme for the distribution of the storage drawn up and approved.

It would probably take a considerable time to conduct a detailed enquiry into the working of these two canals—an enquiry which for obvious reasons, this Committee cannot enter into. But, in view of the magnitude of the works and the importance of the issues involved, we suggest that this investigation be taken up as one of the first items to be dealt with by any special agency which may be brought into existence to give effect to our recommendations.

48. On the remaining four major canals also some additional capital may have to be spent to adapt them to the redistribution of irrigation facilities proposed in this report. Some canal improvements will be necessary to reduce seepage and for the better regulation of supply. The designs of these works will have to be re-examined and adapted in all minor essentials to the redistribution of the irrigated areas proposed in our scheme (Chapter V). Minor additions and improvements will be needed in many places, which, if carried out, will lead to economy of water and increased crop acreage. All such works should be promptly undertaken wherever there is a prospect of increasing the irrigation acreage.

49. *Minor Irrigation Works in the Central Division.*—As stated already, all the six major irrigation works are situated in the Central Division, and the expenditure on minor irrigation works in this division also amounts to about five times what has been spent in the Northern and Southern Divisions. For these reasons, we recommend an expenditure of Rs. 10 lakhs only on these works for the present, unless further investigations show that a larger expenditure is justified.

50. *Irrigation Works in the Northern Division.*—Public opinion in this Division is that this part of the province has not received adequate attention in the provision of irrigation facilities. During our visit to Ahmedabad complaints were received about the insufficiency and mal-distribution of water on the Hathmati and Khari Cut Canals. We realise that the officers concerned are probably doing their best under the present system, but the complaints require investigation with a view to their removal and to the issue of approved printed rules of management for the guidance of local irrigation officers.

There is a demand for large irrigation works in this Division. It is stated that big reservoirs are required but that the only possible sites for them lie within neighbouring Indian States which have hitherto not shown any inclination to accommodate such works. It should be possible by negotiation and mutual concessions to arrive at a reasonable understanding for a common constructive programme for the future.

Several prominent witnesses urged the importance of constructing one or more large canal systems. Some even suggested the construction of canals taking off from the big perennial rivers, the Tapti and the Nerbuda. What is required, in the first instance, is a complete review of the whole water resources of this Division in order to see if there are promising schemes worthy of detailed investigation. Until this is done, no construction works of any magnitude should be undertaken.

We understand (*vide* paragraph 21) that a satisfactory project costing about Rs. 12 lakhs has been prepared for a Weir on the Meshwa river to supplement the supply to the Khari Cut Canal and that it is awaiting the sanction of Government. It would be satisfactory if a sum of Rs. 20 lakhs could be set apart for constructing new works in this Division within the next five years.

51. *Minor Irrigation Works in the Southern Division.*—Representations were made to us at Dharwar that irrigation under the Gokak Canal was unsatisfactory partly owing to insufficiency of storage and partly owing to the diversion of the river supply for power generation at the Gokak Mills. The provision of a reservoir for the Dharma Canal has been suggested. There is also a keen demand that Government should carry out the proposed Malaprabha Canal project.

Cultivators in this Division also consider themselves to have been neglected in regard to irrigation projects although the physical features of the tract are more favourable for irrigation schemes than those in the Northern Division. We are strongly of the opinion that, before deciding whether any projects can be advantageously taken up, adequate preliminary surveys and investigations should be conducted.

Some special expenditure will be justified on preliminary surveys and the preparation of rough designs in the first instance. As in the case of the Northern Division, we recommend that a sum of Rs. 20 lakhs be set apart for expenditure on new works during the next five years.

52. *Second Class Irrigation Works.*—As already explained these are older works many of them constructed in pre-British times and they do not hold any important place in the revenue budget. The area irrigated by these works was 223,060 acres in 1935-36. The gross revenue during 1936-37 was Rs. 7.28 lakhs and the net revenue only Rs. 75,000. The works, which number about 11,693 are scattered all over the province. It is difficult to frame an accurate conception of the economic value of these works. Although, from a revenue point of view, they are of little consequence they are greatly prized by the rural population, and not without reason. Many of them are of undoubted value for irrigating the crops dependent on them during a break in the rains. They help to raise the level of the sub-soil water in their neighbourhood, and thereby improve the efficiency and reduce the cost of well irrigation. They are appreciated as a source of water supply to men and live-stock in arid tracts, where there is ordinarily no rain for six to eight months in the year. Complaints were received that many of the tanks are silting up and that the losses in this respect are not being made good quickly enough by new constructions. Here again, we feel that the selection of such projects can only be settled after the necessary preliminary surveys and investigations advocated above have been carried out.

53. *Grouping together First Class Minor Works and Second Class Works for future Administration.*—Works coming under *First Class minor works (capital account)* and *second class works (revenue account)* are of the same character as regards their engineering features and irrigation value. The difference is merely one of degree. For the sake of efficiency and economy of supervision we recommend that both these classes of works be grouped together as a distinct unit or units in each district and each unit placed in charge of an Assistant Engineer or an Upper Subordinate for purposes of supervision and control. This officer may work under the orders of the Executive Engineer, or, where preferable, under the Collector of the District. The technical work to be done will be comparatively simple. What is required from the officer in charge is more industry and enthusiasm than expert knowledge. He may be assisted, where necessary, by an Advisory Committee—on the lines of the Canal Committee referred to in paragraph 60 in this report. By re-grouping in this manner supervision and

control will be closer and more efficient. The needs of the tracts will be properly realised and Government will be in a better position to respond to the reasonable requests of the public. We also anticipate that the supervision of such works will be simplified and that there will be an appreciable reduction in the expenditure on their maintenance.

54. *Construction by private effort.*—It appears to us that the time has now arrived for encouraging a beginning in the construction of minor tanks and channels by the people themselves in one or more of the various ways in vogue in the United States of America and elsewhere. In 1936-37, there were 11,218 tanks and 485 bandharas in the entire province. The aggregate area irrigated by them was 284,293 acres. The construction of such small works by private effort, as happened in so many instances in the past should be encouraged wherever it is possible to do so without interfering with existing riparian and other rights.

We recommend that, Government should publicly announce for the information of cultivators that wherever they require a tank to store rain water or a channel to utilise a flowing stream, they may come forward with concrete proposals for construction accompanied by an offer to contribute a portion of the cost or the labour required to execute the scheme. Their offer may take other forms, for example, an acreage contribution towards the capital required, or an acreage water rate or cess on the area which will benefit by the work. The acreage contribution towards capital is usually spread over ten years or some similar long period in cases in which Government undertake the construction. Such co-operation between Government and the people is not uncommon in some Indian States.

In certain foreign countries, private or public companies at times undertake the construction of irrigation works, and the cultivators or settlers who benefit thereby gradually purchase the stock in order ultimately to secure exemption from paying the water rate levied.

If a public company should propose to undertake the building of an irrigation tank or channel with a view to making a profit, we consider that Government should legislate in order to define the working relations between the constructing company and the prospective users of the water.

55. There is considerable scope for such work in the Province. The area is large and the number of works required are many and, unless private enterprise is stimulated in this connection, the needs of the rural population in this respect cannot be adequately met for a long time to come. There are competent contractors to build such works even in the rural tracts. But we feel that it would be erroneous to assume that the practice of constructing irrigation works by private effort or by private companies will arise suddenly without special encouragement or special inducement from Government at least in the early stages. The policy of Government in this connection and the rules under which the construction of such works can be financed and assisted by Government will have to be declared. When prepared, they should be printed in English and the Indian languages in leaflet form and circulated in all districts. The services of subordinate officials of the Public Works Department may be lent to private citizens and contractors who want preliminary surveys of projected works carried out.

We consider also that Government should come forward with liberal money grants in aid of such projects wherever the cultivators offer to contribute a cess or give their labour in construction. Money prizes and remissions of assessment for a year or two at a time might be freely sanctioned wherever local people are found to be maintaining their local tanks and channels in first class working condition.

56. *Capital and Revenue Budgets.*—The capital and revenue budgets of irrigation works may be prepared in the existing form if it is necessary to retain the standards of Government of India Accounts for the sake of uniformity and future comparison. But under the present diminished responsibility of the local Government, the budgets, both capital and revenue, may be simplified in the manner herein suggested.

57. *Capital Budget.*—The capital expenditure on irrigation works during the ten years ended 1936-37 was Rs. 100 lakhs. It is suggested that the following minimum expenditure be incurred within the next five or ten years according as Government decide upon an active, or moderate, irrigation policy :—

	Rs. lakhs.
Major irrigation works, improvements and extensions ..	25
Minor works in the Central Division .. ..	10
Minor works in the Northern Division .. ..	20
Minor works in the Southern Division .. ..	20
Total ..	75 lakhs.

More may be spent if Government are able to find the money.

It should be understood that, as most of the good sites, for irrigation works have been already utilised in the past, new works are likely to be more costly and less remunerative. This, however, can only be judged in each case after detailed survey and investigation.

58. *Revenue Budget.*—The revenue grants for 1936-37 for first class minor works were Rs. 2,86,470 and for all the older minor works Rs. 6,43,000, making a total for both of Rs. 9,29,470, or say, Rs. 10 lakhs. This is a large sum. It could be more profitably utilised than at present by regrouping the works and re-organising the establishments. This would eventually result in an appreciable reduction in the acreage rate of maintenance on both these classes of works.

In order to give effect to these recommendations in a practical manner details will have to be worked out by a committee of engineers who have faith in the methods here advocated.

## CHAPTER VII

## ASSOCIATING THE PUBLIC IN SUPERVISION AND CONTROL

59. *Objects to be kept in view.*—We consider it necessary to suggest fundamental changes in the system of supervision and control of the large canal systems of the Deccan—the six major canals in the first instance—along lines calculated to further the policy and practice enunciated earlier in this report. The principal directions in which such changes should be made are :—

(i) To bring Government officials and the cultivators, associated with irrigation, into closer touch so that they may, in future, have a better understanding of each others' difficulties and work harmoniously for a common purpose and to their mutual advantage.

(ii) To induce the cultivators, engaged in irrigation to think, plan, and administer for themselves and to work in a co-operative spirit ; in other words, to make the cultivators more self-reliant.

(iii) To provide for the continuous study of the irrigation needs of the Province and to maintain continuity of investigation and research into the various problems which have been discussed in this report.

The organization and agencies which we consider to be necessary to achieve these objects will now be briefly explained.

60. *Canal Advisory Committees.*—The Royal Commission on Agriculture in India considered very carefully the possibility of devising means whereby the irrigators could have a more direct avenue of approach to the responsible officers of the Irrigation and Agricultural Departments and recommended that an organization on the analogy of local Railway Advisory Committees should be established to deal with complaints in regard to irrigation matters (*vide* paragraph 284 of the Report of the Royal Commission on Agriculture in India).

We are of the opinion that action on the lines suggested by the Royal Commission is most desirable and recommend that Government should institute "Canal Advisory Committees" on the major canal systems of the Deccan and on groups of minor works in Gujarat and the Karnatak. Such committees should be composed of both nominated and elected irrigators, and the Chairman of the Committee should be the Executive Engineer of the Division. The committee might meet once in six or eight weeks to exchange views on the needs of the crops, the regularity of waterings, and all matters bearing on the efficiency of irrigation. Regular minutes should be kept of the proceedings at these meetings.

61. *Conferences of Irrigators.*—We also recommend the institution of Irrigators' Conferences to be held twice annually at which all matters affecting the welfare of the irrigators can be discussed. These conferences would be attended by members of the Canal Advisory Committees, mentioned above, and also by senior members of the staffs of the Departments of Government concerned, namely, Revenue, Irrigation and Agriculture. At such conferences lectures and addresses on matters affecting irrigation and irrigated agriculture should be given by experts of the different Departments.

62. *Brief Reports of Irrigation and Irrigation Statistics.*—Earlier in this report we have recommended the introduction of irrigation by canal sections and, where possible, by villages or groups of villages, in which the irrigators are prepared to undertake co-operative irrigation and to carry out the distribution of water themselves. We consider that it is very necessary that, where such methods of irrigation are introduced, careful records should be maintained by the staff of the Irrigation Department of the total acreages irrigated under each variety of crop annually and estimates made of the total quantity of irrigation water utilized and the duties obtained in each canal section and village or group of villages.

The information thus collected should be made available to Canal Advisory Committees and to Village Irrigation Panchayats who may desire to study in detail the working of the irrigation systems in which they are directly interested. The costs of crop production, both with and without irrigation, should be investigated from time to time for the more important crops by the Government Departments concerned and the information, thus collected, should be tabulated for each major canal system and published in leaflet form for the information of the public.



63. *Rules for Canal Operation and Administration.*—We suggest that hand books specifying the details of the operation and administration of each major canal—and including the revised canal rules—should be prepared and published both in English and in the Indian languages. It is also suggested that in accordance with the practice often followed by railway administrations and large business firms, rules of conduct might be prepared for the use of the subordinate irrigation staff, specifying the importance of a reasonable and fair attitude towards the irrigators, their duties to the public, and to the Department of Government which they serve.

64. *Provincial Irrigation Board.*—In order to assist in giving effect to the recommendations in this report, assuming that they are accepted by Government and for various other purposes detailed hereunder we recommend the establishment of a Provincial Irrigation Board for an initial term of three years at the least.

The Board should consist of three persons, two of whom, at least, should be engineers of considerable experience and reputation and the third an officer or non-official gentleman known for his progressive views, public activities, and practical interest in irrigation matters. The Board should possess an Executive Staff consisting of one Development Engineer of the rank of Superintending Engineer and a Research Engineer of the grade of Executive Engineer who normally should be the Executive Engineer, Irrigation Research Division. The Director of Agriculture may be co-opted as additional member of the Board as it is proposed later that the Board should among its other duties co-ordinate the work of scientific research done by the Agricultural and Irrigation Departments on irrigation problems in the Province. The Executive Engineer, Irrigation Research Division, should be the Secretary of the Board.

The main duties of the Board should be to see that the existing works are maintained in efficient working condition, to take all reasonable steps to remove complaints from irrigated areas, and not only to prevent the waste of water but also to make sure that the water stored in reservoirs is adequately and economically used. The Board should also see that canal administration and operations are scientific and up-to-date, that the latest experience and practices of other British provinces and foreign countries found to be beneficial are promptly utilised, that crops of the highest value obtainable are produced on each irrigation work, and that the revenue derived is also reasonably satisfactory.

The Board should carry on surveys for new projects and extensions with a view to provide, as far as local conditions permit, all parts of the Province with their due share of irrigation facilities. It should also see that the cultivators' association with the irrigation operations becomes a real force, that the Canal Committees and Sectional Panchayats represent both rich and poor, and that they function as live organizations. The Board should be vested with power to change the personnel of committees and panchayats whenever real apathy or inefficiency on their part comes to its notice.

65. The ways and means of bringing the Departmental Officers into closer touch with irrigators with a view to understanding their requirements and difficulties have already been considered on several occasions. The last occasion was in 1931 when the Superintending Engineers, Irrigation Development and Research Circle and Deccan Irrigation Circle, proposed that a permanent Irrigation Board should be constituted to consider all questions affecting irrigation policy. But apparently as no new measures or schemes of any importance were then in contemplation, Government considered that periodical conferences of officers of the Revenue, Irrigation and Agricultural Departments would serve all the purposes of the proposed Board.

In 1932, however, Government approved of the appointment of a Committee called the "Deccan Irrigation Advisory Committee" to advise them generally on all matters connected with canal irrigation in the Deccan and as a means of establishing closer liaison between Government and the irrigators. The Advisory Committee is composed of the Commissioner, Central Division, as Chairman, and two representatives from each of the Major Canals and two from the collective group of Minor Canals as Members, and meets at least once a year. Other officers and experts may attend the meetings of the Committee at the request of

the Commissioner. The functions of the Committee are strictly advisory, but as we have now put forward proposals of a far-reaching character, the Committee should, in our opinion, be replaced by a more responsible body possessing also certain executive powers like the Provincial Irrigation Board now recommended.

66. The Board will normally meet once a month and a reasonable fee may be paid to the non-official members. In the first two or three years it is anticipated that a large amount of the work done by the Board will be in connection with surveys and investigations for new works which will have to be ultimately carried out from capital. During this period, at least, we consider that the cost of the proposed Provincial Irrigation Board should be met three-fourths from capital and one-fourth from maintenance grants (Revenue Budget).

The Irrigation Research Division will function as an Irrigation Research Bureau under the Provincial Irrigation Board, thus coming into line with the Bureau of Irrigation Research proposed to be maintained by the Central Government in connection with the Central Board of Irrigation.

## CHAPTER IX

## WATER-RATE ASSESSMENT.

67. Questions connected with Water Rate Assessment fall naturally under two heads—(1) rates for agricultural purposes, and (2) rates for non-agricultural purposes. As Government have asked for our recommendations on each of these severally, we will deal with the subject in the same order.

## WATER-RATE ASSESSMENT FOR AGRICULTURAL PURPOSES.

68. In the early days of irrigation on all works on which a consolidated assessment was not levied the crop rate system was generally in force, under which the dates of plantation and of harvesting, or more properly of the last watering, were uncontrolled. So long as the demand was less than the supply this system worked without much trouble, but later when the demand overtook the supply on any canal, it became evident that to make the most of the water facilities and secure the maximum of benefit to the largest number of irrigators the supply should be carefully controlled. Seasonal rates were first introduced on the Nira Left Bank Canal in 1905, and in 1910 they were universally adopted.

Some irrigators—surprisingly few in number however,—have represented to us that crop rates should be reintroduced with a view to avoiding the necessity of pre- and post-seasonal waterings which frequently arises under the present system and which they have considerable difficulty in meeting and sometimes even find it impossible to meet. Then there is the question of the additional charge when pre- or post-seasonal waterings are taken. These difficulties, we feel, are greatly exaggerated; and we consider that the seasons as fixed suit the agricultural requirements of the mass of irrigators. If the seasons were not fixed, plantation would incline to straggle and agricultural operations including crop rotation become erratic to the detriment of the yield. Also orderly and economical distribution of water requires that the precise commitments should be known, and this would be impossible if the canal staff had to consider the convenience or claims of individual irrigators. If, however, in any year surplus water were available, Government might consider the advisability of advancing or prolonging any season, either generally or in respect of any particular crop or crops, as might appear to them best suited to the needs of the occasion. Each case should be decided on its merits and no additional charge should be made. We understand that Government already allow water to rabi crops from 15th September without additional charge, whenever the supply permits. This is exactly the kind of concession, beyond which it would in our considered opinion be a retrograde step to go.

69. In the one exceptional case of sugarcane, however, we feel that a crop rate might be justified. Sugarcane is rarely harvested in 12 months, any period over 12 months which may be as much as 8 months particularly in the case of the newer varieties being treated as overlap.

The problem of overlap is a vexatious one both from the point of view of the Irrigation Department and that of the irrigators. At present overlap is permitted under certain conditions on a monthly basis, and the irrigators have to apply for it separately. More than one water application may be required to be submitted on this account. The submission of a water application is always regarded as a nuisance by the average cultivator; it may also be the occasion of harassment and petty exactions by the village officers and subordinate canal staff. When several applications have to be submitted in respect of one and the same crop, the exasperation of the irrigators may be readily imagined. If cane is assessed on the basis of a crop rate, these difficulties will largely disappear. But the period of overlap will have to be controlled if the block system is not to be rendered nugatory. We would, therefore, suggest that overlap in blocks should be strictly prohibited between 15th April and the break of the monsoon but permitted without application and without additional charge at other times of the year. In the case of factories, overlapping *adsali* should not be permitted before the break of the monsoon. The cane rate will, however, have to be fixed at Rs. 60 per acre for factories and Rs. 54 for individual cultivators to prevent any diminution of revenue under this head. These rates really correspond to the present rate of Rs. 45 per acre per annum plus a charge of Rs. 15 and Rs. 9 for overlap in the case of the factories and ordinary irrigators respectively under the existing system. Both factories and ordinary

irrigators already pay these rates on the average, and will be saved all the trouble and inconvenience at present connected with overlap. Should overlap extend into the prohibited period a charge should be made at a deterrent rate, say, the full ordinary hot-weather dry crop rate for every watering taken. In the case of all other crops, the present seasonal system of assessment is, as we have seen, best suited to serve the interests both of canal cultivation and irrigation revenue.

70. The actual water rates are based on the quantity of water used by each type of crop *light, medium* or *heavy* and the relative values of water in the three irrigation seasons.

Suggestions have been made that all the rates are high compared with those in other Provinces and also that rates should bear some relation to the value of the crop. We have carefully considered these suggestions and are of opinion that to base the water rates on the value of water consumed, as at present, is perfectly rational as crops which take more water but give less profit than other crops should not be encouraged. Comparing the present rates with the difference in profit between irrigated crops and crops grown on rain we find that they are reasonable. We find that the irrigation rate in Bombay, in the case of seasonal crops, is generally 1/7th or less of the total value of a crop whereas in America the rate varies from 1/5th to 1/6th of this value and in Egypt the rate is about 1/7th. We therefore feel that the present rates for seasonal crops are fully justified, but in view of the depressed state of the market and the prevailing depression of the irrigators we recommend that the classification of seasonal crops into *light* and *medium* be discontinued and the present *light* rates charged for both classes of crops.

No reduction is necessary in the case of cane grown by the sugar factories, or of other perennials, such as lucerne and fruit trees; in fact fruit trees grown as a commercial crop could in our opinion bear a heavier charge, and this may be considered when the general economic situation improves. A small reduction in the cane block rate to come into effect immediately is however recommended.

When the proposed redistribution of areas discussed in Chapter V has been effected, the new cane block rate and two seasonal block rate may be fixed at Rs. 16 and Rs. 6-8-0 per acre respectively. To encourage the cultivation of vegetables and fruit trees with a view to improving the dietary of the people it is recommended that one guntha per acre may be permitted to be grown with these crops in the new two-seasonal blocks, provided that all such cultivation is concentrated in a selected and detached sub-block or parcel of land. Water may also be allowed in the hot weather in the perennial section to these sub-blocks at half the seasonal rate.

In the non-perennial section, the irrigators must make their own arrangements for watering such areas from wells, but any rates chargeable under the provisions of Section 48 of the Bombay Irrigation Act should be waived in their case.

71. *Rates on Major Canals.*—Thus, on the Major Canals, the rates we would recommend are as under :—

—	Name of crop	Present rates	Rates proposed		Remarks
			Before introduction of new system	After introduction of new system	
			Rates in rupees per acre.		
1	Sugarcane grown by ordinary irrigators—				
	On present basis .. .. .	45 0 0	45 0 0	40 0 0	For 12 months.
	On a crop-rate basis .. .. .	.....	54 0 0	48 0 0	
2	One-third Sugarcane Blocks—				
	Excluding overlap .. .. .	19 0 0	18 0 0	16 0 0	For 12 months.
	Including overlap .. .. .	.....	21 0 0	18 0 0	
3	Sugarcane grown by Sugar Companies—				
	On present basis .. .. .	45 0 0	45 0 0	45 0 0	For 12 months.
	On a crop-rate basis .. .. .	.....	60 0 0	60 0 0	
4	Other perennials .. .. .	22 8 0	22 8 0	22 8 0	

No.	Name of crop	Present rates	Rates proposed		Remarks	
			Before introduction of new system	After introduction of new system		
			Rates in rupees per acre.			
5	Hot-weather Seasonals—					
	Light	7 0 0	*7 0 0	*6 0 0	*Same rate for both classes of crops.	
	Medium	10 8 0				
6	Kharif Seasonals—					
	Light	3 0 0	*3 0 0	*2 8 0		
	Medium	4 8 0				
7	Rabi Seasonals—					
	Light	5 0 0	*5 0 0	*5 0 0		
	Medium	7 8 0				
8	Two Seasonals—					
	Light	8 0 0	*8 0 0	*7 8 0		
	Medium	12 0 0				
9	Two Seasonal Blocks	See note (a)	No change	†6 8 0	†Provides for irrigation throughout the kharif and rabi seasons.	
10	Pre-Seasonal waterings—					
	Light crops—					
	From 25th April	5 0 0	†4 0 0	†4 0 0	†Pre-seasonal waterings should commence in every case not earlier than 1st May.	
	From 5th May	4 0 0				
	From 15th May	3 0 0				
	Medium crops—					
	From 25th April	7 8 0	†4 0 0	†4 0 0		
	From 5th May	6 0 0				
	From 15th May	4 8 0				
11	Post-Seasonal waterings	2 0 0	2 0 0	2 0 0	For each watering vide Notes (b) and (c).	

*Explanatory Notes—*

(a) The present two-seasonal blocks are strictly speaking merely rabi blocks and pay only the *light* rabi rate compulsorily. If *medium* rabi crops are grown, the corresponding rate is assessed. Kharif irrigation is entirely optional; and if practised, it is paid for in addition according to the class of crops grown.

(b) No post-seasonal waterings should be allowed to monsoon crops; if water is required, the crop should be assessed as a two-seasonal one

(c) If more than one post-seasonal watering is taken in the hot weather, the full hot weather rate should normally be charged.

Owing to the retarded development of the Nira Right Bank Canal and the Girna Canal it is suggested that a reduction of about 25 per cent. in the rates for seasonal crops recommended above may be sanctioned for a period of three to six years.

On the Minor Works and works for which neither capital nor revenue accounts are kept the reduction of rates should be on similar lines. We desire, however, to recommend a specific reduction in the rate for rice in Gujarat from Rs. 7 to Rs. 5 per acre for so long as the present unsatisfactory water supply continues. With a more assured supply Rs. 6 per acre would be a reasonable rate. With an improvement in the market rates the question of an even higher water rate may be considered.

72. Other modifications that we would recommend are as follows :—

(1) *In respect of Irrigation from the Canals—*

(i) When surplus water is available in the hot weather, one or two pre-seasonal waterings should be given for *san*, Dhaincha, Karala, etc., when they are used for green manuring, to holders of cane blocks and two-seasonal blocks free of charge.

In the Kharif Section, half rates should be charged for fodder crops in order to encourage the cultivation of such crops.

(ii) It is desirable to pod village *gairans* in the canal tracts, if feasible, free of charge. To what extent and in what areas this concession may be given without injury to canal interests should be decided by the local Canal Officer.

(iii) For lift irrigation from the canals or their distributaries the rates charged should be half the flow rates in the case of cultivators using *mots* worked by bullocks as the water is used most economically and the area irrigated is usually small.

Where power pumps are used, three-quarters the flow rates would be a suitable charge as economy in the use of water is not so great. In the case of those power pumps, however, which were installed when half rates were in force but are now charged full flow rates, the half rates should be restored.

(iv) When owing to late replenishment, water cannot be supplied from 15th June, it should ordinarily be allowed to kharif crops for four months from the date of first supply without any additional charge on account of the post-seasonal waterings.

(v) After the three or six years during which concessional rates as recommended in paragraph 71 above are charged have elapsed the rates for seasonal crops on the Girna Canal should be the same as on the Major Canals, the storage conditions being the same. No change should be made in the cane rates. It would not be fair to enhance the rate charged to the Ravalgaon Sugar Company during the guaranteed period of supply now that Government have secured a regular consumer, when no enhancement would have been practicable in the absence of such consumer, owing to the undeveloped state of the canal and the collapse of the gul industry.

Incidentally it may be remarked that the cane acreage guaranteed is considerably below the economic area for a sugar factory—which is also a reason why an enhancement of rate is undesirable. The cane might however be assessed at a crop-rate of Rs. 37 per acre inclusive of overlap.

The present rate of Rs. 14 per acre for other perennials on the Girna Canal should also continue.

(2) *In respect of Irrigation from Wells close to Canals and Distributaries.—*

In the case of wells sunk after the admission of water into the canals within 100 feet from the main canal or a distributary, the latter being defined as a channel designed to carry not less than 5 cusecs, the water rate should be half the flow rates, provided that the Canal Officer is generally satisfied that the well does in fact derive a supply by percolation or leakage from the canal or distributary. In the case of wells beyond 100 feet, no charge should be made.

(3) *In respect of Irrigation from Notified Channels.—*

(i) If water is taken by flow from a notified channel, across which a masonry bund is constructed by Government, the full rate for the same class of irrigation from the canal should be charged, provided that in the event of deficiency of supply in the channel, canal water can be and is supplied to bring the crop to maturity. If this be not possible, the full rate should be charged only for the period reckoned in whole months, for which the supply from the channel was available. When, however, the bund has been constructed by the cultivators themselves with the permission of Government, only half rates should be charged.

(ii) In the case of lift irrigation from such channels half the flow rates should be charged. For irrigation from wells sunk within 100 feet from such channels carrying a supply of not less than 5 cusecs throughout the year half rates should be charged provided that the Executive Engineer is generally satisfied that the well does in fact derive a supply by percolation or leakage from the channel.

(4) *Miscellaneous.*—

(i) Fruit trees along the boundaries of irrigated fields or within 5 feet of them or of water channels flowing throughout the year should be charged at the rate of Rs. 5 per 100 per annum, instead of the present rate of Rs. 10 per annum, which is too high. No charge should be made for fruit trees less than two in number per acre of land irrigated or up to six in any individual case, or for shade trees. The charge on a seasonal basis should be as under :—

Monsoon season Re. 1 per 100 trees.

Rabi season Rs. 1-8-0 per 100 trees.

Hot weather season Rs. 2-8-0 per 100 trees.

Whole year season Rs. 5 per 100 trees.

The minimum charge should be Re. 1.

(ii) Trees directly watered from the canal or notified nallas should also be charged the above rates. Those watered from channels or nallas by lift should be charged half the flow rates.

*Shindi* trees should be charged only when tapped for toddy.

Stray trees in the midst of an irrigated field should not ordinarily be separately charged.

73. We must now refer to the possibility and suitability of a system of water rates on a volumetric basis.

It is generally assumed that the supply of water by measurement is eminently desirable, if only for the reason that an irrigator is sure to take less water when he pays for it by volume than if his supply is charged for on an acreage basis.

In Chapter VI we have stressed the importance of maintaining correct records of measurement of water delivered from day to day at distributary heads. The cultivators will gradually get used to calculating crop acreages against any given discharges at distributary head, and become familiar with the duties of water in relation to the crops.

The formation of Co-operative Societies or *Panchayats* may be encouraged for taking over internal distribution and eventually for purchasing water from Government and distributing it to the crops. The charges for water to be recovered from individual cultivators may be assessed by the *panchayat* and collected by the Revenue Department. We wish to urge that in all future arrangements the ideal of paying for water by measurement with the safeguard mentioned in paragraph 42 *ante* should be constantly kept in view.

#### WATER RATE ASSESSMENT FOR NON-AGRICULTURAL PURPOSES.

74. Canal water is supplied on application for various non-agricultural purposes. Chief among these are supplies to municipalities for domestic consumption and to mills and factories for power generation and other purposes. Small quantities of water are also supplied for manufacturing bricks, tanning hides, extinguishing charcoal, watering roads, etc.

The principal non-agricultural consumers are four in number—

The Poona City Municipality and the Cantonment Board which derive their supply from Lake Fife, Poona,

The Sholapur Municipality and the Mills which derive their supply from the Ekruk Tank, Sholapur,

The Gokak Mills which derive their supply from the Dhupdal Reservoir, Belgaum, and

The Barsi Municipality which derives its supply from the Pathri Tank, Sholapur.

75. In the case of the Poona City and Cantonment water supply the consumption is some 500 million cubic feet and this quantity is now annually reserved at Lake Fife for the purpose. In addition the lowest 500 million cubic feet of the lake contents above sill level are never allowed to be drawn on for irrigation, so that, virtually some 1,000 million cubic feet are reserved for the two local bodies. These 1,000 million cubic feet represent more than a quarter of the total storage of the lake; also in view of the fact that the rains are apt to be late in the catchment, irrigation on the Mutha Right Bank Canal has had to be successively curtailed during the last twenty years. Under present conditions we fear that this is inevitable as human wants must always override agricultural requirements. On the score of revenue, however, it is clear that the Poona City and Cantonment have contributed substantially to the sound financial position of the Mutha Canals. In point of fact, the average water rate charged to the Municipality represents over  $2\frac{1}{2}$  times the economic value of the water actually consumed and  $1\frac{1}{2}$  times the value of the water reserved (1,000 million cubic feet) computed on the basis of the capital cost of the reservoir and canal system and present working expenses. Actually the Municipality is charged at present on a sliding scale, viz. :—

Rs. a. p.

- 2 8 0 for 10,000 cubic feet for a supply up to 6 million gallons a day ;  
 4 0 0 for 10,000 cubic feet for a supply in excess of 6 million gallons and  
 up to 9 million gallons a day ; and  
 8 0 0 for 10,000 cubic feet for a supply in excess of 9 million gallons a day.

We were informed by the representatives of the Poona City Municipality that they are carrying out investigations for an independent reservoir for their water supply. We are however of opinion that it would be uneconomical for them to invest in a totally separate scheme. It is desirable that Government should immediately examine the possibility of augmenting the storage either by the construction of a new and higher dam at the site of the existing one or an auxiliary reservoir higher up the valley. An increased storage will permanently satisfy the water requirements of the City Municipality and the Military Cantonments of Poona and Kirkee as well as restore irrigation to those areas under the canal which once were using water and have since been deprived of it.

Our recommendation for the future is that the rate charged should be Rs. 2-8-0 per 10,000 cubic feet for a supply up to 9 million gallons a day and Rs. 4 per 10,000 cubic feet for all supplies in excess of 9 million gallons a day. These rates, will of course, undergo modification when the storage is augmented as indicated above.

76. In the case of the Ekruk Tank there can be no question that the supplies made to the Sholapur Municipality and Mills are largely responsible for the handsome return of 6.6 per cent paid by the work. Here again as on the Mutha Right Bank Canal, there has been a considerable curtailment of irrigation. We understand, however, that the Sholapur Municipality is examining schemes for an independent supply and when this supply comes about, there will be room for expansion of irrigation. The water rate now charged is Rs. 2-0-0 per 10,000 cubic feet which we consider reasonable. In the case of the Sholapur Mills the charge of Rs. 4-0-0 per 10,000 gallons is adequate and any enhancement may result in a reduction of consumption.

77. In the case of the Dhupdal Reservoir, Government are under a contractual obligation to provide the Gokak Mills Company with a supply of water which is equivalent to a uniform discharge of 68 cusecs. This represents the whole of the designed storage and about 65 per cent. of the total average supply (storage plus river flow), so that the balance available for irrigation is comparatively small. In return for this supply the Gokak Mills pay Government a lump sum of about Rs. 14,313 per year. This sum represents only about one-eighth of the gross revenue that could be realised under present conditions from the same quantity of water if applied to crops. There is a large unsatisfied demand for water on the Gokak Canal in the rabi season and in fact water is allowed only till the end of December for such crops as can be sanctioned on the restricted supply available. We understand, however, that until 1983 when the existing agreement expires, it will not be possible for Government either to withhold giving a supply to the Gokak Mills or to enhance to the amount payable by the Mills. We would, therefore, urge



Government to investigate the possibility of increasing the storage by constructing an auxiliary reservoir either on the main river or one of its tributaries. If this is impracticable, the possibility of a revision of the agreement with the Mills, with the consent of the latter, whereby a larger proportion of the supply can be released for irrigation may be considered. The Mills already have a power plant as a stand-by and may agree to instal additional prime movers if Government make it worth their while."

78. In the case of the Pathri Tank, the amount realized from the sale of water to the Barsi Municipality and Mills has always considerably exceeded the amount realized from irrigation ; but in view of the fact that this tank does not always fill it has not been possible for it to pay an adequate return. The rate at present charged to the Barsi Municipality is Rs. 2 per 10,000 cubic feet which in our opinion is not excessive.

79. We do not suggest any alteration in the rates for manufacturing bricks, tanning hides, extinguishing charcoal and other sundry purposes for which water is occasionally supplied, but we think that no charge should be made if water which is not taken by flow is used in the construction of houses, gul furnaces, etc. of *bona-fide* agriculturists whose *vasties* lie outside village *gaothan* limits. The charges at present recovered under these heads are negligible and by foregoing them Government will scarcely be making any sacrifice, while the cultivators will greatly appreciate the concession.

## CHAPTER X

## SUGAR FACTORY IRRIGATION

80. In the Deccan sugarcane used to be grown exclusively for the manufacture of gul or jaggery. The gul has always been famous for its superior quality, and accordingly it has enjoyed a wide market and commanded good prices. The cane used to be grown on wells, minor tanks and handharas, but even when the advent of the major canals made its extensive cultivation possible, cane continued to be thought of only in terms of gul.

81. In the second decade of this century however an attempt was made for the first time in the Province to manufacture sugar to supply local needs. Two sugar factories commenced operations under what were then considered happy auspices, but their attempt to establish this new industry on the Deccan canals proved a failure, partly because the cane grown was the variety known as *pundia* which is poor in sucrose and has a low fibre content, necessitating the use of large quantities of additional fuel, but principally because the factories depended for their supply of cane such as it was on local irrigators and had to pay high prices for it based on the price of gul. The cost of manufacture was thus out of all proportion to the sugar recovery, and after a few years both Companies gave up the unequal struggle and went into liquidation.

Soon after these reverses, another start was made on entirely different lines by the Belapur Sugar Syndicate. Profiting by the mistakes of their predecessors they planned to grow their own sugarcane and so be independent of the vagaries of the gul market. Government also decided to assist the new enterprise, acquired the land necessary for the Syndicate and entered into a long term agreement with it regarding the supply of water on very favourable terms.

The Syndicate gradually introduced new varieties of cane more suited to the manufacture of sugar than *pundia*, but it was only after 1930 when the new varieties had been propagated in sufficient quantity to form the bulk of the supplies required that the Company made real headway. When protection was given to the sugar industry in 1931, it was in a position to take immediate advantage of the resulting "closed" market and is now, we believe, firmly entrenched.

82. While the new industry was passing through these vicissitudes, the old industry of gul making had expanded enormously as a result of the large supplies of water made available for irrigation by a succession of major canal projects. The area of cane including overlap irrigated by the larger canals increased from about 3,200 acres in 1883 to about 26,500 in 1918 and 41,000 in 1927, all figures being inclusive of overlap. Exclusive of overlap the area in 1918 was about 20,700 and 29,500 in 1927. Up to 1922 the cane area was limited by the supply of water available; therefore, the supply was in excess of the demand, so that the cane area then depended on the gul rate. Owing to the high rates prevailing during the post-war boom, the cane area continued to expand till 1927. With the succeeding depression the rates rapidly declined and by 1930 the cane area had contracted to less than 20,000 acres.

It also became increasingly apparent that owing to excessive over-production and to some extent also to the flooding of the market with cheap foreign sugar which had to a large extent replaced gul in the dietary of the people a further deterioration in the gul rates and consequent further contraction in the cane area was almost inevitable. Cane had always been regarded as the mainstay of the Deccan Canals and directly and indirectly accounted for the greater part of their revenue. Government could not, therefore, view the decline in its cultivation save with grave concern and appointed first Mr. Wynne Sayer of the Imperial Institute of Sugar Technology and then Mr. Bristow to study all the problems connected with it. Both officers confirmed Government's general opinion that the gul market was hopelessly glutted and recommended the establishment of white sugar factories as the only means of saving cane cultivation on the canals. No immediate action was, however, possible on these recommendations, and with each succeeding year the decline became more and more pronounced. As other classes of irrigation had also declined simultaneously with disastrously cumulative effect on the irrigation revenue, Government as we have seen appointed the Kamat Committee in 1931 "to

examine and report how to improve the financial aspect of the canals". The principal recommendation of this Committee, which submitted its report in 1932, was in complete agreement with the suggestion previously made by Mr. Wynne Sayer and by Mr. Bristow—that white sugar factories should be established on the Deccan Canals. So convinced was the Kamat Committee that this was the only means of rehabilitating the declining fortunes of the canals, that it urged the granting of substantial concessions to attract prospective sugar companies.

83. As we have seen protection had already been introduced in 1931, and soon after the Kamat Committee had submitted its report, Government issued a Press Note inviting industrialists to set up white sugar factories on the canals. The introduction of protection had already resulted in a large number of factories being started in the United Provinces and Bihar and even industrialists from Bombay established factories in those Provinces where sugarcane was being grown in abundance. Owing to the early struggles and somewhat tardy success of the Belapur Sugar Syndicate a factory in the Deccan was considered a somewhat risky venture and certainly more expensive than in Northern India, principally because experience had shown that a factory to succeed in the Deccan needed its own plantation.

The terms offered by the Government of Bombay contemplated in the main a fixed water rate and a fixed charge on account of drainage, and could hardly be regarded as particularly attractive, but as the Belapur Sugar Syndicate was by then paying good dividends, a number of sugar companies promoted by local industrialists and business-men was introduced to commence operations, which they did even before their negotiations with Government for more favourable terms were concluded. These negotiations were very protracted and in fact the Companies with a few exceptions only signed their agreements when Government threatened to withdraw all concessions and treat them as ordinary irrigators. The final terms offered by Government provided for the same water rate for cane as was charged to ordinary irrigators, except that the block system of irrigation was not applicable to the Companies, and for the payment by the latter of the actual cost of all drainage works in their factory areas *plus* an overhead charge of 30 per cent. The Companies have represented to us that they signed their agreements under protest as, having erected their plant and started operations, they had no other course open to them. This in brief is the history of the white sugar industry on the Deccan Canals.

84. The problems connected with Sugar Factory irrigation may for convenience be considered under the following heads :—

1. Water Rate.
2. Drainage.
3. Leasing of lands by the Companies and irrigation by "local" cultivators.
4. Soil classification and restrictions on cropping.
5. Acquisition of land for laying Tram-lines.
6. Present and probable future position of the Companies.

85. *Water rate.*—Sugar Factory irrigation is, in our opinion, a very different proposition from the irrigation practised by an ordinary cane grower. Apart from being more extensive, more concentrated, and very much more assured, if not actually permanent, it is practised in connection with a heavily capitalised industry that is as yet by no means firmly established, at least in the case of the newer Companies.

One of the first requisites of any industry and more particularly a new industry is a known and limited liability for "overheads". Government apparently recognised this when negotiations were first started by the Companies, and it is somewhat perplexing that they subsequently withdrew their offer of a fixed water rate. As water has been guaranteed for a period of 30 years, we recommend that the agreements with the Companies should be revised to provide a fixed water-rate for the same period. This is particularly desirable in view of the fact that the Belapur Sugar Syndicate pays a fixed rate in respect of its old area.

We consider the present rate of Rs. 45 per acre per annum to be the maximum that can be safely borne by the sugar industry, and except in the case of the Ravalgaon Sugar Farm, the factory rate may accordingly be fixed at this figure, though as we have pointed out in another chapter an appreciably lower charge should be made in the case of the ordinary irrigator when the new system recommended by us is introduced. Inclusive of overlap the factory rate should be Rs. 60 per acre. In the case of the Ravalgaon Sugar Farm, the rate should, for the reasons given in Chapter IX, be fixed at Rs. 28 per acre per annum, exclusive of overlap (present rate), or Rs. 37 per acre, inclusive of overlap.

The question of a volumetric rate has been examined in the chapter on Water Rates, and, as we have recommended in that chapter, a suitable volumetric rate should be introduced in connection with sugar factory irrigation, by actual agreement, at an early date.

86. *Drainage.*—The problem of the drainage of factory areas is a somewhat vexed one. There can be no doubt that the greater part of the damage in these areas has been caused by the intensive irrigation carried on by the Companies; on the other hand it is equally certain that at least some part of the damage is attributable to percolation and seepage from the distributing system. Again, as we shall see in the next chapter, in the absence of proper drains water-logging would appear to be an almost unavoidable concomitant of irrigation in the average Deccan catchment. In the circumstances, Government as owners of the land and purveyors of the water seem to us to have an equal interest in the draining of water-logged lands as the Companies themselves and should take their share of the responsibility.

There are certain Sugar Companies that also cannot in our opinion afford to pay the large sums required for the drainage of their factory areas, and it might jeopardise their very existence if they were held to the specific performance of their contracts in this respect. As we have observed in another section the Sugar Companies are faced with severe internal competition, and both on grounds of equity and of expediency, we recommend for the present some concession in respect of the drainage of factory areas. The cost of the main drains should be borne equally by Government and the factories. The factories should construct all subsidiary drains according to plans prepared and approved by Government, but no charge should be made by Government for the preparation and approval of the plans or for supervision during construction. All drains may be constructed by the Companies through their own agency. Government should in every case be the final judge of the necessity of any subsidiary drain. We consider that this concession should be granted to the Sugar Companies at least for a term of six years, at the end of which the terms of agreement relating to drainage should be again revised according to the conditions of damage to land then existing and also the financial position of each Company.

87. *Leasing of land by the Companies.*—The reservation of factory areas has occasioned considerable discontent among local owners. Only *established* cane, garden and seasonal irrigation is now permitted in these areas. But we consider that even this restricted irrigation has interposed serious and in some cases insurmountable difficulties in the way of the Sugar Companies' securing sufficient suitable land for their plantations by private negotiation. Then again there are owners who either from sentiment or prejudice against the factories refuse to lease their lands at any price. Factory irrigation thus being often both restricted and scattered has suffered considerably in efficiency. The Kamat Committee anticipated these difficulties and recommended the intervention of Government if necessary to secure to the factories the requisite area of suitable land by compulsory leasing. It is our opinion however that if any pressure is put by Government on local occupants to part with their lands either by acquisition or by compulsory leasing, there will be a storm of opposition and the situation may develop into one of CAPITAL VERSUS LABOUR. At the same time we consider it to be essential for the economic working of the factories on the success of which the fortunes of the canals in such large measure depend, that they should not be starved of their minimum requirements of suitable concentrated land. If amicable relations are to exist between the Companies and the local occupants, the matter should not be left to the decision of either party, nor should it be allowed to be

taken to the Courts. None of the newer Companies has yet begun to pay a dividend and in fact their economic position is generally far from satisfactory. In these circumstances Government should be pleased to mediate by appointing the Collector of the District or an Arbitration Committee to negotiate between the two parties and bring about a settlement.

It will increase the chances of a settlement if Government will agree to offer to the displaced owners 15 to 20 per cent. lower water rates as a special case. This would perhaps be a departure from tradition but Government would be solving a difficult problem without appreciable loss of revenue and with great satisfaction to the two parties. In the meanwhile established irrigation may be allowed to continue but the local owners should be bound under agreement to sell all cane grown thereby to the factories at a price fixed by Government and regulated in relation to the ruling prices of sugar. Should any owner default in this respect, he should forfeit the right to further irrigation of cane within factory area limits.

88. *Soil Classification and Restrictions on Crops.*—The standards by which the suitability of lands for cane irrigation in blocks is judged can in our opinion be considerably relaxed in the case of factory irrigation. The lands acquired by Government for leasing to the Belapur Sugar Syndicate were for the most part composed of coarse murum soils, but have since been deepened and improved as a result of steam-ploughing and persistent cultivation. This happy consummation may also be reasonably expected in the case of the newer Sugar Companies in the course of a few years. We therefore recommend that the concession allowed to the Belapur Sugar Syndicate in respect of its old area be extended to all factory areas with the proviso that the lands are first ploughed by tractors or other mechanical ploughs. Deep soils (more than 8 feet) are normally excluded from lands classed as suitable for cane, but it would appear from the experiments which are being conducted at the Padegaon Research Station that such soils gradually improve under cane cultivation. As they are generally low-lying and often saturated in consequence, their improvement is very desirable and as their water requirements should be relatively low we recommend that the Sugar Companies be permitted to plant cane in such soils also.

With regard to the restrictions on cropping we have recommended that three crops may be permitted in five years. This recommendation applies *a fortiori* to sugar factory irrigation. Nidwa or second ratoon may also be allowed.

In making the recommendations we do not think that we have sacrificed any essential of orderly irrigation. We have however felt justified in assuming that the Sugar Companies are not blind to their own interests and that Government need not let its trusteeship press too heavily on a new industry. The Companies, we are glad to see, have a large staff of highly trained men, many of them agricultural graduates, in charge of their field operations, and we are confident that no untoward consequences will result from the proposed relaxation of the existing restrictions.

89. *Acquisition of land for laying Tram-lines.*—There appears to have been some difficulty about this in the past, but we understand that Government have since recognised the imperative need of the Sugar Companies' possessing an efficient system of transport for their raw materials and finished product, and the lands required are now being acquired under the Land Acquisition Act.

90. *Present and Probable future position of the Companies.*—The position of the new sugar factories in the Deccan is very unhappy. Owing to the very rapid extension of the sugar industry in the United Provinces and Bihar internal competition has become a serious menace, and owing to the low costs of production in those provinces the prices of sugar have fallen very considerably. From the balance sheets and profit and loss accounts of the newer Deccan factories we see that they have not only not been able to obtain a reasonable return from their investments, but have not been able even to provide for the usual depreciation in stock and in some cases have actually suffered losses. The investments are now in the neighbourhood of Rs. 25 lakhs for each factory. In most cases the factories started with a small plant, but with changing circumstances, and particularly as the Northern Indian factories began to increase their capacities, the Deccan factories

also had to increase their capacities to prevent dropping out of the race altogether. A bigger plant usually gives greater efficiency and, incidence of overheads being less, the cost per unit of outturn is also less, and we are glad that the Deccan factories are trying to keep pace with the factories in other provinces though under very discouraging circumstances.

The sugar industry and particularly the Bombay sugar industry, is in some respects in a class by itself. Unlike most other big undertakings this industry is established in rural areas and gives employment to agricultural labourers during periods which they would ordinarily spend in enforced idleness. The seven factories established on the canals have given employment to nearly 150 graduates or diploma holders in agriculture and science, about 1,000 under-graduates and skilled workmen, and over 20,000 agricultural labourers. They have provided schools, dispensaries and other amenities in areas in which they were formerly unknown. They pay the Provincial Government a substantial and assured irrigation revenue and the Central Government very much larger sums in the shape of excise revenue. They introduced fluid capital into the areas in which they operate and often provide the local owners with the means of carrying on successful *bhusar* irrigation. We have reviewed the circumstances that led to their establishment, and we are convinced that it is in the interests of the country as a whole and of the Deccan Canals in particular that they should be given every encouragement and assistance to consolidate their position. We would therefore urge Government to make it their special care that none of the existing factories is allowed to come to grief if it can be possibly helped.

91. We understand that a factory to be an economic unit should be of about 650 tons capacity and be able to work 180 days. For this some 3,000 acres of basic cane are necessary, if the factory is to be independent of outside supplies, and we consider that each Company which desires it should be given a guarantee for this area where the water supply is available and other conditions are favourable.

Two Companies—The Belapur Sugar Syndicate and the Maharashtra Sugar Mills—wish to expand to a 1,000 tons capacity, but we consider that for the present these Companies should buy the additional cane required from local agriculturists at rates fixed by Government in relation to the ruling price for sugar as already suggested in the case of displaced local owners. If later on it is found that the cane area reserved under the new system recommended by the Committee is not all taken up and water remains in the storage reservoirs unutilised, the question of further storage may be considered. In Statement No. 7 we have indicated the increased crushing capacity of plant and corresponding acreage of basic cane which might be sanctioned immediately in the case of each factory. The total acreage of basic cane guaranteed will then be 16,925 acres on the major canals or 22,567 acres inclusive of overlap. This represents only 37 per cent. of the total cane area for which provision has been made under the new system of distribution and is but a small reservation considering the pivotal importance of the sugar industry to Deccan irrigation. As the production of sugar has already exceeded consumption in India, we are of the opinion that no new factories should be allowed to be started. It would suffice if the existing factories are carefully nurtured and brought to a condition of strength and stability by all reasonable means within the power of Government.

## CHAPTER XI

## WATER-LOGGING, LIFT-IRRIGATION, ETC.

92. In this Chapter we propose to deal with two or three matters connected with irrigation which have either not been considered in the previous chapters or to which only a passing reference has been made. They are—

- (1) Water-Logging.
- (2) Lift-Irrigation by means of Power Pumps and Wind-mills.
- (3) Power Generation—Hydro-Electric Schemes.

*Water-Logging.*

93. The main factors affecting the sub-soil water-table in the irrigated tracts are :—

- (i) percolation and seepage from the distributing system and
- (ii) irrigation of crops.

The rainfall is nowhere so heavy as to cause any appreciable damage by itself but might in certain situations and in years of exceptionally heavy fall aggravate the conditions of saturation already brought about by these two causes.

94. *Percolation and Seepage from the Distribution System.*—In the Deccan the canals and distributaries generally cut through soft rock and murum, and it is the infiltration of water through these particularly at changes of section from bank to cutting and *vice versa* and at curves that is responsible for the greater portion of the percolation from the distributing system.

[When a canal is opened, there is fairly heavy percolation which at first injures only land in the immediate vicinity of the canal but may in course of time affect low-lying land far down the valley. In due course, however, the percolation is very much diminished by the formation of a colloidal silt film on the bed and sides of the canal and the water-logged fringe near the canal generally dries out. But the damage down in the valley steadily increases unless the canal is absolutely sealed artificially. Such sealing may be desirable in sections in which the losses by percolation and seepage are excessive both in the interests of prevention of water-logging and the economical use of available supplies.] We would consider a total loss of more than 25 per cent. in a length of 75 miles of main canal to be excessive. As we have received several complaints about the damage caused by excessive percolation from the distributing system, we recommend that the necessity of sealing by puddling and lining should be carefully investigated.

95. *Percolation due to irrigation.*—By far the more important cause of water-logging, however, is unquestionably the heavy irrigation of crops, more particularly sugarcane. The Deccan valley can be divided into :—

- (i) coarse, shallow soils near the ridges ;
- (ii) moderately deep soils from 12 inches to 8 feet deep, overlying murum ;
- (iii) deep soils generally composed of *chopan*, overlying *man* or massive *kankar*.

The amount of the damage depends on the position and concentration of cane in these soil types. If cane is planted in shallow or moderately deep soils, it causes water-logging in the lower areas and salt-efflorescence near the 8 feet murum isobath the intensity depending on the concentration. Cane planted in deep soils does not cause damage if it is scattered so as to prevent a rise in the sub-soil water-table. The extent to which heavy perennial irrigation is responsible for the damage existing on the major canals will be apparent from the fact that out of the 100 to 120 inches of water usually given to cane in a year only about 40 inches go to building up the plant, about 20 inches evaporate from the soil, and the balance of 40 to 60 inches find their way into the sub-soil. Occasionally some cultivators apply nearly 150 inches to their crop and the absorption into the sub-soil in such cases would be as high as say 90 inches. The damage due to the water which thus finds its way to low-lying lands is bound to be appreciable.

96. *Preventive Measures.*—In considering the measures of a primary character that might be taken to minimise the damage we would begin with the irrigator and emphasize the importance of preventing over-watering. In the past owing to weed trouble in the canals waterings were apt to be delayed, and the irrigators were tempted to fill their fields to overflowing at every watering for fear that the next watering might be late. With the eradication of weeds made possible by the rotational running of canals since adopted waterings are now most punctually given, but old habits die hard and there is as yet no appreciable diminution in the quantity of water taken. Time and propaganda should however bring about the desired improvement.

Another potent cause of over-watering is strangely enough the bund rules. These rules were originally designed to prevent waste, but in their present form under which numerous bunds of a specified minimum height are prescribed they only serve to encourage "ponding" of fields. In Chapter XIV we have suggested the revision of the Canal Rules so as to require only a surrounding bund of sufficient strength to prevent waste, but it would be a desirable measure to fix the *maximum* permissible height also in the case of new bunds.

Other simple measures which require Government intervention are the following:—

- (a) No cane should be allowed in shallow soils unless the natural drainage is good and no extra waterings will be needed in the hot-weather, the factories alone being exempted for the reasons and subject to the proviso mentioned in paragraph 88 of Chapter IX.
- (b) Cane should be allowed only in such concentration in a catchment that the damage caused may be a minimum.
- (c) In deep soils cane should not be allowed in large concentrations.

All these measures and others of greater complexity are already being enforced, but it has to be admitted that the damage has steadily increased on most of the major canals until today nearly 60,000 acres are affected by water-logging and salt-efflorescence. On the Nira Left Bank Canal the area of water-logged and salt-affected lands in 1904 was 4,202 acres and by 1936 it had risen to 15,510 in spite of preventive and remedial measures taken by Government. We must therefore accept these evils as being to a certain extent the inevitable results of perennial irrigation. Conditions might have been even worse in the absence of these measures, and accordingly we recommend their continuance with the proviso that all excessive complexities of soil classification, etc., should be avoided.

97. *Remedial Measures.*—The problem that next arises is what should be done with regard to the large damaged area already existing on the canals. We have been informed that the cost of draining this area according to present methods would be about Rs. 60 lakhs. This would clearly be prohibitive, but we are by no means satisfied that the present methods are necessary in every case. We are aware that land drainage in the Deccan is not a simple matter; on the other hand we feel that Government engineers are fully capable of designing and constructing drains on much simpler lines than the drains already constructed or proposed to be constructed with service road and other refinements complete. We consider that there will be many cases in which deep cuts in the nalla beds extended till a proper outfall is obtained will serve the purpose of the main and carrier drains with reasonable efficiency. The responsibility of constructing the subsidiary and relief drains should in the ordinary course rest on the cultivators who should be given all the necessary advice and direction by the departmental officers. If a drainage scheme on more scientific lines involving heavy expenditure is considered necessary in any particular instance, the foregoing conditions should be satisfied and special justification for its construction should be forthcoming. In the case of water-logging of villages more regard should be paid to the efficiency of the drainage measures than in the case of damaged land.

We also consider that the use of mechanical excavators and trenching machines may be of special value in this connection. In view of recent improvements in this class of machinery the question of their use should be reconsidered. Wind-mills might also be experimented with for pumping in water-logged lands with a view to lowering the water-table.



✓ The reclamation of water-logged and salt-affected lands after drainage should wherever possible be carried out by the owners with the technical advice of the Irrigators' Advisory Bureau, the establishment of which we recommend in the next chapter.

To assess the efficiency of any drainage measures that may be adopted and to concert fresh measures, as well as to take stock of the general position of the canals in regard to water-logging and salt-efflorescence, a watch and record should be kept of all situations along canals and distributaries and private fields which are a source of damage to lands. The damage should be noted in sufficient detail in the annual village reports on irrigation. We also recommend the issue of brief pamphlets explaining how soil tilth should be preserved by a proper rotation of crops, green manuring, etc., the causes of water-logging and salt-efflorescence, the measures for their prevention, and the more simple remedies for the reclamation of water-logged and salt-affected lands. Well-directed propaganda to the same effect will in our opinion bear much fruit.

#### *Lift-Irrigation by means of Power Pumps and Wind-mills.*

98. As we have seen in the preceding section a considerable portion of the water applied to the soil in the irrigation of crops finds its way into the sub-soil. A small proportion of this sub-soil water again finds its way back to the parent river by percolation into nallas and also directly into the river channel. Where drains have been constructed the nalla and river flow is naturally considerably augmented. To the supplies thus derived must be added the losses by wastage from fields and the tails of the distributing system of channels.

It is estimated that anything between 20 to 25 per cent of the discharge of a developed canal in the Deccan is recovered by the river. Here we have a valuable supplementary supply if only it could again be diverted on to the land. In most cases the construction of a subsidiary pick-up weir and canal would be uneconomical owing to the long length of weir required and the small command generally over deep, cut-up, chopan soils near the river banks obtained with a reasonable length of canal. The Lakh weir and canal on the Pravara River is a case in point.

The alternative is lift-irrigation by means of power pumps. Now a days there are several makes of thoroughly reliable pumps and of engines to supply motive power on the market and the old distrust of a pumped supply is no longer justifiable. Where electric power is available at reasonable rates, electrically driven centrifugal pumps can be depended on for an absolutely assured and economical supply. That today lift-irrigation by means of power pumps holds no terrors for the progressive agriculturist is proved by the large number of them who practise this form of irrigation from the canals themselves many of them in avowed preference to flow irrigation. We therefore think that the possibilities of a comprehensive scheme for pumping water from the rivers and large nallas in the major irrigated tracts would repay investigation, more especially in the tracts in which Sugar Companies are established and have applied for an increase of their guaranteed cane area but been refused it on account of limited storage or other reasons connected with the distribution of the available supply. For instance, on the Pravara Canals the Belapur Sugar Syndicate and the Maharashtra Sugar Mills are both pressing for permission to extent their present capacity from 600 to 1,000 tons, but from the point of view of the canal supply it would be inadvisable to allow the Companies to expand beyond 750 tons capacity at any rate for the present. At the same time the dry-weather river flow at Belapur is about 80 cusecs. If this water could be pumped at a reasonable cost to supplement the discharge of the canal, the cane area could be increased to the extent desired by the two Companies.

✓ The prospects of the utilisation of the water of the tail races from the hydro-electric works at Khopoli, Bhivpuri and Bhirā for irrigation purposes should also be specially investigated.

✓ *Prima facie*, lift-irrigation by power pumps in the irrigated tracts would only pay in the case of high-rated crops such as sugarcane and fruit trees. But in un-irrigated tracts and more particularly tracts liable to scarcity or famine, it would also in all probability pay in the case of other crops as well particularly chillies,

onions, etc. We would therefore recommend that this aspect of the matter be also investigated. The aim should be to establish large centrally situated pumping stations so as to reduce the cost of pumping to a minimum.

99. In tracts where only a limited amount of seasonal irrigation is possible, wind-mills might prove a useful and economical means of lifting water. A wind-mill is not a powerful motor and works only intermittently. A modern aero-motor with multiple-vanes, which would cost Rs. 1,300 to Rs. 1,500 to instal, can be expected to work for 8 to 12 hours out of the 24 under ordinarily favourable wind conditions and to irrigate 10 to 15 acres *throughout the year*.

Judging from experiments carried out in Madras some years ago it would appear that if wind-mills were located in compact colonies so that field repairs could be effected promptly and economically by a small staff of skilled mechanics, they could be of substantial benefit to the dry farmer. We understand that Government have sanctioned an experiment on the Krishna River in Bijapur District, and if the result should prove encouraging we would recommend the extension of wind-mill irrigation to other tracts through Government enterprise in the first instance. When this form of irrigation is firmly established, the plant might be made over as a going concern to co-operative societies organised by the irrigators for its subsequent operation.

100. *Power-Generation—Hydro-Electric Schemes.*—It has been represented to us by Irrigators' Associations as well as by prominent individual irrigators that one important means of increasing canal revenue that has been overlooked in the past is the generation of electrical energy at the storage reservoirs and canal falls and its sale for industrial, lighting and power-purposes. We think that there is considerable force in this contention and we think a practical beginning should be made in this direction without delay. Electric grid systems are coming into operation elsewhere in India even under less favourable circumstances, and this Province should not allow itself to be left behind in this respect.

We note that some activity in this respect is already being shown at present. The electric plant installed at Bhatgar for lighting purposes and hoisting material in connection with the dam is now used to supply energy to Bhor State. We understand that a scheme for the utilization of the considerable surplus energy available for the purpose of lift-irrigation from the Nira River between the dam and the pick-up weir at Mir and the electrification of villages *en route* is being investigated. We are also informed that a hydro-electric scheme in connection with the Bhandardara Dam is under preparation for the supply of energy in bulk to Sangamner, Nasik, Ghoti and Igatpuri and later to Belapur and possibly to Ahmednagar.

As electric power would be useful not only for the extension of irrigation but also for lighting the towns and villages, we consider that no time should be lost in obtaining accurate particulars of all sites at which hydro-electric power can be generated. After these particulars have been collected two or three of the most favourable sites should be selected for detailed investigation.

## CHAPTER XII

## SUBSIDIARY AIDS TO IRRIGATION

101. In this chapter we consider the subsidiary requirements of the cultivators, which are not directly connected with the distribution and use of irrigation water. Our recommendations are made under the sub-joined headings :—

- (a) Communications.
- (b) Railway freight concessions.
- (c) Marketing facilities.
- (d) Banking facilities.
- (e) Research in irrigated agriculture.
- (f) Agricultural propaganda.
- (g) Model crop farming.
- (h) Agricultural advice and service to cultivators.
- (i) Co-operative organization of irrigators.
- (j) Irrigation research.

102. *Communications, i.e., Roads and Railways.*—We are convinced that the development of communications in the Deccan Canal tracts would assist materially in the expansion of irrigation more particularly in the Nira Right Bank Canal tract. The requirements of the Nira Valley in this respect were surveyed in 1933 by Messrs. Evershed and Thompson who made definite recommendations for the extension of communications. We consider that one of the main recommendations in their report, viz., the linking up of the Barsi Light Railway at Pandharpur with the Dhond-Baramati Railway at Baramati by rail should be given effect to if it is a reasonable financial proposition. We are further of the opinion that the minor road projects recommended should be undertaken whenever funds can be made available and given priority in any future programme of road development. The attention of District Local Boards should also be drawn to the very great importance of good roads in the irrigated tracts as facilitating the marketing of agricultural produce and particularly produce of an easily perishable nature.

103. *Railway freight concessions.*—We consider that Government should approach the railway authorities concerned to examine the possibility of a reduction in railway freight charges on manures imported into the irrigated tracts of the Province, especially bulky manures such as town sweepings, *mowkra* refuse sludge, etc.

In order to encourage the development of such subsidiary industries as dairying, fruit farming, poultry keeping, etc., in the Deccan Canal tracts special facilities should be provided by the railway administrations for the transport of perishable food articles, such as milk, fruit, and eggs, from the irrigated areas to the urban centres.

104. *Marketing facilities.*—In the course of our inquiry we were impressed by the serious losses caused to the producers by the absence of adequate or satisfactory facilities in most irrigated tracts for the marketing of produce. Evidence has been produced before us to show that in the Deccan Canal tract a cultivator selling gul worth Rs. 63 has to pay no less than Rs. 3-9-0 in market charges comprising *adat*, *batta*, *hamalt*, weighing fees, *bazar kesar*, *dharmadaya*, weight reductions, octroi etc. Similarly a cotton-grower in the Canal tract forfeits 8 per cent. of the price of his produce in such charges. The Fruit and Vegetable Committee appointed by Government reported that out of every Rs. 9 realized as sale price on fruit in Bombay only Rs. 1-12-0 goes to the pocket of the producer. Similarly in wheat sales about three-fifths of the ultimate terminal price reaches the wheat grower. We therefore recommend that in the main irrigated tracts of the Province steps should be taken by Government to establish markets regulated by law on the same lines as markets established under the Bombay Cotton Markets Act, 1927. Experimental packing and grading stations should be organized in combination with such regulated markets and the provisions of the Agricultural Produce (Grading and Marketing) Act, 1937, applied, wherever possible to the marketing of produce in the irrigated areas.)

We further recommend that Government should make long term loans available at easy rates of interest to Multi-Purpose Co-operative Societies, to which reference is made later, for the construction of godowns for the storage of members' produce. Such storage facilities should also be provided in regulated markets.

105. *Banking facilities.*—The evidence shows that the existing banking facilities in the main irrigated tracts are inadequate and that a banking habit has not yet been generally inculcated among irrigators as a class. Indebtedness has greatly increased and is now a serious handicap to economic recovery and development. We recommend that together with the extensive organization of village Multi-purpose Co-operative Societies Banking Unions with the taluka as the area of operation of each should be started with such societies and the larger cultivators—who may require finance for agricultural purposes in excess of the limits laid down by the Societies—as members. Such an organization will meet all requirements for short term credit. Long term credit demands can best be met by the establishment of Land Mortgage Banks.

106. *Research in irrigated agriculture.*—The main irrigation research station of the Agricultural Department in the Province is the Sugarcane Research Station at Padegaon in Satara District which was opened in 1932. This station is financed jointly by the Imperial Council of Agricultural Research and the Government of Bombay, and its research programme has been sanctioned up till 1940. We visited this station and inspected the work in progress which we consider to be of great importance to the future development of agriculture in the Deccan irrigated tracts. Accordingly we recommend that the station should be continued until the completed results of the scientific research work being carried on are available. We further recommend the establishment by Government of sub-stations on some of the important canals for the complete testing out of the Padegaon results as they become available.

Research work is also essential in order to obtain trustworthy results in respect of the following :—

- (a) Varieties of crops suitable for irrigation.
- (b) Quantity of water required by different crops in different soils of varying depths.
- (c) Crops suitable for reclaiming water-logged and salt-affected lands.
- (d) Economic use of manures.
- (e) Eradication or control of insect and fungoid pests.

Without such dependable data irrigation cannot rest on a truly scientific basis. In fact under present market conditions it is only by effecting the utmost economies and preventing all possible waste that irrigation can hope to flourish. We are of the opinion that research work into the economies of subsidiary agricultural industries is also essential, especially in the direction of cattle-breeding, dairying, sheep breeding, poultry farming, fruit growing, preservation of fruit products, etc., and we recommend that the existing Government Farm at Kopergaon should be expanded and utilised for this work.

107. *Agricultural propaganda.*—Agricultural propaganda and demonstration among the irrigators is carried on by the district staff of the Agricultural Department in the irrigated tracts. It has been represented to us that this staff is insufficient to deal adequately with the various aspects of agricultural work, e.g., seed distribution, crop protection, etc., in so large and intensively cultivated an area. The necessity of expanding the staff may therefore be considered by Government, especially when the expansion in irrigation anticipated as a result of our proposals materialises. All possible measures should be taken to associate and co-ordinate as closely as possible non-official and official work towards agricultural propaganda and demonstration in the irrigated areas.

108. *Model crop farming.*—We consider it essential to progressive development and improvement of irrigated agriculture that the irrigators should be given practical demonstrations at numerous centres of "model crop farming" incorporating the improvements in methods and materials advocated by the Agricultural Department. We recommend that such "model farms" should be established on the lands of suitable irrigators willing to co-operate with the

Department in such work. These farms should be cultivated by the land-owners with the advice and assistance of local officers of the Department, and utilised as demonstration centres and nuclei for the spread of improved seed, etc., among the neighbouring villages.

109. *Agricultural advice and service to the public (Irrigators' Advisory Bureau).*—We are convinced that as a result of the scientific research work in progress at Padegaon a considerable amount of useful information will be available which must be brought to the notice of the cultivators in the irrigated tracts. The work which has already been done clearly indicates that owing to the differing types of soil in the Deccan Canal tracts it is practically impossible to make general recommendations to cultivators in such matters as irrigation technique, manuring, crop rotations, varieties of crops to be grown, etc. It is, therefore, necessary that some permanent organization should be established for the purpose of giving irrigators technical advice based upon a preliminary examination and determination of the soil types involved in the case of each individual cultivator applying for such assistance. We recommend therefore that when the scientific research work in progress at Padegaon has been completed, an "Irrigators' Advisory Bureau" in charge of a competent Soil Chemist should be established under the control of the Provincial Irrigation Board. Possibly the existing accommodation at the Padegaon Station could be adapted for this purpose. The Bureau should have well-equipped laboratories for soil analysis, etc., and should undertake such analysis for irrigators. On the results of such analysis the Bureau would issue specific recommendations relating to irrigation technique, cropping schemes, manurial treatments, reclamation, etc., based on the scientific research work in irrigated agriculture carried out by the Bureau. In addition the staff of the Bureau could assist the Research Executive Engineer in such work as the survey of water-logged and alkali-affected areas, as well as examine the progress of reclamation and land drainage schemes initiated by the latter from the point of view of soil fertility. It could also be utilised for observations on the incidence of insect pests and plant diseases and on the efficiency of control measures adopted and for general propaganda work.

110. *Co-operative organisation of irrigators.*—We are of the opinion that the co-operative organization of irrigators must be encouraged in every possible direction if any rapid and effective improvement in their economic condition is to be attained. We consider that the type of co-operative organization most suitable for introduction and extension in the irrigated tracts is the "Village Multi-purpose Co-operative Society", dealing with a limited area, and we recommend that the Registrar, Co-operative Societies, be asked to undertake a survey of the Deccan Canal tract with the object of dividing it into suitable units for the organization of a net work of such societies. It would be most desirable that the areas of operation of such societies—or groups of societies—should be made to coincide with areas in which the co-operative distribution of irrigation water (reference—Chapter VI) is being undertaken by the irrigators. We also recommend that Government should consider after a number of years the withdrawal or restriction of concessions in water rates for special crops, e.g., fruit trees, vegetables, etc.,—which we have recommended earlier in this report—to the members of Village-Multi-purpose Co-operative Societies only.

111. *Irrigation research.*—The research work now being carried on by the Irrigation Research Division has for its objective the efficient utilization of canal water, investigations into the causes of damage to lands by water-logging and salt-efflorescence, and their reclamation by drainage and other means, and scientific regulation of effluent irrigation.

We consider it necessary that all this work should continue. The Research Division, as explained elsewhere, should collate the results of its experiments relating to the loss of water in transit and it should have besides control over measuring devices and the measurement of water delivered for irrigation. It should also be the agency for maintaining co-ordination between the scientific investigations of the Agricultural and Irrigation Departments, and the work of the Irrigators' Advisory Bureau.

## CHAPTER XIII

## FINANCIAL OUTLOOK

112. *Financial Position of Irrigation Works in Bombay as compared with other Provinces.*—Statement No. 1 gives the total capital outlay, net percentage return and area irrigated in each of the Provinces of British India, including Burma, for the year 1934-35. It will be seen from the statement that the return for that year was 1·36 per cent. in Bombay as against 13·42, 4·19, and 3·13 per cent. respectively, in the Punjab, the United Provinces, and Madras, the three provinces in which irrigation works are most successful. The return in Bombay had reached 2·25 in 1909-10, and continued to be over 2 per cent. up to 1914-15, but it decreased with the increase of capital expenditure on new schemes under construction in the second and third decades of this century. It showed a temporary improvement during the boom period following the War, but its fall with the subsequent drop in commodity prices was precipitous and the average annual percentage return between 1930-31 and 1935-36 has been slightly less than 1 per cent.

The average net annual revenue was about Rs. 9 lakhs between 1910 and 1920. It rose to Rs. 15 lakhs in the boom period, and the highest figure on record has been Rs. 20·6 lakhs in 1927-28; but thereafter it suddenly dropped to an average of about Rs. 10 lakhs between 1930-31 and 1935-36. Since 1936-37 a slight improvement has been noticeable on account of the revenue from sugar companies.

113. *Capital Outlay and Debt.*—The total capital spent on First Class Irrigation Works in Bombay up to 31st March 1937 amounted to Rs. 1,075 lakhs and it was financed as under:—

	Rs. (Lakhs)
From the Famine Insurance Fund .. .. .	61
From Ordinary Revenues .. .. .	89
From Loans .. .. .	885
Indirect Charges .. .. .	40
Total ..	1,075

Out of the total loan of Rs. 885 lakhs Rs. 424 lakhs have already been paid off by the Bombay Government, and the actual balance outstanding on 1st April 1937 was Rs. 461 lakhs repayable to the Government of India at 4·5 per cent. interest in equated half-yearly instalments spread over a period of 45 years from 1937-38.

114. *Financial Results.*—The financial results of all the First Class Works for the year 1936-37 are detailed in Statement No. 4, and the average net results for the three years ending 1936-37 are given in a table on the accompanying Map No. 1. The following is an abstract of the results:—

Particulars of Work	Capital Outlay	Net Revenue	Percentage Net Return on Capital Outlay
	Rs. (Lakhs.)	Rs. (Lakhs.)	Per cent.
<i>For the year 1936-37.</i>			
First Class Major Works .. .. .	903	10·86	1·20
First Class Minor Works—			
Central Division .. .. .	17	2·38	2·03
Northern Division .. .. .	24	Loss	....
Southern Division .. .. .	22	0·28	1·29
All First Class Works (including incomplete Works) .. .. .	1,075	13·37	1·24
<i>Average for three years ending 1936-37.</i>			
All First Class Works .. .. .	1,072	12·98	1·21

It will be seen that the net revenue in 1936-37 on the total capital outlay was Rs. 13.37 lakhs, or 1.24 per cent.

115. *Value of Water and Revenue Realised.*—The irrigating capacity of a Major Canal System mainly depends upon the storage capacity at its headworks. The total storage impounded on all the six Major Canal systems is about 49,200 million cubic feet. The capital outlay including canals and distributaries amounts to Rs. 903 lakhs. Thus the average cost of the entire system is approximately Rs. 1,850 per million cubic feet of water stored. The interest charges alone at 4 per cent. amount to Rs. 74. By a similar calculation the actual working expenses based on the quantity of storage come to Rs. 29 per million cubic feet. Thus the value of water delivered to the cultivator, i.e. the cost incurred by Government amounts to Rs. 103 per million cubic feet; but the revenue derived from water utilised during 1936-37 was Rs. 60 per million cubic feet, or about 58 per cent. of its actual cost. These figures are very approximate and are put forward merely to give a general indication of the financial position of the works.

Some of the First Class Minor Works do not possess storage tanks, and those that have them show even smaller earnings per million cubic feet of storage used, the reason being that the absorption and evaporation losses from such small tanks are very heavy and there is usually no fair-weather flow in the streams to augment the storage.

116. *Capital Outlay Proposed during the next Five Years.*—In Chapter VII we have suggested a programme of capital expenditure for the next five years. This will be:—

- (i) Rs. 25 lakhs on extensions and improvements to the six Major Canal Works, mainly in connection with the changes and reforms suggested;
- (ii) Rs. 10 lakhs on First Class Minor Works in the Central Division;
- (iii) Rs. 20 lakhs on First Class Works in Gujarat; and
- (iv) Rs. 20 lakhs on First Class Works in the Karnatak.

The total capital expenditure during the ten years ending 1936-37 was about Rs. 100 lakhs, or Rs. 10 lakhs per annum. We now recommend an expenditure of Rs. 75 lakhs in five years, or an average of Rs. 15 lakhs per annum. Although their direct financial results may be disappointing, the irrigation works as a class are of substantial value to the rural population; and if Government are able to spend more money, and carry out extensions and developments at a faster rate, there is full justification for such a policy.

117. *Reduction of Working Expenses and Increase of Revenue.*—When the above expenditure is incurred and the responsibility for distribution of water is transferred to the irrigators themselves, and when irrigation is concentrated in blocks as proposed in Chapter V, we have no doubt that the working expenses will be considerably reduced. We consider that 33½ per cent. of the gross revenue would then be an adequate provision for working expenses. At the same time the full use of all water stored would be assured every year, and it is expected that every million cubic feet of it will irrigate a much larger area than it does at present.

In Chapter V we have assumed that 8.6 acres of mixed crops in the proportion therein given could be grown on one million cubic feet of water. From experience on the Nira Left Bank Canal it is found that in some years even 10 acres of such mixed crops have been irrigated per million cubic feet of storage. Our assumption is therefore based on actual results, and there is no reason why Canal Engineers should not aspire in future to irrigate 10 acres of such mixed crops. At the rates at present in force the gross revenue on 8.6 acres will amount to about Rs. 100 and at the reduced rates proposed by us it would be Rs. 87 per million cubic feet.

118. *Results of the New Scheme.*—Statement No. 6 gives in detail a very rough estimate of our anticipations as regards the area to be irrigated and revenue to be realised on each of the six Major Canals. The following abstract

of sections (ii) and (iii) of the statement will indicate succinctly the results anticipated :—

Item	Actual results of the year 1936-37	Results anticipated after the proposed improvements are carried out
Capital Outlay ..	Rs. 903 lakhs.	Rs. 928 lakhs.
Area Irrigated—		
Under Sugarcane ..	40,246 acres.	60,715 acres.
Under all crops (including sugarcane) ..	241,933	350,639 „
Gross Revenue ..	Rs. 25.29 lakhs.	Rs. 44.62 lakhs.
Working Expenses ..	Rs. 14.43	Rs. 14.87 „
Net Revenue ..	Rs. 10.86 „	Rs. 29.75 „
Percentage Return on Capital Outlay ..	1 20	3.20

It will thus be seen that with the improvements proposed in Chapters V to VIII, a return of 3½ per cent. may be expected within five years. We are hopeful that after some years of working of the new system the proportion of working expenses to gross revenue may be reduced to about 25 per cent. It may also be possible to restore some of the reductions in rates of assessment now proposed with the return of better times. Should all these favourable anticipations be realised, the return may go up to even 4 per cent. This, if achieved, will raise the entire Major Canals system into the class of *productive works*.

119. *First Class Minor Works*.—We do not propose here to go into similar details in the case of First Class Minor Works as data are not so readily available for framing even rough estimates. But we have no hesitation in expressing our belief that the Minor Works as a whole could also be improved *mutatis mutandis*, along the lines proposed for the Major Works.

It is suggested in Chapter VII that the Second Class Works and the First Class Minor Works should be grouped into one class in each District and Division. If this is done, the working expenses on both will be reduced, and management will be more efficient. As remarked elsewhere, the working expenses on First Class Minor Works as a whole come to about Rs. 3 lakhs per annum; and those on Second Class Works to about Rs. 7 lakhs, making a total of Rs. 10 lakhs for both classes. This is a considerable sum, and if it is judiciously expended by reorganizing the two classes of works as proposed, the result will be a substantial improvement in efficiency and economy.

120. *Cost of the Proposed Provincial Irrigation Board*.—At this stage we would emphasize the paramount need of appointing the Provincial Irrigation Board proposed in Chapter VIII at the earliest possible date. Unless this is done, the improvements proposed for reducing working expenses and increasing revenue will not proceed with the necessary speed. The annual cost of such a Board would be about Rs. 3 lakhs and considering that there is a prospect of the net revenue increasing by about Rs. 1½ lakhs in the short space of five years this special expenditure on a Provincial Board and its activities cannot be regarded as unusual or extravagant.



## CHAPTER XIV

## SUMMARY OF RECOMMENDATIONS

121. We have said enough to show that a review or re-examination of the working of the irrigation system as a whole has been necessary for sometime past for its moral health. We have made a fairly exhaustive survey of the various aspects of the irrigation problem, including those to which our attention has been drawn by the large number of witnesses who gave evidence before us and by Government officers and members of the public who favoured us with memoranda and notes.

Stated generally, our replies to the four points raised in the Government Terms of Reference are as under :—

(i) A change in the general irrigation policy is necessary in order to distribute water in future on a recognised plan for each canal and, as far as possible, to recover fixed water rates for the use of the water for terms of not less than six years at a time. No discrimination is intended between owner irrigators and tenant farmers.

(ii) Until changes are made in the present system of working, which will take time, a revision of the current water rates will be necessary. Such revision is indicated in the appropriate chapter and summarised in the next paragraph. The summary also takes into account the concurrent changes to be made in the Canal Rules.

(iii) It is proposed to mark out lands set apart for irrigation as permanent *bagait* and to charge suitable water rates. The rates recommended by us are also specifically mentioned.

(iv) The necessary remedial measures are proposed for the improvement of lands and villages damaged by water-logging (Chapter XI).

122. We will now summarise our conclusions and recommendations in greater detail under the following four heads :—

(i) Changes needed in water rates, canal rules, etc., that is, in regard to matters which have been the subject of complaint or grievance on the part of the users of water ;

(ii) Equitable distribution of irrigation facilities and permanent changes necessary in the Government policy and system of canal administration ;

(iii) Subsidiary and allied matters which will require attention to enable Government to pursue the investigations begun and to carry out the reforms suggested by the Committee ;

(iv) Agencies to be employed and organisation to be set up for giving effect to our recommendations.

*Changes in Canal Rules, Water Rates, etc.*

123. The following is a summary of the principal measures recommended :—

(a) *Water used for Agricultural Purposes.*

(1) The present system of seasonal rates should continue except in the case of sugarcane which should be assessed on the basis of a crop rate, the period of overlap being however controlled in blocks.

(2) The classification of seasonal crops into *light* and *medium* should be suspended and the prevailing *light* rates charged for both classes of crops for the present. When the new system is brought into effect the rates proposed in Chapter IX should be assessed.

(3) For *lift* irrigation from the canals or their distributaries the rates charged should be half the flow rates in the case of cultivators using *mots* worked by bullocks. Where power-pumps are used three quarters the flow rates would be a suitable charge.

(4) The rates on the Girna Canals should subject to (5) below be the same as on the Major Canals—except in the case of sugarcane which should be

Rs. 28 per acre per annum or Rs. 37 per acre, inclusive of overlap, and in the case of other perennial crops Rs. 14 per acre per annum as at present.

(5) The rates for seasonal crops on the Nira Right Bank Canal and the Girna Canal should be reduced by about 25 per cent. for a period of three to six years.

Early steps should be taken to charge for water delivered to sugar companies on a volumetric basis.

The same system should be extended to ordinary irrigators as soon as responsible Co-operative Societies or Panchayats come into existence in the various canal sections and proper arrangements are made for the accurate measurement of water.

(b) *Water given for Non-Agricultural Purposes.*

(1) The Poona City Municipality should be charged a rate of Rs. 2-8-0 per 10,000 cubic feet for supplies up to 9 million gallons a day and Rs. 4 for supplies in excess of 9 million gallons a day.

(2) Every avenue for negotiating a revision by mutual consent of the agreement between Government and the Gokak Mills Limited, should be explored in order to release a larger proportion of the available supply for irrigation.

(c) *Sugar Factory Irrigation.*

(1) *Water rates.*—The agreements with the Sugar Companies should be revised to include a fixed water rate for sugarcane for the guaranteed period of supply. A rate of Rs. 45 per acre per annum on the present basis of assessment or Rs. 60, inclusive of overlap, is recommended. For reasons already stated the rate for the Ravalgaon Sugar Farm should be fixed at Rs. 28 per acre per annum (present rate) or at Rs. 37 per acre, inclusive of overlap.

On all sugar factories a suitable volumetric rate should be introduced by mutual agreement at an early date.

(2) *Drainage.*—The cost of the main drains should be borne equally by Government and the factories, but the latter should construct all subsidiary drains as well as maintain the whole drainage system. No charge should be made by Government for the preparation or approval of the plans and estimates for such drains or for supervision during construction.

(3) *Leasing of lands by the Companies.*—Established local irrigation should be allowed to continue but the owners should be bound to sell the cane grown to the Companies at a price fixed by Government on the basis of the ruling prices of sugar. The Collector of the District or an arbitration Committee should be appointed to effect an amicable settlement between the Companies and the Local occupants in regard to the leasing of lands.

(4) Generally it is desirable that all Companies should be given the same terms as those granted to the Belapur Sugar Syndicate's old area except in respect of drainage [*vide* (2) above].

(5) Every Company should be permitted to expand its crushing capacity to 650 tons, if it so desires, wherever the water supply and other conditions are found to be favourable.

Every effort should be made to support and strengthen the existing factories. It does not however seem desirable that new factories should be allowed to be started.

(d) *Prevention of Water-Logging.*

(1) Propaganda should be undertaken to educate the irrigator in the economical use of water.

(2) The necessity of sealing canals and distributaries from which transit losses are excessive by puddling and lining should be carefully investigated.

(3) Drains should generally be designed and constructed on a much simpler plan than at present.

Deep cuts in nalla beds should ordinarily be made by charging the cost to the capital account of the irrigation work concerned.

(4) The responsibility of constructing subsidiary and relief drains should rest on the cultivators themselves.

The reclamation of water-logged and salt-affected lands after drainage should in all cases be carried out by the owners with the technical advice of the Irrigators' Advisory Bureau.

(e) *The Bombay Irrigation Act, 1879, and the Bombay Canal Rules, 1934.*

No amendments would appear to be necessary to the Bombay Irrigation Act, 1879, but the Bombay Canal Rules, 1934, may be modified in the following respects :—

*Cane blocks.*—(1) One-to-four cane blocks should be abolished.

(2) Unitization into 20-guntha plots should be done away with and cane planted in permanently demarcated *pot* numbers or *hissa* numbers equivalent in area to one-third of each irrigator's holding in the proposed cane blocks.

(3) The Bund Rules should be simplified so as to require only a surrounding bund, no size being specified save that the bund should be strong enough to prevent waste.

(4) There should be no charge for demarcating block boundaries and no sketches need be prepared and supplied.

(5) *Sets* may be planted in the *pot-pats* provided that a width of at least 12" of open channel is maintained.

(6) If a crop-rate for cane is introduced, overlapping should be prohibited in blocks between 15th April and the break of the monsoon. If however the present system of assessing sugarcane is continued, the charges for overlapping cane should be on a monthly basis and should not extend beyond the period of sanction provided that water is not taken.

(7) Three crops of cane may be allowed in the same area in five years.

*Fruit and flower gardens.*—(1) No charge should be made for water taken to grow a protective fence round a garden.

(2) The hot-weather watering should be given as far as possible at shorter intervals than ten days.

*Bhusar (seasonal) irrigation.*—(1) Sanction should be given only in respect of whole survey numbers or *pot* numbers. This will obviate the necessity of measurement and penalization, etc., of excess areas. Where the *pot* numbers or *hissa* numbers are very large, they should be permanently split up, as required by the occupant, through the agency either of the Revenue Department or the Public Works Department on payment of a nominal charge.

(2) There should be no unitization and no bunds except a surrounding bund.

*General.*—(1) The minimum limit of 16½ feet mentioned in Canal Rule No. 8 (3) should be altered to 10 feet.

(2) Two crops should be permitted to be grown in one season without extra charge provided that water is not taken for the second crop beyond the sanctioned period.

(3) When a sanctioned crop is not planted or fails, another crop assessable at the same or a lower rate may be sown in the same area without additional charge and no written intimation should be required to be given to the Executive Engineer.

(4) The classification of crops into *heavy*, *medium* and *light* should be discontinued and there should be only—

Cane,

Other Perennials,

Hot-weather, Kharif, Rabi and Two-seasonal crops.

(5) If in any year surplus water is available, the irrigation season may be advanced or prolonged either generally or in respect of any particular crop or crops without additional charge being made.

(6) If an irrigated crop is required to be given well water for a part of any season owing to a deficiency in the canal supply, a proportionate rebate on the rate should be allowed for the period for which the canal water was deficient, provided that due notice is given to the Canal Officer before well water is given.

(7) If water applications are submitted after the due date, no additional charge should be made in the case of cane or other perennials. In the case of other crops an additional charge of 25 per cent. may be made at the discretion of the Executive Engineer.

(8) For waste of water the acreage rate chargeable should not exceed the single watering rate, the minimum charge being on ten gunthas.

*Permanent Changes deemed necessary in Government Policy and System of Administration.*

124. The more important of our recommendations are :—

(i) The proposed rationalisation measures should be introduced immediately on the six major canals because changes and improvements on these will take speedy effect and are vital to the success of the entire system. After the reforms have been successfully carried out on these works, it will be easy to apply them to the extent practicable to the minor irrigation works ;

(ii) To redistribute crop acreages by canal sections and by villages with due regard to the limits necessitated by transit losses ;

(iii) To allot crop acreages to cultivators generally in proportion to the acreage of land owned by them in the village ;

(iv) To classify permanently 25 to 40 per cent. of the cropped area of a village as *bagait* or irrigable land ;

(v) To entrust the distribution of water to the cultivators themselves wherever practicable by organising Irrigation Co-operative Societies of Panchayats for the purpose ;

(vi) To record correct measurements of supplies delivered at distributary and outlet heads and in different canal sections from day-to-day ;

(vii) To maintain a regular balance sheet of receipts and issues of water utilised by crops, or otherwise expended or wasted in transit, showing how the storage is used from month to month and year to year ;

(viii) To assess the water rates as far as possible on the basis of market prices of products raised by irrigation, the rates being revised at intervals or not less than six years ;

(ix) To draw up a plan and programme of construction of works to be carried out for a term of three to five years, and to allot funds both capital and revenue in advance for new constructions and maintenance respectively ;

(x) To appoint Canal Committee as advisory bodies to co-operate with Government in the execution of these new measures and to ensure stricter supervision and control and more efficient business administration ; and

(xi) To create a Provincial Irrigation Board with sufficient funds and directing power to assist Government in regulating irrigation affairs generally, to pursue the investigation work initiated by this Committee, and to work for the results aimed at in this report.

*Subsidiary and Allied Matters—Future Developments.*

125. There is a large number of other matters which will require attention in order to give full effect to the reforms and investigations which we have suggested. They can only be taken up after Government have passed orders on our main recommendations, laid down the policy which they propose to follow, and appointed

the agencies through which effect is to be given to their decisions. The following is, so far as we can visualise at present, a fairly exhaustive list of the problems to be considered :—

(i) The Nira Valley Irrigation System should be examined and its future treatment and programme of working decided on. This work should be done under the supervision of the suggested Provincial Irrigation Board or of a special Committee of two or three experienced Engineers. The actual work may be done by the Government Engineers, but the final programme and proposals should not be authorised except after thorough investigation by a committee of review.

(ii) The needs of famine years in respect of new irrigation works should be anticipated and studied, and suitable projects and construction programmes kept ready against future emergencies.

(iii) Special attention should be paid to the investigation of projects in the Northern and Southern Divisions for the next five years. Surveys and investigations for these should be carried out by special staffs or establishments working under the supervision of the proposed Provincial Irrigation Board.

(iv) Promising sites for hydro-electric schemes should be examined and two or three of the more favourable ones selected for detailed investigation. The detailed investigation should be put in hand after the preliminary reports on the sites have been considered and approved by Government.

(v) Sugarcane being the most important money crop, the prospects of its cultivation should be closely watched and measures taken from time to time to facilitate its cultivation.

A brief monthly report reviewing the conditions of sugarcane cultivation and its immediate future prospects should be submitted to Government by the executive of the Provincial Irrigation Board.

(vi) The use of pumping should be encouraged by charging low water rates for three to six years at a time, wherever water collects in pools, ponds or underground reservoirs or is found running to waste. No harm would be done to the public interests even if water is allowed to be used without charge for two or three years at the commencement in such situations provided that no permanent rights are created.

(vii) Elementary instructions and rules which are the results of past research in irrigation and agriculture in the irrigated tracts should be collected and published in a form which could be profitably followed by cultivators.

This should be done by the Research Engineer and the Irrigators' Advisory Bureau both of whom should in these and other matters keep in close touch with the working of the Central Board of Irrigation at Delhi and its Research Bureau when instituted.

(viii) The curricula of studies in hydraulic engineering in the Poona Engineering College and for the Bombay University examinations should be brought into line with the special needs of irrigation in this Province.

(ix) College professors and practising engineers should be given inducements and prizes for writing books on irrigation engineering, publishing accounts of important hydraulic works, and treatises or articles on topics of irrigation interest.

(x) Enquiries should be made both in India and in foreign countries as to what new crops can be cultivated with advantage under the Deccan canals and what research should be conducted for this purpose. The cultivators should be frequently advised by leaflets and in other ways by the Agricultural Department regarding the prospects of successful cultivation of new crops.

(xi) Officers of the Public Works (Irrigation) Department should be periodically deputed to visit irrigation works in other provinces of British India and Indian States, where irrigation has made headway, and also occasionally to countries like the United States of America, Egypt and Italy to study modern system of canal administration and varying irrigation practices.

(xii) The subsidiary aids recommended in Chapter XII should be provided to the utmost extent practicable, financially and otherwise, under the advice of experts.

#### *Organization and Agencies.*

126. To give effect to the scheme of things which we have outlined, assuming that it will meet with Government approval—we suggest that provision should be made for—

- (i) An agency in the shape of a Provincial Irrigation Board ;
- (ii) A Budget ; and
- (iii) A Plan and Programme for three to five years at a time.

(i) *Provincial Irrigation Board.*—The creation of a Provincial Irrigation Board is recommended because the work to be done is of a complex character and without an agency competent technically and otherwise to make a special study of the various problems involved and to deal with them in a rational manner, it will not be possible to give full effect to our proposals. As the works as a whole are still unremunerative, we have been particularly anxious to keep down the cost. But expenditure of this nature is necessary even for the growth of revenue. If the proposals about the Board and auxiliary measures are sanctioned, Government will have created the mechanism and agencies necessary to carry on the work which we have initiated, till all the changes and reforms both permanent and temporary which the situation calls for are carried out.

As already stated at some length in Chapter VIII the Board should consist of three persons, two of whom at least should be engineers of considerable experience and reputation and the third an officer or non-official gentleman known for his progressive views and activities. Rules should be framed to harmonize the duties of this Board with those of the senior officers of the Public Works Department. The executive staff of the Board should consist of one Development Engineer of the rank of Superintending Engineer and a Research Engineer of the grade of an Executive Engineer.

The creation of an Irrigation Research Bureau is a necessary adjunct to the proposed Provincial Irrigation Board.

(ii) *Budget.*—During the ten years ended 1936-37 the capital expended on irrigation works was about Rs. 100 lakhs. For the next five years an outlay of capital amounting to Rs. 75 lakhs seems a reasonable provision. A start may be made with a minimum grant of Rs. 50 lakhs which may be added to after two or three years.

(iii) *Plan and Programme.*—The principal reforms and changes needed have been explained in detail in the previous chapters. A new Construction Programme based on the needs of all parts of the Province is also indicated. We trust that this report will be found to contain all the essential material needed to enable Government to decide on a Plan and Programme for the next few years.

The report also suggests measures and reorganization with the object of promoting closer touch between irrigation officers and cultivators and of encouraging self-help and enterprise among the latter. The officers are expected to use their best endeavours to raise the level of administrative efficiency and the cultivators to develop a healthy self-reliant mentality. By closer co-operation and by following up-to-date business methods, the efforts of both should result in the country obtaining products and services of the highest value.

## CHAPTER XV

## GENERAL

✓127. Past records show that an impetus was given to the activities of the Bombay Government in the sphere of irrigation by the visit and subsequent recommendations of the Indian Irrigation Commission of 1901-03. Until the introduction of the Montagu-Chelmsford Reforms in the year 1921, all the irrigation works in the Province for which capital accounts are kept were under the control of the Government of India, and the Bombay Government administered the works merely as an agent of the Central Government. Now, the responsibility both for policy and administration has devolved upon the Provincial Government.

On Sind being constituted a separate Province in the year 1936, the Sukkur Barrage and the Indus River Irrigation Works which till then formed an important charge of the Bombay Public Works Secretariat were transferred to the new province, but already some three years before their transfer the superior Secretariat staff had been appreciably retrenched.

Although the aggregate area irrigated in the Province is now very small compared to what it is in provinces like the Punjab, the United Provinces and Madras, yet some of the storage reservoirs constructed in the Bombay Deccan in recent years are not only among the most important in India but in point of size bear favourable comparison with great engineering structures of this class in other parts of the world. On account of the varying physical features, soil and other local conditions, the works left under the control of the Bombay Public Works Department, particularly the Major Canal Works, demand a high degree of technical skill and more than ordinary care and caution for their successful operation. Another point of which special note should be taken is that although a considerable outlay has been invested on these new irrigation works, the results whether judged from the area irrigated or the revenue derived have so far been disappointing.

After taking all these circumstances into consideration, we have formulated proposals which involve a readjustment of some of the basic conditions on which the administration of the works has hitherto rested and which, we feel confident will meet the needs of the situation.

✓128. *Present Position of the works.*—Although the capital expended on the new irrigation works has been Rs. 10·75 crores, the estimated value of products grown in 1936-37 on them was only Rs. 1·83 crores—an amount barely sufficient to maintain the population of an average Bombay district for six months. (The main reason why irrigation is backward in spite of the efforts of past Governments has been the long time that projects of this class take before water can be fully and economically utilized and before a reasonable dividend can be returned on the capital invested. Some of the works were originally begun to provide employment for famine labour; construction in the boom period succeeding the War was costly; and the annual capital grants for construction were slow, varying and uncertain. All these factors contributed to swell the costs. The works not being built as productive undertakings it is not quite fair to judge them from a strictly commercial point of view.

But there is a large area of well irrigation in Bombay—larger in proportion to the population than in any other province except the United Provinces and the Punjab,—which is a sure sign that the population here is just as eager for irrigation as anywhere else, and there are extensive tracts of arid land in the Province to which canal systems would come as a great boon.

✓129. *Causes of Failure and Remedies.*—The following are among the principal causes of the want of success of these works :—

There has been no exhaustive review of the policy followed on these works and no adjustments have been made to suit changing conditions since the Indian Irrigation Commission of 1901-03 visited the Province.

Wherever irrigation is successfully practised in other parts of India, the water supply is usually derived from perennial streams. In Bombay, on the other hand, water has to be stored in reservoirs at great expense. Canal construction is also more costly. This requires that it should be utilised with

correspondingly increased care and economy. As a result of wasteful use a water-logged area has developed which in extent already amounts to about 20 per cent. of the total irrigated area.

The co-operation of cultivators in the management of the canals has not been as fully sought or encouraged as it might have been.

No plan or programme of construction taking due note of the relative needs and claims of the various parts of the Province has been maintained.

The Nira Right Bank Canal, which is a new work and the biggest one in the Province, has been a partial failure. Although it came into operation twelve years ago, this canal has barely begun to pay its working expenses.

Absence of fixity of irrigation tenure, that is lack of a permanent contract or understanding between the cultivators and the Government for the continuous use of the water has been one of the main reasons for the want of success of these works.

Appropriate remedial measures have been considered at great length in the course of this report, and a summary of the measures recommended is given in Chapter XIV.

At present water is always there and, save for sugarcane and a few other crops, the cultivators take it only if its use is forced on them through the failure of the rain. Irrigation will benefit them if it is practised as an industry, and water is applied to small holdings which are within the power of the farmers to cultivate and for which they have the necessary labour, skill and capital.

If a cultivator finds that he has an abundant supply of water at his disposal when he can use only a small quantity of it with profit, he loses interest and ceases to value the supply at its true worth. Through lack of business training and acumen he is unable to develop big scale irrigation along with his neighbours on a co-operative basis. According to the economic law of *diminishing utility*, successive doses of the same commodity or service meet with a smaller and smaller satisfaction. But if the cultivator is offered only a limited supply and if he knows that on his failure to use it the supply is liable to be transferred to others who are waiting for it, every cubic foot of water offered will be eagerly sought and made the most of.

This, in short, was the psychology of the block system introduced at the beginning of this century. Its object was to secure to the cultivator a permanent interest in the irrigation facilities granted to his village. The working of the block system has been the subject of investigation and scrutiny on more than one occasion. But its basic principles being rational and unassailable, it has not been found possible to replace it.

130. *Special Precautions in extending the Block System.*—Special precautions will be necessary in redistributing the irrigation facilities and extending the block system. A detailed plan or scheme will have to be worked out for each canal as a first step before its introduction is authorised by Government. The two or three officers to constitute the Committee should be picked men who may be depended upon to use tact and persuasion to make the measures a success. The Committee must be prepared for opposition from the cultivators in the upper reaches of a canal, to any measures that may be proposed for restricting their crop acreages. Some villages and many enterprising cultivators have probably already got more than their share of irrigation facilities.

At first sight, the business of prevailing upon cultivators to exchange land for the formation of blocks may seem difficult. But, in practice, the Committee will have the choice of numerous alternative proposals to satisfy the needs of the most fastidious cultivator.

After a share list of irrigators is prepared for a village on a rational basis, the Committee should get into close touch with the cultivators and by negotiation select land for blocks. The cultivators whose lands are included in the blocks will not be allowed to use canal water for more than their individual share which would ordinarily not exceed one-third of the land owned by each. They have to give the remaining land to other cultivators or in the alternative grow only dry crops on it. If an owner of land selected for inclusion in a block is found to be obstinate and



unwilling to part with his land, the Committee may select some other stretch of land for a block and force on the recalcitrant owner the necessity of seeking land for his own use within some one else's property.

131. *The True Value of the Works.*—A periodical re-examination or review of the working of the irrigation system in comparison with similar undertakings elsewhere cannot fail to be beneficial to its efficiency and success. We started upon our enquiry with the conviction that a critical review of the working at least of the six major canals was necessary. There has been no disposition on the part of the Committee to undervalue the interest taken and the enterprise shown by the previous Administrations in projecting and constructing these large beneficent schemes. Our principal thought has been to put the experience gained in recent years both in this Province and elsewhere to profitable use and to shape the future of the Bombay works along lines which will permanently increase their value to the country.

In accounts phraseology an irrigation work is classed as *productive* if it is expected to give a net annual return equivalent to full interest charges on capital outlay within ten years from the date of its coming into operation. On account of the special local unfavourable conditions already narrated few irrigation works in this Province have come to be classed as *productive* undertakings.

There is an idea abroad that on works classed as *protective* the storage impounded should be reserved for ordinary farm crops, chiefly for cereals and food grains, during years of deficient rainfall. This, however, seems a misapprehension. The best protection that a canal can give is afforded when the supply is used from year to year, as profitably as it can be, to obtain crops of the maximum value. It is with a view to secure this important advantage that a redistribution of irrigation facilities computed on rational lines is advocated in this report. It is also to this end that we have urged that the lands which can be regularly watered every year should be permanently classed as such, that is, marked off as *bagait* land, and that the water rates should be stabilised, subject to revision only at fixed intervals to allow for marked fluctuations in prices.

During years of scarcity and famine, however, we recommend that Government should curtail, according to a deliberate plan suited to local conditions, the area of sugarcane both in blocks and in factory areas to a reasonable extent in order to extend the area under cereals, food and fodder crops.

In the conditions prevailing in the Deccan ten years is too short a period for an irrigation system to begin to function as a *productive work*. If experience in this respect has been more favourable in provinces like the Punjab or Madras, it is because under the conditions of soil and climate prevailing there the landowners of those provinces find it a marked advantage to utilise the water and to pay for it.

It may perhaps be of interest to state in this connection that over a great part of the United States of America where irrigation works have come into being, it takes at least twenty years to bring a large irrigation enterprise into complete utilization.

132. Instead of discussing first principles and deploring past losses every time a new project has to be sanctioned, the general policy of Government in our opinion should be to sanction new works, if they can afford the outlay, without expecting a return in the shape of full interest charges in less than 20 years. Works of the class to which the six major irrigation works belong may be expected under efficient management to earn enough net revenue in that period to cover interest charges on the original outlay.

On the Deccan Canals irrigation may be ordinarily expected to increase the value of crops grown by 25 to 40 per cent. Even during years of drought, this average crop value is secured, while without irrigation in such years there may be no crops at all.

133. The Bombay irrigation works now suffer through lack of a deliberate policy and plan. We have endeavoured, within the limits of time and resources at our disposal, to supply this omission and to submit in outline a complete exposition of the subject. Irrigation facilities in the shape of equivalent crop acreages will be equitably distributed over villages and to individual cultivators on a rational plan, and a far larger number of cultivators will be able to participate in the benefits of irrigation than is the case at present.

We have shown that a minimum net revenue of 3 per cent. on the works capital may be confidently expected from the six major canals which we have been considering. If, simultaneously, the irrigating communities under these canals taking advantage of their privileged position work hard and under good advice to make the most of their water facilities, the financial and other results from these canals may far exceed our expectations.

Irrigation works wherever they are constructed form a permanent asset. They add to the creative mechanism of the State, help to increase non-tax revenues, and pave the way to other direct and indirect benefits which contribute materially to the productive power and prosperity of the population. If Government are pleased to take firm decisions on the recommendations now submitted and follow a consistent policy, continuously for some ten years at least, in enforcing the new measures, there is every prospect that both they and the cultivating communities concerned will derive the full benefits anticipated in this report.

- (1) M. VISVESVARAYA.
- (2) J. W. SMYTH.
- (3) M. VISVESVARAYA *for* W. J. JENKINS.
- (4) C. E. AITKEN.
- (5) J. G. MORE (subject to a minute of dissent).
- (6) LALCHAND HIRACHAND.
- (7) R. B. GIRME.
- (8) G. G. SHEMBEKAR.
- (9) J. A. ALI.
- (10) V. N. VARTAK.

Bombay, 5th May 1938.

## MINUTE OF DISSENT BY Mr. J. G. MORE, B.A., LL.B., M.L.A.

## THE PROTECTIVE PURPOSES OF THE IRRIGATION WORKS.

✓ *A Drift in Policy.*

There has been a drift in the Irrigation Policy of Government. The Drift is in the favour of the Capitalists. The confidential proceedings of the Irrigation Conference of officials, 1929, reveals this change of policy. The first question this Conference considered was,

“ Whether the existing Irrigation Works which were Protective Works should hereafter be treated as productive works, and if so, what means should be devised to make them pay ? ”

The decision arrived at was,

“ That every endeavour should be made to increase the revenue from the canals and not to look upon them as constructed from grants purely for famine purposes.”

This policy behind the curtain is the corner stone of the recommendations of the Kamat Committee, 1932. “ Get as much as you can but do not abandon ” has been the watch-word of the Irrigation Policy. The Kamat Committee served this purpose. This is what the Kamat Committee says,

“ In the present financial situation, it is of the greatest importance that the biggest return possible should be obtained and the object of our appointment is to make proposals to that end.”

This policy was hatched behind the curtain. With this object in view the Kamat Committee's recommendations gave real impetus to the establishment of sugar factories. The shrewd eye of the capitalist at once caught hold of this golden opportunity. The capitalist entered into the fresh field in rural areas with the manifest object of exploiting the real indigenous agriculturists. The effect of this policy in short has been to replace the indigenous agriculturist by the capitalist.

2. It is important to ascertain the purposes of these irrigation works, the limit of expenditure expected to be incurred by the general tax-payer for them and the expected returns from them. The Indian Irrigation Commission, 1901-1903, very carefully considered all these aspects. They might very well be summed up for a clear understanding in their own words.

“ It will, however, be said, and truly said, that the protective value of an irrigated acre cannot be limited to the saving that it may effect in the future cost of famine relief. There is an indirect loss of revenue due to famine, of which account must be taken, in the loss of land revenue due to land going out of cultivation or to the great impoverishment of the cultivators ; and there are corresponding losses in the revenue from excise, customs, salt, stamps, etc. ; and all of which are likely to continue for some time after famine has passed away. *The total of these losses, if it could be fairly estimated, would possibly not fall short of the recorded actual cost of famine relief, including remissions of land revenue, etc., which is all that we have hitherto considered.* But, over and above all this, it may be contended that the expenditure which Government may legitimately incur on famine prevention cannot be limited by a consideration of the reduction in the future cost of famine to the State which will result from such expenditure ; and that a much higher scale of expenditure may be justified, for the sake of saving the inhabitants of insecure tracts from all the losses and demoralisation and miseries of famine.” (*Vide* paragraph No. 104 of the Indian Irrigation Commission Report.)

3. The Commission further on opined, “ It is difficult to put any limit to the expenditure which the State may incur in order to prevent what has been called the scandals of famine. The cost and net returns of a protective irrigation work cannot like those of the protective Railways at so much per mile. It is more important to realise what irrigation can do than what it cannot.”

4. The Irrigation Commission after fully considering the prospective improvement in the financial returns of all the irrigation works in the Deccan have given their considered opinion as under :—

“ When every allowance is made for this and for possible improvement in the administration of the canals we do not think that they will ever prove remunerative in a financial sense or they can be expected on the whole to return more than two per cent. on the capital cost.”

5. The next question to be considered whether these irrigation works which were designed to protect the country against famine have served their purpose? It is true that there has been a considerable fall in the famine relief expenditure. This can very well be attributed to these protective works in the past. But on account of change of policy in favour of sugarcane cultivation and more particularly in favour of sugar factories both recurrence and intensity of famine have been on the increase. The majority in their report admit the fact that “ only a few capitalist bodies like the sugar companies and some enterprising professional irrigators like the Saswad Malies have hitherto taken the fullest advantage of the facilities available.” The majority further admit that the economic conditions of the irrigators in general have gone from worse to worst. The famine conditions of the year 1936-37 are still fresh in our minds. They have equally affected both dry and irrigated areas. The Honourable the Finance Minister Mr. Latthe, taking a prompt survey of the irrigation policy and a drift therein, very aptly describes the situation in the irrigated tracts in his Budget speech of 1937-38. He says, “ The areas and districts which have been sought to be protected at such a heavy cost to the tax-payer remain as poverty stricken and as little immune from famine as they ever did”. [In conclusion the drift in Irrigation Policy of Government, actuated as it was by the principle of, “ Get as much as you can ” is solely responsible. Therefore a revision of the present policy has become a matter of first importance.]

6. The general tax-payer, in his own interest, has to see that this drift in irrigation policy is stopped in time. The object of protective irrigation works is to promote and develop food and fodder supplies of the country. He is made to bear the burden in anticipation of savings in famine relief expenditure. In the absence of protective irrigation works he has simply to think what he would be required to spend. It was estimated that Bombay's average annual expenditure on famine relief for the 20 years ending with 1915-16 was Rs. 35,50,000. (*Vide* HISTORY AND CONSTITUTION—FAMINE RELIEF FUND). His liability is, as has been pointed out by the Indian Irrigation Commission, is somewhat unlimited in order to prevent what has been called the scandals of famine.

7. Food and fodder famines have been recurring calamities not confined to dry areas. The scarcity conditions were as acute in the areas under the Nira Right Bank Canal as elsewhere in 1936-37. There was phenomenal rise in prices of food grains and other necessaries of life in this province in 1918-19. In the deficiency of food grains during the famine of 1918-19, according to Mr. C. A. Innes, the Food-stuffs Commissioner, was unprecedented for 30 years. It has been well recognised that fodder famines are comparatively very difficult to deal with. The task of mitigating the evil effects of serious fodder famine and of preventing the disastrous loss of agricultural stocks is as important as ever.

8. I have attempted above to throw light on the changes in the irrigation policy as to what it has been and what it ought to be. It is imperative once for all to recognise in clear and unambiguous terms the real nature, object and sphere of the irrigation works. As to the nature of these Deccan irrigation works the Indian Taxation Enquiry Committee, 1924-25, has put it very aptly in a nutshell as under :—

(i) “ The protective works are works constructed with the knowledge that they are not likely to pay their way, purely as preventive of the evils of famine. By their very nature they are not expected to bring in a full return on their capital cost, though indirectly they may do so by avoiding expenditure of a more wasteful kind on measures of famine relief.”-

(ii) The object of irrigation works is to protect and develop food and fodder supplies with the manifest object of preventing or minimising the intensity, extent or cost of famine.

(iii) The sphere of protection is the indigenous agriculturist to whom alone protection is to be given because he is the producer of food and fodder supplies which really serve to prevent or minimise the intensity, extent or cost of famine.

(iv) Capitalist otherwise known as a commercialised agriculturist is an evil in disguise in rural areas and if allowed to flourish will outright ruin the producer, viz., the peasant who is the backbone and the pride of the country.

9. Therefore, I strongly recommend to the present responsible Government strictly to adhere to the protective purposes of the irrigation works and extend real protection to the indigenous agriculturists.

I am sorry to state here that I have to differ from my colleagues on this most vital feature of the irrigation policy.

#### *Second Class Works.*

(Paragraph 24—Chapter IV of the Report.)

10. *Tanks and Bandharas.*—There are many tanks and bandharas in the Province. Most of them are silted for want of timely and necessary repairs. The charge for water is consolidated with the land revenue and is collected every year irrespective of the fact whether water is received or not by the cultivators. At present there are many lands which do not receive water at all, but on account of this consolidated assessment, owners of these lands are required to pay charges for water. This assessment is subject to remission on account of the failure of the works, but more often than not remissions are not given. Water rate assessment is payable whether water is available or not. So it works great hardship and injustice on the cultivators. In all the divisions cultivators have raised before the committee very strong complaints which deserve notice. But this is a matter which requires thorough and independent enquiry. Therefore, I recommend to Government to institute forthwith an enquiry into this matter with a view to remove all just grievances of the cultivators. Moreover, it is highly desirable to separate charge for water from the land revenue assessment.

#### *Equitable Distribution of Irrigation Facilities.*

(Chapter V of the Report.)

11. The new redistribution system recommended by the majority in Chapter V of the Report is the Central Scheme on which important recommendations are based.

*Object of the Block System.*—“The object of the Block System”, as stated in the Report, “is to distribute the benefits of irrigation works over as large a number of villages as possible and at the same time to concentrate the irrigation given to each village to areas or blocks of a specified extent and in selected soils and situations favourable to irrigation.”

*Main advantages claimed.*—

- (1) Economy of water ; and
- (2) Simplification of canal administration.

12. In the first place the system proposed is not a new system. It is merely a reintroduction of the old Block System which failed to achieve its main object mainly because of concentration of irrigation. Sir M. Visvesvaraya looked on the “Phad” System as the ideal system of irrigation ; and the Block System, which he tried to introduce more than thirty years ago, was derived from this “Phad” System. However, it was not proposed by him to divide the locks into “Phads” because he then realised that such a drastic distribution of holdings would be impossible. But he then anticipated that exchange of lands could be arranged between those with lands outside the selected blocks who wanted to grow cane in the blocks and those with lands inside the blocks who did not want to grow

cane. The old Block System of Sir M. Visvesvaraya and the System of Redistribution now proposed by the majority are essentially the same. The proposed system, which contemplates equitable distribution of irrigation facilities to all cultivators, also anticipates exchange of lands. It should be borne in mind that the new system cannot be introduced without exchange of lands. The lands which might come under the new system, if introduced, will potentially claim abnormal prices while lands which are to go dry will lose in prices very considerably. Besides cultivators have a natural ingrained attachment to their ancestral lands and they will not be prepared to part with them even at the risk of their lives. I am sorry to state here that Mr. Inglis is not correctly quoted in the Majority Report. He, in his Note, points out why the Block System had failed to achieve its main object of concentration. In his Note on Irrigation on the Block System in the Deccan Canal Tracts—Technical Paper No. 16—Mr. Inglis states—“In actual practice, however, it was found that men with lands inside block would not exchange their lands with men outside, partly because the cultivators had a natural ingrained attachment to their ancestral acres, and partly because it was realised that land in a block was potentially far more valuable than land outside a block.” Therefore I submit it is not advisable to try to reintroduce a system which had grievously failed in the past.

13. Secondly the main advantage claimed by the redistribution system is that it would result in economy of water. I am afraid the saving that is claimed under this system will be very little if at all it is achieved. The fact that nobody can give even an approximate idea of saving of water bespeaks much in support of my argument. My reason for saying so is that this redistribution will not stop the loss of water in transit from the main canal which is comparatively very high. It will not effect also any economy of water from the distributaries. Owing to concentration, it is true, there will be some saving of water in the channels or outlets; but this saving will be very little. Under the new system it is contemplated to locate the blocks in favourable situations. It may be found necessary to locate the blocks in different situations around a village linking them with water channels. There will be no waste of water, if fields in the vicinity of channels are watered. Even assuming that there will be some economy of water, are we to introduce the new system disturbing very seriously private rights of property and the sentiments attached to it? Certainly not.

14. Thirdly the scheme contemplates that every land holder is to get water for one-third of his land. Under it it will be difficult to apportion an economic area of irrigation to a small holder. The small holder ought to be the first concern of Government. He must be allowed water up to 8 to 10 acres of land if Government really mean to help him. The effect of the scheme, if accepted, will invariably be to replace poor cultivators by rich landlords.

15. Fourthly, bogus rights in property will be encouraged by this system. The landholder within the block will accept various ways by which he will try to get water for more area than what will be allotted to him. It is easy to conceive this and need not be dilated.

16. Then again there will be a great scope for corruption for departmental staff and it will lead to considerable discontent. Besides there is unanimity of opposition to the scheme from irrigators all over the Province.

17. Lastly it is necessary to take into account the most deplorable economic conditions of the cultivators and their sheer inability to afford capital for irrigation water. The agricultural economic depression has been persistently playing a great havoc in rural areas and nobody knows when it will cease. Any way its effects on economic conditions of the cultivators are likely to last long. A mere idea of the cultivators' debt position is sufficient to deter Government to thrust the proposed new system down the throats of the cultivators. Regarding the debt problem His Excellency the present Viceroy of India in Criterion Miscellany No. 40—“The Indian Peasant” says as under :—

“Debt is the curse of the Indian farmer, for it robs him of the full fruits of his labour, saps his initiative, destroys hope and with it ambition, and darkens the whole outlook of his life.” The Land Mortgage Bank Committee

appointed by the Bombay Government in 1933, taking into consideration the serious magnitude of debt position warns as under :—

“ In case this favourable opportunity is missed, the pressure of debt may grow to such an alarming extent that it may lead to agrarian discontent and may shake the foundations of the rural economy.” Therefore, I think it will not be advisable to think of introducing the redistribution system.

18. By the by I may point out one thing. An exception to the allotment of shares to each individual is made by the majority in the case of capitalists and rich landlords which is inequitable and therefore deserves to be deprecated.

19. For all these reasons I do not think that the new scheme should be introduced. Therefore I have to recommend that the present irrigation policy should be continued with necessary modifications and changes as per my recommendation.

#### FUTURE CONSTRUCTION PROGRAMME.

(Chapter VII of the Report.)

##### *Konkan.*

20. It is true that the abundance and the regularity of the rainfall in Konkan is such that measures of husbanding or storing it on a large scale are unnecessary. However, there are many possibilities for providing irrigation facilities at a comparatively low cost. This tract is generally considered to be safe as it is very rarely visited with real famine. But one has to take into account that much of the rainfall is simply a waste, as it runs to sea in torrents in a very short time. Secondly, this tract has to depend on one crop only, namely, rice. It requires a regular and constant supply of water for its growth. But the rainfall in these parts is not evenly distributed in the seasons. Sometimes it starts very late. There are occasional breaks for a long time. This unequal distribution has very bad effect on the growth of rice crop. The average yield of rice does not go beyond annas eight to ten in a rupee. Consequently it will be a great help to agriculturists in this tract if the rainfall is supplemented by irrigation. It will be also possible to have second crops like val, chavaly, water melons, etc.

21. *Perennial Waters of Ulhas, Patalganga, and Kundalika.*—(i) These rivers have perennial water supply and the supply is so ample that it can not only irrigate the villages of these rivers but it can also meet the need of water for drinking purposes of a large area. There is also electric power available nearby, and water pumps can safely be installed for irrigation purposes. This scheme will not involve Government in any large expenditure. What is required is money for investment in the beginning for installing these plants. Government themselves can either do it and recover the whole amount from the beneficiaries of these schemes or Government can advance loans to co-operative societies specially formed for this purpose and can get back the money from the societies by instalment.

(ii) *Dams across the hills Streams.*—This might prove useful in certain places for the promotion of rabi cultivations.

(iii) *Construction of Small Tanks.*—Rice crops might be rendered a degree more secure by the construction of small tanks.

(iv) *Multiplication of Wells.*—In Thana and Kolaba districts valuable garden crops might be secured and extended by the multiplication of wells.

I recommend to Government to take in hand the Ulhas, Patalganga, Kundalika, schemes as early as possible. Government may bear in mind the fact that the Konkan tract has not received any benefits by way of water works so far.

## WATER RATE ASSESSMENT.

(Chapter IX of the Report.)

22. In determining the question of water rate assessment the various interests served and the basic principle of assessment applicable to them must be considered first. These interests can be safely grouped under three heads:—

(1) The indigenous agriculturists that is owner cultivators and tenant farmers ;

(2) The industrialist, i.e. commercialized agriculturists such as Sugar Factories and other capitalist bodies, Mills and Railways ;

(3) Municipalities.

These interests are distinct in character and defer widely from each other.

(1) *Water Rate Assessment for the indigenous Agriculturists.*

23. The irrigation works are designed for protective purposes. They are deliberately constructed with a view to protect and develop the food supply of the country (*vide* the Indian Commission Report of 1880—Page 108—and the terms of reference to the India Irrigation Commission of 1901-03). This food supply is dependent upon the indigenous agriculturists. By their very nature these irrigation works, as they are intended purely as insurance against famine, are not expected to be remunerative. Such being the case it is clear that the only consideration in fixing the charge for water from such works is what the indigenous cultivators are able to pay. This view has been supported by the Indian Taxation Enquiry Committee appointed by the Government of India in 1924. On page 102 the Report of this Taxation Inquiry Committee states "IT IS CLEAR THAT THE ONLY CONSIDERATION IN FIXING THE CHARGE FOR WATER FROM SUCH WORKS (PROTECTIVE WORKS) IS WHAT THE CULTIVATORS ARE ABLE TO PAY. IN OTHER WORDS THE RATES TO BE PERIODICALLY EXAMINED WITH REFERENCE TO PRICES AND OTHER CONDITIONS." I think the water rate assessment must be a fixed percentage of the extra net profit accruing to the cultivators due to irrigation. This may be called the Protective Rate.

24. Taking this as the basic principle for fixing water rates the question that next arises whether the present water rates are justifiable. In the opinion of the majority "the present rates are fully justified". But I do not agree with this view. The justification for the present rate in the Report is sought on the strength of Statement No. 9 incorporated in the Report. This statement has been compiled from information supplied by the Department of Agriculture. I submit that this statement is incorrect and fails to represent the real state of things. It is allowed to be incorporated in the Report without giving any opportunity to the Members of the Committee to verify its correctness by cross-examination. Besides its incorrectness has been pointed out and admitted by most of the Members of the Committee. This statement, incorrect as it is, fails to afford any basis for fixing the rates. Therefore, in the absence of any reliable data, I am unable to suggest as to what this fixed percentage exactly ought to be. But it may be decided by the Government if this sound principle is approved. Therefore, I recommend here that in future a reliable data as to cost of production both in dry and irrigated area should be obtained.

25. For the time being taking into consideration the most deplorable economic plight of the cultivators in the irrigated areas, on account of the world-wide agricultural depression ; and their sheer inability to afford or to procure capital

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for canal water, I recommend reduction in water rates for the indigenous agriculturists on the major canals as below :—

*Water Rates on the Major Canals.*

(Rates in Rupees per acre.)

Serial No.	Name of crops.	Present rates.		Rates proposed.		Remarks.
		Rs.	a p.	Rs.	a p.	
1	Sugar cane grown by ordinary irrigators on present basis.	45	0 0	30	0 0	For 12 months.
	On crop-rate basis .. ..	..	..	36	0 0	
2	One-third sugar cane Blocks—					
	Excluding overlap .. ..	..	..	12	0 0	
	Including overlap .. ..	..	..	14	0 0	
3	Other Perennials .. ..	22	8 0	15	0 0	
4	Hot weather seasonals—					* Same rates for both classes.
	Light .. ..	7	0 0	6	0 0*	
	Medium .. ..	10	8 0			
5	Kharif Seasonals—					
	Light .. ..	3	0 0	2	0 0*	
	Medium .. ..	4	8 0			
6	Rabi Seasonals†—					
	Light .. ..	5	0 0	4	0 0*	
	Medium .. ..	7	8 0			
7	Two Seasonals—					Provides for irrigation throughout the Kharif and Rabi seasons.
	Light .. ..	8	0 0	6	0 0*	
	Medium .. ..	12	0 0			
8	Two Seasonal Blocks—					Do. do
	Light .. ..	5	0 0	5	0 0*	
	Medium .. ..	7	8 0			
9	Pre-seasonal Watering—					Same rates for both classes of crops. Pre-seasonal watering should commence on 15th April.
	Light crops :—					
	From 25th April .. ..	5	0 0	3	0 0	
	From 5th May .. ..	4	0 0			
	From 15th May .. ..	3	0 0			
	Medium crops :—					
From 25th April .. ..	7	8 0	3	0 0		
From 5th May .. ..	6	0 0				
From 15th May .. ..	4	8 0				

\* Classification of seasonal crops into light and medium to be discontinued.

† Rabi season to begin on 15th September and water should be available as of right from 15th September.

*Post-Seasonal Waterings.*—(1) Two post-seasonal waterings should be allowed to monsoon crops if demanded at Re. 1 per watering and if more than two post-seasonal waterings are taken full Rabi seasonal charges should be levied.

(2) Two post-seasonal waterings should be allowed in hot weather at Rs. 1-8-0 per watering if demanded and if more than two post-seasonal waterings are taken full hot weather seasonal charge should be levied.

*Nira Right Bank Canal.*

For the proper and speedy development of Nira Right Bank Canal the rates given above in respect of seasonal as well as two seasonal crops should further be reduced by 25 per cent. for a period of six years. For perennials other than sugar-cane Rs. 10 per acre besides free waterings should be given for green manuring.

*Food and Fodder Crops.*—(1) In case of crops which produce both food and fodder such as Jowar, Bajri, Maize, etc., it is necessary in view of the recurring fodder famines, to offer some inducement to the irrigators to go in for such crops. Therefore water rates for such crops in Kharif and Rabi seasons should be at Rs. 1-8-0 and Rs. 3 respectively. In Kharif season water for fodder crops should be made available for as wide an area as possible even at a still lower rate.

(2) *Water Rate Assessment for Industrialised Concerns.*

26. It is an admitted fact that "only a few capitalist bodies like the Sugar Companies and some enterprising professional irrigators like the Saswad Malis have hitherto taken the fullest advantage of the facilities available". Their undertakings are purely of commercial nature. They run business concerns with an eye of profiteering. This runs counter to the protective purposes of the irrigation works. So long they are allowed, I think commercial principle must be made applicable to them in fixing water rates. Water should be disposed of to the best advantage so as to bring in as great a revenue as possible. Here fixing of the price of water ought to be of the nature of the commercial transactions and should be regulated mainly by the cost price of water. In the case of sugar factories there ought to be another consideration in fixing the rates as the guaranteed supply of water is for 30 years. The factories ought to pay a larger share of their profits. Government should take this as basic principle of water rates I, therefore recommend to Government to give recognition to this principle. For the time being I recommend the following rates for the factories. What is applicable to factories ought to be made applicable to other industrialized concerns. But as the "gur" manufacturing is passing through a hard period I agree with the rates proposed by the majority. This should be taken as a concession for 3 years only. Thereafter rates may be increased.

WATER RATES FOR SUGAR FACTORIES.

(Rates in Rupees per acre.)

	Present Rate.	Rate Proposed.	Remarks.
Sugarcane grown by sugar companies on present basis.	45	60	
On crop-rate basis .. ..	....	80	For 12 months.

The commercial principle in future should be made applicable to Mills and Railways.

(3) *Water Rate Assessment for Municipalities.*

27. The protective principle should be applicable so far as the supply of water for drinking purposes is concerned. The present rates may not be disturbed. The Municipalities which are willing to provide their own water works may be allowed in future to do so if they wish.

*Minor Works.*

28. On minor works the reduction of water rates should be on similar lines. Another consideration in the case of minor works is, the nature of the source of supply. This may be more or less secure or precarious as the case may be. Therefore, all round lower rates ought to be fixed where the chance of full crop is less. Innumerable grievances were presented to the Committee by Irrigators on these minor works during its tour. These grievances in short are :—

- (1) That timely waterings are not given and as a consequence crops suffer heavily.
- (2) That full charges are recovered for insufficient watering of the crops.
- (3) That irrigators are bound by special conditions with a view that they should not complain for insufficient watering and that they should pay full charges.
- (4) That rates are high.
- (5) That coercive methods are adopted in recovering water dues.

29. These grievances are real and should be immediately redressed. There is no justification whatsoever to recover from the irrigators full charges for insufficient watering. In fairness there must be a proportionate reduction. The rate for rice in Gujarat is Rs. 7 per acre. Irrigators there usually get only one and very rarely two waterings for which Rs. 7 are charged. This works great hardship. So the rate should be reduced to Rs. 4 as requested by Mr. Mehta, M.L.A., a responsible and representative witness on behalf of the irrigators.

## OTHER MODIFICATIONS.

(Paragraph 72 of the Report.)

30. With regard to other modifications which are recommended by the majority I beg to recommend following changes and additional suggestions :—

Paragraph.	Item
72 (1) (i)	Available surplus water in the hot weather should be given to all irrigators free of charge.
72 (1) (ii)	In the case of cultivators using mots the rates for lift irrigation should be one-third of the flow rates.
72 (1) (iii)	Rates for Rawalgaon Sugar Company.

The majority recommend that "It would not be fair to enhance the rates charged to Rawalgaon Sugar Co., during the guaranteed period of supply". I do not agree with this view. The special rate proposed for this factory is Rs. 28 as against Rs. 45 in the case of other factories and on crop-rate basis Rs. 37 as against Rs. 60 for other factories. The reasons given for the preferential rates are :—

- (1) That it would not be fair to enhance the rate as Government have secured a regular customer.
- (2) That the cane acreage guaranteed is considerably below an economic area for a sugar factory.

It should be borne in mind that the temporary concessions to cane growers outside factory area and for other perennials on the Girna Canal are simply consequential. In my opinion no preferential treatment should be given to the Sugar Factory. The factory belongs to one of the members of the Irrigation Inquiry Committee. The guaranteed basis annual cane area to the Company is 1,400 acres and this concession means on present basis Rs. 23,800 yearly gain to the Company and loss to Government revenue up to the end of guaranteed period of 30 years. To give yearly such a big concession to the Factory would be extremely unfair to other factories in whom also Government have "secured regular customers". The argument that the guaranteed cane acreage is an uneconomical unit is not sound and convincing. No shrewd businessman can start a concern and can go on

running it at a loss from year to year. The Factory has been paying Rs. 43 per acre and it is unintelligible to understand why this rate should be reduced. As the factory is an individual concern and is set up with an eye of profiteering Government should, as a business proposition, apply commercial principle in fixing water rates. It should be also remembered that in shallow soil certain new varieties of cane such as E K 28, give better returns. Besides one acre of sugar cane requires ten times more water than that required for ordinary seasonal crop. Then if for ordinary seasonal crop the Girna Canal cultivator is expected to pay Rs. 4 or Rs. 5 for Rabi crop according to the recommendations of the majority, why the Factory should not pay 10 times more? In due course full development of the canal is anticipated. Irrigators will utilise the whole supply of the canal. If it is suggested that on account of the uneconomical unit the Factory is running at a loss it would be far better for Government to leave it to its own fate. I am strongly against this preferential rate and I recommend Government should not sanction it.

*Paragraph 72 (ii).—Wells close to distributaries.*—No charge should be levied even if a well is within hundred feet from a distributary.

*Paragraph 72 (iii).—Notified Channels.*—(1) In the case of bunds constructed by the villagers no charge should be taken for the use of water. (2) In the case of lift irrigation from such channels no charge should be taken. To levy a charge would be a sheer injustice especially when canal water is not made available to those who utilise waste water.

*Paragraph 72 (iv).—Miscellaneous.*—(2) No charge should be levied on any kind of trees watered from notified channels.

*Water supply to Gokak Mills.*—The Gokak Mills Co. Ltd., is a foreign concern. Soon after the construction of Dhupdal reservoir, i.e., within one year Government have entered into an agreement for 99 years to supply water to these mills. "The Mills pay only about 1/7th of what the same volume of water would fetch if used for irrigation." Besides it was revealed in evidence that Government under the agreement required to pay rebates to the Company if less than the fixed quantity of water is supplied. It was also revealed that Government have recently revised the agreement. This revised agreement though asked for perusal, was not supplied. Probably it contains something more in favour of the Company. The agreement with the Company is a glaring example of indiscriminate use of power by Government in favour of a foreign concern. I think the present responsible Government should go into the question of legality of the agreement and its binding nature. Personally I think no Government can bind the hands of future Governments by entering into contractual obligations with a private concern which is on the face of it highly detrimental to the interest of the general public at large. If Government cannot legally secure release from the contractual obligations then Government is in duty bound to increase the supply of water by raising the dam so that grievances of the cultivators on the canal might be removed. So far as the cultivators on this canal are concerned the officers in charge make it their special concern to bind the cultivators by special conditions to pay full charges for insufficient watering to their crops. In fairness, as their crops suffer from want of water, they also should get rebates. The cultivators on this canal have been complaining for shortage of water to their maize crop,—the main crop on the canal. Out of the area irrigated more than half is occupied by it. The crop requires water in the month of January but no water is allowed after 15th December. As a result this crop very often withers away. Some 4 or 5 years back Government used to give water even after 15th of December. Since then it is stopped. This is probably done with a view to meet the demand of the Mills under the revised agreement.

In Kharif season the river water overflows the dam. Therefore, the Government should see that this water is made available to the cultivators for their fodder crops at a concession rate.

#### *Urgent necessity of Reduction of Rates.*

31. One of the main objects in appointing the present Irrigation Committee, so far as I can gauge, is to give relief to the indigenous irrigators in their distressed condition. Real relief lies in the reduction of rates. It was due long ago. The Kamat

Committee was aware of it but it was outside the scope of their enquiry. Therefore, I recommend to Government to introduce the rates recommended above forthwith.

#### SUGAR FACTORY IRRIGATION.

##### (Chapter X of the Report.)

###### *Water-rate.*

32. I do not agree with the majority recommendation. In the first place Rs. 45 is below minimum. At present gur manufacturers are seen willing to pay even Rs. 60 per acre. Secondly, this being commercial business, commercial principle ought to be made applicable. Fixing of the price for the water is of the nature of the commercial transaction and should be regulated mainly by the cost price of the water. As the majority have admitted that sugar factories have taken the fullest advantage of water facilities there is no reason why factories should not pay more. The minimum should be Rs. 60 excluding over-lap. I think Government are entitled on the ground of their guaranteeing the supply of water for 30 years to fix the rate on a higher scale. Therefore I recommend that Rs. 60 should be fixed as the minimum; the Rawalgaon Sugar Farm Limited should pay the same rate. No discrimination should be shown to it.

###### *Drainage.*

33. I do not agree with the majority views. Water-logging and salt-efflorescence in and adjoining factory areas according to the evidence of experts before us is due to perennial irrigation. Percolation or seepage from canals or distributaries is no doubt one of the causes of water-logging and salt-efflorescence, but in the case of factory areas it is not difficult to ascertain what damage is exactly due to canals. It was the duty of sugar companies before starting work to point out and to ascertain the damage due to canals. Therefore all costs of drainage—whether main, subsidiary or relief—should be borne by factories. Government policy should be to design, construct and control drainage. Drainage is a highly specialised class of work which can only be done by specially trained staff. Government control is necessary to protect local irrigators who own low-lying lands, especially adjoining lands, which are very liable to damage by the company irrigation. The main object of sugar companies, being to make money and hence to spend as little as possible on land drainage, they are the last people to whom the interests of the local irrigators which are in direct opposition to their own should be entrusted.

###### *Leasing of Lands by the Companies.*

34. I am sorry to state that the grievances of the local owners and remedies for the same have not found place in the report of the majority. In our tour whenever we visited factory areas local owners and tenants have very graphically narrated their tales of woes and miseries inflicted by the factory owners. All sorts of ways such as inducement, threats and deceitful practices have been resorted to by the factory owners in their deal with the owners of lands. These methods are in no way better than those followed by money-lenders generally. The terms of the agreements, which are usually for 30 years, are most unjust and unfair. Without any cause whatever, it is seen, lands are released while pressure is brought on those who are not willing to lease their lands in various ways. It is also seen that certain lands are not at all taken on lease even though the owners are willing. Government too have not failed to contribute their quota. In their zeal to see canals run on sugarcane basis, Government have indirectly helped the factories. They have indirectly introduced compulsion on the farmers by stopping water supply to them. That is simply an undue interference with private rights.

The discontent of the farmers in the factories areas is growing in volume, and assuming a very serious aspect. If the just rights of the farmers are not safeguarded in time this discontent may grow to such an alarming extent that it may lead to agrarian revolt and may shake the foundations of the factories.

35. Therefore, I very earnestly recommend to Government :—

(1) Not to bring pressure directly or indirectly on the local farmers compelling them to lease their lands to the factories.

(2) To allow local farmers full direct facilities of water for growing any kind of crop they like.

(3) To appoint a committee to revise all the agreements so as to secure fair and equitable terms to those who have already leased their lands to the factories and also to those who might be willing to lease.

(4) To compel the factories to accept the lands released by them without any justification. This can be done by indirectly compelling the factories.

(5) To secure to those farmers, who are willing to sell their sugarcane to the factories, a fair price for the cane. The minimum price fixed for the cane should not in any case be less than the cost of cultivation *plus* some margin of profit.

#### *Acquisition of Land for laying Trolley Lines.*

36. Acquisition of land under the Land Acquisition Act is wrong in principle. The Indian Sugar Committee, 1920, have disapproved of such procedure.

#### *General.*

37. (I have already stated in dealing with protective purposes of the canals that there has been a drift in the irrigation policy of Government. This policy of "Get as much as you can" from the canals with a view to make them remunerative runs counter to the protective purposes of the canals. Canals are not meant for commercial purposes.) Besides, the future of sugar factories in the Deccan is gloomy. The factories in the Deccan cannot compete with U. P. factories obtaining cheapest cane. The cost of growing cane is comparatively very high. Besides possible developments of factories in the Nizam and Mysore States should also be taken into consideration. One more fact which deserves attention is the damage to lands by heavy irrigation, the evil of water-logging and salt-efflorescence is a menace. Appendix No. 7 of the Report points out the serious nature of the evil. Excluding the adjoining low-lying areas the damage to lands within factory areas has increased by leaps and bounds within four years. In 1932-33 the estimated damage was 3,929 acres. It went up to 7,135 in the year 1936-37.

38. The important question that deserves emphasis is the Government policy. Are we to pursue a policy which directly goes against protective purposes of canals? The canals are meant to develop food and fodder supplies of the country with a view to diminish the severity, extent and costs of famines. Therefore, the protective irrigation works are not expected to be remunerative. (The Indian Irrigation Commission, 1901-03, had opined that the protective irrigation works in the Deccan cannot be expected to yield more than 2 per cent. return on the capital invested.) And it is highly desirable not to expect more returns than what was originally contemplated. This contemplated return will materialise in the near future if the canals are developed on proper lines. The present most deplorable economic conditions of the indigenous agriculturists and their inability to pay for water must be taken into consideration for the time being. Consistent with the policy of maximum economic benefits of the indigenous agriculturists it is possible in the near future to get the contemplated return. Therefore every effort should be made to discourage running of the canals on cane basis.

39. I fully appreciate the viewpoint of Mr. U. N. Mahida, I.S.E., Executive Engineer, Research Circle, in his note which he submitted to the committee; I recommend to Government to investigate the possibility of the development.

f the canal system on seasonal and rabi basis. Here Mr. Mahida's scheme may be quoted with advantage and in his words :—

“ It would be desirable to preserve land in a fit condition for cultivation and it may be sound in principle to postulate that land is a national asset and all efforts should be made to preserve it in a condition fit for producing crops. But it is not always possible to incur large expenditure on Land Drainage Schemes for a canal system, particularly when canal revenues are low. These conditions suggest the investigation of the possibility of the development of a canal system on a Seasonal and Rabi basis.

We will then be utilising almost the whole of available storage by the end of the Rabi season which means minimum losses, particularly losses due to the evaporation from storage. Further, this plan would reduce the existing damage, specially water-logging, and preclude any possibility of future damage. Direct protection by flow irrigation will be spread over a very wide area ; food and fodder resources of the countryside would be developed to a large extent and neighbouring areas receiving some measure of protection, as this system would result into larger food and fodder supplies being available. Also, a larger tonnage of farmyard manure will then be available ; (requirement of this manure per acre of seasonal irrigation is low ; but the total area under irrigation will be large). It is not suggested that cane and perennial irrigation should be prohibited altogether but it is proposed to develop perennial irrigation on wells. Guaranteed perennial irrigation by flow should be eliminated gradually or stopped entirely, if possible, at the next block revision for selected canal system.

Development of perennial irrigation on wells in canal tracts will—

- (1) reduce the existing damage and water-logging ;
- (2) preclude the possibility of further damage ;
- (3) save expenditure on costly drainage schemes ;
- (4) materially improve the economic life of irrigators.

Sufficiently large and suitable areas are available where 'lift' will be economical and cost of new wells that may be found necessary quite low. Areas under perennial irrigation on wells will get canal water as available, during monsoon and rabi. They will thus be enjoying the facilities of obtaining irrigation water, whenever the irrigation channel serving the area is running for Monsoon and Rabi crops. Channels may not be specially run for this class of irrigation.”

#### WATER-LOGGING OF LANDS.

(Chapter XI of the Report.)

40. The main factors affecting the sub-soil water table in the irrigated tracts are :—

- (1) Percolation and seepage from the canal and distributaries.
- (2) Perennial irrigation of sugarcane.

It should be borne in mind that it is not the ordinary four months or eight months irrigation which causes water-logging. It is perennial irrigation which causes it.

*Water-logging of Lands for which Government Canals are wholly responsible.*

41. I am of opinion that wherever water-logging or salt-efflorescence is due to percolation or seepage from canal distributaries, Government should bear the full cost of drainage and reclamation of such lands. It should be remembered that Government have so far collected land revenue assessment from the owners of such lands without any justification and at the same time putting them to serious yearly losses in the shape of produce. I think Government are both morally and legally responsible to compensate the owners of such lands and, therefore, bear the full cost of drainage and reclamation.

## GENERAL.

(Chapter XV of the Report.)

*The Nira Right Bank Canal.*

42. The Nira Right Bank Canal is constructed with the object of providing facilities of irrigation to one of the worst famine-stricken parts of this Province, namely Sholapur District. The reasons why the Nira Right Bank Canal has not yet properly developed are :—

- (1) Lack of propaganda in training the irrigators in the art of irrigation.
- (2) Want of adequate supply of manure.
- (3) The irrigation staff is not well versed in the art of irrigation management, as the staff employed on the construction of the canal is doing water distribution.
- (4) Extreme poverty of the cultivators.
- (5) The rigidity with which rules are enforced.

It should be remembered that the Nira Right Bank Canal came into operation after the boom period. The irrigators went in for irrigated cultivation but as this synchronised with the depression period, they could not pay the irrigation dues. Their lands had, therefore, to be sold and resold from year to year without any hope of further development of irrigation.

*The Nira Right Bank Canal and the Mhaswad Tank.*

43. As a part of the Nira Right Bank Canal project the Mhaswad Canal was proposed to be remodelled. This remodelling work was completed by about the year 1932. The reason for this change was the uncertain condition of the rainfall which supplied water to the Mhaswad Tank. It was also thought that the change in the course of distributary and outlets would result in some economy of water, as the new course was to be as straight as possible. The capacity of the course was also to be increased. The original Mhaswad Canal was designed for 100 cusecs only. So when the work of the remodelling of Mhaswad Canal Branch No. 3 was started it was designed to accommodate a flow of 100 plus 300 cusecs. It was proposed to supplement Mhaswad Tank water by 300 cusecs from the Nira Right Bank Canal. Water had been supplied ever since the completion of the remodelling works from the Nira Right Bank. But this supply of water has been abruptly stopped a year ago to the detriment of the irrigators under Branch No. 3. Mr. Murthi (the Executive Engineer of Sholapur) has admitted in evidence before the Committee that as a consequence of stoppage of water from Nira Right Bank irrigators' crops have severely suffered. Therefore, I recommend to Government that the Mhaswad Tank water should in future be supplemented by the water from the Nira Right Bank Canal for all kinds of crops in the interests of irrigators under Branch No. 3. I am also in favour of constructing tail tanks for the Nira Right Bank Canal for storing surplus monsoon water which will indeed serve a very useful purpose.

44. Mr. Aitken (Superintending Engineer) and one of the members of the Committee has submitted an important note on the Nira Right Bank Canal to the Committee. Therein he emphasises the necessity of constructing the Vir Dam. I do recommend to Government to take up this work in hand as early as possible. The Bombay Government is bound to respect the agreement with Phaltan Durbar. Under the agreement Government are required to supply water from the Nira Right Bank Canal for 21,000 acres to this State. At present only 5,000 acres are being irrigated. The demand might increase at any time and will have to be met. This cannot be done without restricting water to the irrigators in Sholapur District. Therefore, the necessity for raising the Vir Dam is obvious.

J. G. MORE,  
M.L.A.,

Member, Irrigation Inquiry Committee.

16th May 1938.



## NOTE BY THE CHAIRMAN ON Mr. J. G. MORE'S MINUTE OF DISSENT.

Mr. More is alone among his colleagues in thinking that no change of policy in the administration and operation of irrigation works is necessary. He considers that the existing practices should continue with some modifications suggested by him.

✓2. The Member holds the view that the object of the protective irrigation works is to promote and develop food and fodder crops but that latterly there has been a drift in policy in favour of capitalists.

The encouragement of mixed crops for which there is demand has always been the policy of Government in the Irrigation Department. A reference to Statement No. 6 (Appendix II of the Report) will show that the total sugarcane area under the proposed new scheme will be 60,715 acres and the total area according to the original project estimates was 57,500 acres. It will be seen there will be no material increase in the cane area.

Sugar factory irrigation was recently encouraged by Government in order to make good the serious loss of cane area due to the fall in the price of gul arising from unusual outside competition. There have been minor adjustments but no departure as such from the original policy as understood by Mr. More.

✓3. Mr. More is opposed to the Block System and also to the new scheme under which the irrigable area in each village and the area assigned to each cultivator in the Blocks will be permanently fixed. The Member quotes the Indian Irrigation Commission of 1901-03 in favour of the policy advocated by him. But he does not seem to be aware that the Block System was not only approved but its introduction was pressed upon the attention of the Bombay Government by the same Commission through the Government of India (*vide* Report of the Commission, paragraphs 291 of Part I and 165 and 167 of Part II). The new scheme will be a logical development of the principles of the system and will be in a more complete manner fulfilling the intentions of the Indian Irrigation Commission.

✓4. Two other suggestions of Mr. More are that sugarcane irrigation should be discouraged, and that guaranteed perennial irrigation should be eliminated gradually.

A reference to the Irrigation Administration Report for the year 1934-35 will show that the value of irrigated crops under first class works was Rs. 143 lakhs, of which that of the sugarcane crop alone amounted to Rs. 90 lakhs or 63 per cent. In the same year the total canal revenue was Rs. 26 lakhs to which sugarcane contributed Rs. 13 lakhs or 50 per cent.

✓A moment's reflection will show that the elimination of cane will strike at the root of the income of the cultivators and will bring about the financial ruin of the irrigation system as a whole.

✓5. Mr. More assumes that the Block System has failed. There are defects in the blocks as they exist at present due to non-enforcement of concentration which will now be an integral part of the new scheme. The Government Engineers do not seem to be opposed to it and the Kamat Committee have also favoured its retention. There is, however, opposition to the system from some cultivators because it will introduce restrictions on their freedom to take up a block or give it up at will according to market fluctuations and their own caprice or convenience. Under the new system the *bagait* area will be fixed permanently and the water-rate will also be fixed for a term of six years or more. Cultivators who are interested in the old ways of doing things or who have been profiting by the old order naturally resent any changes.

✓6. At the present time on account of outside competition irrigation is entering upon a new phase and profits are dwindling. For profitable irrigation in future all the stored water must be used for crops. Production should be also increased by strict economy in the use of water. If losses are to be avoided, some of the present haphazard methods will have to be abandoned. Canal operations should

be specialised, greater discipline should be enforced, and a higher degree of co-operation and co-ordination fostered between cultivators, canal officers and the business public.

7. What I have stated in this note are my own views. I have not thought it necessary to ask the Committee to meet again after they had signed the Report because I feel that none of the Members would be willing to support proposals which may lead to such calamitous results as those referred to in paragraph 4 above. It is a matter for regret that Mr. More who had ample opportunities of bringing forward his questions at Committee meetings failed to do so, but announced his intention of writing a minute of dissent at the last moment when the fair copy of the Report came up for signature.

Bombay, 20th May 1938.

M. VISVESVARAYA,  
Chairman,  
Irrigation Inquiry Committee.

## APPENDIX I.

## LIST OF SOME OF THE WITNESSES EXAMINED.

1. Mr. C. C. Inglis, C.I.E., B.A., B.A.I. (Dub.), M.Inst.C.E., I.S.E., Director, Central Irrigation and Hydro-dynamic Research Station, Poona.
2. Mr. S. B. Tyabji, A.M.Inst.C.E., M.I.E. (Ind.), J.P., Superintending Engineer, Northern Circle.
3. Mr. V. S. Bhide, B.A., LL.B. (Cantab.), Bar-at-Law, I.C.S., Collector of Dharwar.
4. Mr. D. MacLachlan, I.C.S., Collector of Ahmedabad.
5. Mr. E. W. Trotman, I.C.S., Collector of Poona.
6. Mr. J. G. Simms, M.A. (Oxon.), I.C.S., Collector of Ahmednagar.
7. Mr. P. K. Shinde, B.A., I.S.E., Executive Engineer, Dharwar Division.
8. Mr. L. E. Greening, M.Inst.C.E., M.Inst.Struct.E., I.S.E., Executive Engineer, Belgaum Division.
9. Mr. C. G. Kale, B.A., B.Sc., B.E., A.M.I.E. (Ind.), I.S.E., Executive Engineer, Poona Irrigation Division.
10. Mr. E. P. Little, I.S.E., Executive Engineer, Nira Right Bank Canal Division.
11. Mr. U. N. Mahida, B.E., I.S.E., Executive Engineer, Irrigation Research Division.
12. Mr. K. V. Joshi, M.Ag., Deputy Director of Agriculture, North Central Division.
13. Mr. N. S. Joshi, B.E., A.M.I.E., Assistant Engineer attached to the office of the Superintending Engineer, Deccan Irrigation Circle.
14. Rao Sahib J. T. Desai, Assistant Engineer in charge of the Hathmati and Khari Cut Canals.
15. The Senior Inspector, the Bombay Provincial Co-operative Bank Ltd., Baramati Division.
16. Mr. H. P. Metha, M.L.A.
17. The President of the Poona City Municipality.
18. The President, Godavari Canal Irrigators' Association.
19. The President, Pravara Canals Bagaitdars' Sangh.
20. The President of the Nira Left Bank Canal Irrigators' Association.
21. The Secretary of the Mutha Canals Irrigators' Association.
22. The President of the Ashti Tank Irrigators' Association.
23. Representatives of the Belapur Company Ltd., the Saswad Mali Sugar Factory Ltd., the Phaltan Sugar Works Ltd, and the Maharashtra Sugar Mills Ltd.
24. Group of Representative Irrigators from the Nira Right Bank Canal and the Mhaswad Tank.
25. The President, Taluka Development Association, Gokak, and Representative Irrigators from the Gokak and Dharma Canals.
26. Mr. Zodge, Vice-President, Girna Canal Bagaitdar Sangh.
27. Mr. Mathurbhai Dungarbhai of Aslali, President, Irrigation and Revenue Relief Committee.
28. Representative Irrigators from the Hathmati and Khari Cut Canals.
29. Rao Sahib S. T. Jachak of Baramati, and Mr. Annasahib Khore, President of the Taluka Development Agricultural Association, Indapur.
30. Rao Sahib N. S. Borawke of Kopergaon.

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**APPENDIX II**

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**STATISTICAL STATEMENTS AND DATA**

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## STATEMENT No. 1

## Cultivation, Irrigation, and Financial Results of Irrigation Works in the Provinces of British India for 1934-35

Serial No.	Name of Province	Total area sown in the Province	Area irrigated		Financial results of works for which capital and revenue accounts are kept		Estimated value of crops raised on all areas receiving State irrigation
			Under all Government irrigation works	Under irrigation works for which capital and revenue accounts are kept	Capital outlay	Net percentage return	
1	2	3	4	5	6	7	8
		Acres	Acres	Acres	Rs. Crores	Per cent	Rs. Crores
1	Madras .. ..	37,539,000	7,302,000	2,559,143	19.41	6.13	20.75
2	Sind .. ..	4,192,000	4,069,000	3,554,250	30.21	..	6.21
3	Bombay .. ..	26,405,000	388,000	213,603	10.68	1.36	2.43
4	Bengal .. ..	27,921,000	130,000	103,332	1.97	..	0.10
5	United Provinces ..	35,033,000	3,827,000	3,844,288	26.18	4.19	18.43
6	Punjab .. ..	29,833,000	*10,485,000	11,137,119	34.52	13.42	32.23
7	Bihar and Orissa ..	29,547,000	853,000	852,727	6.28	3.80	3.50
8	North West Frontier Province	2,555,000	410,000	409,572	3.02	3.67	0.93
9	Central Provinces ..	20,809,000	323,000	297,224	6.85	0.14	1.13
10	Rajputana .. ..	446,000	27,000	26,537	0.35	1.98	0.06
11	Baluchistan .. ..	410,000	20,000	20,533	0.35	.	0.03
12	Burma .. ..	18,164,000	2,054,000	710,910	4.08	3.12	5.31
	Total ..	232,854,000	29,888,000	23,729,243	143.90	5.08	91.11

\* In addition 663,391 acres were irrigated on the Indian State channels of the Western Jumna Canal, the Sirhind and the Ghaggar canals.

## STATEMENT No. 2

## Cropped and Irrigated Areas in the Province of Bombay

Year	Tract	Gross area	Culturable area	Cropped area	Area irrigated				
					New irrigation tanks and canals	Older tanks and canals	Wells	Other sources	Total
1	2	3	4	5	6	7	8	9	10
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1920-21 ..	Gujarat ..	6,511,080	5,082,276	3,842,134	12,350	12,959	93,512	3,404	122,315
	Deccan ..	23,888,420	17,147,930	12,550,907	233,220	55,089	462,970	2,890	754,169
	Karnatak ..	9,552,695	8,017,091	6,618,393	15,595	88,778	60,694	7,720	172,788
	Konkan ..	8,767,013	4,124,208	2,114,429	..	18,085	24,811	13,239	56,134
	Total ..	48,719,208	34,371,505	25,125,863	261,255	174,911	641,987	27,253	1,105,406
1925-26 ..	Gujarat ..	6,526,661	5,088,180	4,202,776	17,654	16,306	87,419	14,152	135,531
	Deccan ..	23,888,101	17,181,369	14,530,405	208,133	47,347	351,903	2,765	610,148
	Karnatak ..	9,532,399	8,008,204	7,027,590	15,748	99,302	59,976	12,998	188,024
	Konkan ..	8,765,687	4,121,875	2,065,543	..	24,091	25,109	12,996	62,196
	Total ..	48,712,848	34,399,626	27,826,314	241,535	187,046	524,407	42,911	995,899
1930-31 ..	Gujarat ..	6,528,913	5,067,892	4,453,100	25,298	8,242	85,452	2,441	121,433
	Deccan ..	23,888,216	17,230,393	15,413,870	215,829	81,906	492,002	2,790	792,527
	Karnatak ..	9,538,228	8,026,651	7,169,875	15,770	98,740	79,194	8,701	202,406
	Konkan ..	8,764,778	4,142,709	2,095,747	..	26,154	17,425	18,001	61,580
	Total ..	48,720,135	34,467,645	29,132,592	256,897	215,042	674,073	31,933	1,177,945
1935-36 ..	Gujarat ..	6,525,819	5,078,807	4,602,561	14,075	6,429	78,729	2,247	101,480
	Deccan ..	23,888,984	17,277,969	15,606,553	209,194	99,621	546,625	4,456	859,896
	Karnatak ..	9,539,851	8,025,077	7,041,353	13,380	92,426	87,015	6,783	199,604
	Konkan ..	8,766,261	4,166,935	2,122,578	..	24,584	19,998	14,916	59,498
	Total ..	48,720,915	34,548,788	29,373,045	236,649	223,060	732,367	28,402	1,220,478

Notes.—(1) Total area of Province—76,126 square miles ; total cultivated area—294 million acres ; area irrigated by new irrigation works—0.24 million acres.

(2) Figures of area irrigated as shown in columns 6 to 10 for 1930-31 and 1935-36 include double cropped areas. Total for the Province in column No. 10 excluding double cropped area is 1,036,021 acres for 1930-31 and 1,061,316 acres for 1935-36.

## STATEMENT No. 3

## Rainfall at Selected Typical Stations

Year	Gujarat		Deccan								Konkan	Karnatak		
	Ahmedabad	Godhra (Panch Mahals)	Canal Tracts				Other areas				Alibeg	Belgaum	Dharwar	* Bijapur
			* Chitali (Godavari R. B. Canal)	* Songson (Pravara R. B. Canal)	* Baranati (Nira L. B. Canal)	Phaltan (Nira R. B. Canal)	Jalgaon	Satara	* Poona	* Ahmednagar				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Rainfall in inches during the 12 months ending 31st May of each year														
1906-07	36	48					34	35	21	24	66	45	38	29
1907-08	33	37					23	47	89	15	95	51	40	13
1908-09	33	42	Not available	Not available	18	Not available	32	44	24	25	70	47	22	18
1909-10	31	44	Not available	Not available	28	Not available	35	34	17	19	78	47	20	18
1910-11	24	52	Not available	Not available	23	Not available	33	45	32	38	91	39	27	26
1911-12**	10	7			12		20	22	18	18	55	42	26	13
1912-13	41	48			14		26	53	29	10	76	74	41	19
1913-14	37	56	16	23	15		30	30	24	23	87	39	27	16
1914-15	39	46	21	27	17	17	41	57	35	24	102	90	50	25
1915-16	12	16	30	39	17	20	31	50	39	36	95	59	28	24
1916-17	31	39	39	34	29	32	34	37	28	47	121	49	33	89
1917-18	47	59	19	21	25	19	25	40	35	35	127	51	39	31
1918-19**	8	16	6	8	12	10	15	17	14	9	25	35	25	7
1919-20	33	47	25	29	20	17	36	32	29	23	80	47	42	18
1920-21	20	23	6	12	9	15	12	35	23	9	43	51	25	13
1921-22	43	56	13	10	17	13	32	37	19	23	80	51	32	23
1922-23	33	38	21	21	20	25	24	46	23	19	77	50	34	18
1923-24	12	21	11	13	10	10	33	28	14	18	90	49	25	10
1924-25	22	33	17	17	15	14	25	32	21	21	75	53	38	17
1925-26	22	24	10	13	13	10	21	28	15	27	58	42	32	19
1926-27	51	53	16	12	15	10	23	37	31	17	78	48	30	15
1927-28	77	89	24	17	23	20	30	44	24	24	86	44	35	19
1928-29	36	51	22	25	24	20	29	34	24	38	90	45	33	30
1929-30	24	41	15	7	23	16	22	43	20	17	73	42	30	25
1930-31	32	58	22	28	16	18	43	54	30	30	93	44	32	19
1931-32	39	59	21	19	27	24	55	56	26	31	101	59	37	27
1932-33	43	40	28	24	29	32	32	61	34	34	83	81	48	34
1933-34	48	52	32	27	26	19	40	47	31	33	85	64	43	22
1934-35	29	50	19	21	17	24	49	40	21	33	113	49	32	21
1935-36	23	38	16	24	19	24	31	29	24	27	90	36	28	24
Average	32	42	20*	20*	19*	19*	31	39	25*	25*	80	51	33	21*

Note.—Stations and years of scanty rainfall are marked with single and double asterisks respectively. The heaviest fall at each station is shown in bold figures.

**STATEMENT**  
**Progress of Irrigation and Revenue on**

Year	Nira Right Bank Canal			Nira Left Bank Canal			Mutha Canals			Pravara Canals		
	Area irrigated		Revenue	Area irrigated		Revenue	Area irrigated		Revenue	Area irrigated		Revenue
	Sugar cane	All crops		Sugar cane	All crops		Sugar cane	All crops		Sugar cane	All crops	
	2	3	4	5	6	7	8	9	10	11	12	13
Acres	Acres	Rs. Lakhs	Acres	Acres	Rs. Lakhs	Acres	Acres	Rs. Lakhs	Acres	Acres	Rs. Lakhs	
<b>Results anticipated according to respective</b>												
(Project of 1922)			(Project of 1922)			(Project of 1896)			(Completion Report of 1937)			
20,000*	148,500*	25.47*	9,000*	79,000*	16.12*	5,800	10,800	3.95	10,000	52,000	7.81	
<b>Actual area irrigated and Revenue</b>												
1910-11			7,541	37,962	3.19	5,058	11,153	3.96	271	2,628	0.14	
1911-12			9,439	39,227	4.36	5,696	14,029	4.34	604	7,977	0.18	
1912-13			7,825	52,399	5.03	4,326	13,062	3.60	496	20,747	0.27	
1913-14			9,043	76,683	5.43	4,558	16,665	3.92	487	4,243	0.43	
1914-15			6,741	54,133	5.88	4,670	12,298	3.90	636	3,884	0.16	
1915-16	The system came into operation in 1924-25.		8,491	50,859	5.55	4,179	11,524	3.67	1,023	4,726	0.19	
1916-17			8,700	34,228	4.97	5,075	10,402	4.27	1,330	2,278	0.22	
1917-18			10,133	34,451	4.26	5,530	14,796	4.26	1,578	5,439	0.16	
1918-19			11,600	64,642	2.16	5,059	17,215	3.56	892	9,319	0.22	
1919-20			7,851	82,977	4.85	2,872	24,601	3.71	369	16,924	0.23	
1920-21			8,220	73,779	9.50	4,127	18,582	3.53	855	26,574	0.41	
1921-22			7,335	68,714	7.85	3,723	16,047	3.04	966	34,949	0.71	
1922-23			9,250	75,024	7.57	3,442	26,402	3.59	3,113	49,984	1.67	
1923-24			10,012	77,340	5.94	4,709	18,118	3.28	5,953	39,229	3.35	
1924-25		2,786	6,775	78,630	7.16	2,899	20,754	3.46	8,830	36,856	4.37	
			6,729†			801†						
1925-26		17,825	7,968	82,970	8.01	2,836	24,469	3.78	9,256	49,230	5.29	
			2,228†			155†			1,914†			
1926-27	18	26,558	9,642	78,170	8.59	2,852	18,533	4.48	10,328	32,010	5.41	
			3,576†			931†			1,952†			
1927-28	12	17,045	9,341	73,109	10.15	2,510	14,887	3.71	10,583	23,911	8.29	
			4,114†			1,166†			3,369†			
1928-29	13	14,168	7,864	67,909	10.28	2,772	13,738	3.02	7,397	32,032	6.00	
			4,104†			996†			6,144†			
1929-30	64	16,146	7,093	71,965	8.15	2,256	14,478	4.38	5,888	37,030	4.75	
			3,473†			1,258†			2,876†			
1930-31	388	18,894	6,339	65,943	6.82	2,648	14,637	4.04	5,922	29,328	5.59	
	26†		5,134†			263†			2,137†			
1931-32	847	20,209	6,177	56,230	4.21	2,696	13,575	3.20	6,040	23,044	2.70	
	281†		2,886†			1,773†			1,855†			
1932-33	1,073	21,894	7,032	53,387	6.90	3,195	11,299	4.40	6,432	20,407	4.78	
	831†		3,060†			1,177†			3,104†			
1933-34	2,289	33,854	6,262	53,720	7.05	2,815	10,927	3.98	6,425	23,309	3.19	
	1,072†		4,760†			1,086†			3,646†			
1934-35	4,013	26,073	5,985	59,928	5.59	2,216	11,139	4.43	7,482	26,357	6.57	
	1,811†		4,460†			1,335†			2,848†			
1935-36	3,637	30,893	7,072	60,605	7.60	2,505	11,565	4.14	9,513	27,053	3.81	
	2,046†		7,971†			1,079†			3,862†			
1936-37	4,730	50,634	7,343	75,690	7.06	2,790	17,082	4.13	11,021	53,127	6.02	
	3,736†		6,959†			1,054†			8,119†			

\* The 1922 project includes irrigation and revenue from the proposed Vir Storage Reservoir also. Until the latter is constructed, the

† Area of overlap.



No. 4

## Irrigation Works in the Province of Bombay

Godavari Canals			Girna Canal			All Major Works			All First Class Works (both Major and Minor)		
Area irrigated		Revenue	Area irrigated		Revenue	Area irrigated		Revenue	Area irrigated		Revenue
Sugar cane	All crops		Sugar cane	All crops		Sugar cane	All crops		Sugar cane	All crops	
14	15	16	17	18	19	20	21	22	23	24	25
Acres	Acres	Rs. Lakhs	Acres	Acres	Rs. Lakhs	Acres	Acres	Rs. Lakhs	Acres	Acres	Rs. Lakhs
Projects or Completion Reports of Works											
(Completion Report of 1917)			(Project of 1921)						(Not available)		
10,900	41,440	6.58	1,800	8,500	0.93	57,500	340,240	60.88			

realised year by year

2	2,562	.	..	1,137	0.04	12,872	55,442	7.33	15,734	126,555	12.51
2	16,444	0.15	2	2,758	0.06	15,743	81,435	9.09	19,021	146,074	13.76
480	34,331	0.74	3	3,247	0.11	13,130	123,786	11.21	15,210	200,455	14.14
1,491	23,807	2.20	1	2,799	0.16	15,580	124,157	12.14	18,206	214,293	17.39
2,436	17,102	1.56	3	2,243	0.16	14,486	89,660	11.66	16,977	170,676	16.99
2,791	18,898	1.91	31	1,710	0.11	16,443	87,717	11.43	19,629	147,356	15.84
4,187	19,002	2.28	97	1,887	0.13	19,372	67,797	11.87	23,013	121,139	16.47
6,441	21,729	2.17	125	3,473	0.08	23,807	79,888	10.93	28,616	149,402	15.43
7,084	45,893	2.12	63	4,495	0.20	24,698	131,564	8.26	29,742	214,003	12.72
3,764	32,488	4.43	34	3,842	0.23	14,800	160,832	13.45	16,410	242,316	19.26
6,478	51,445	2.82	52	5,286	0.20	19,732	175,666	16.46	22,515	273,367	22.98
6,669	40,767	6.98	133	5,623	0.31	18,226	166,100	18.89	21,208	259,129	25.62
9,549	50,224	5.38	345	7,618	0.36	25,699	209,283	18.56	28,745	286,925	25.45
9,726	51,461	5.56	687	7,745	0.54	31,087	193,893	18.67	34,822	267,382	24.65
8,507	43,724	5.36	560	9,239	0.58	27,571	191,989	17.93	37,455	270,566	26.83
8,221	40,252	4.72	377	7,893	0.44	28,658	222,639	22.36	36,873	295,579	28.26
1,367†						5,664†					
6,291	26,448	4.26	443	10,905	0.46	29,573	192,624	23.98	39,753	272,164	30.34
1,847†						8,307†					
7,241	26,816	6.73	269	6,132	0.40	29,956	161,900	30.73	42,579	243,222	36.63
1,437†						10,086†					
5,744	25,472	6.04	203	5,134	0.39	24,993	158,543	26.70	39,421	231,544	32.98
2,043†						7,143†					
4,194	23,996	5.21	432	3,920	0.44	19,827	195,570	24.23	31,314	246,065	30.29
1,148†						8,755†					
3,784	23,352	3.35	309	5,482	0.80	19,390	157,636	21.68	30,108	228,705	27.03
517†						8,077†					
3,502	18,110	2.30	489	4,210	0.19	19,751	135,378	13.01	30,450	207,151	16.61
444†						7,239†					
3,620	16,647	3.58	855	5,665	0.54	22,207	129,299	18.97	34,149	194,416	26.62
331†						8,542†					
2,896	16,751	3.99	1,146	5,873	0.63	21,793	144,434	19.75	36,277	212,816	25.46
222†						11,150†					
3,077	16,671	3.30	1,152	7,816	0.91	23,925	147,984	23.72	35,777	214,224	29.06
54†						10,851†					
3,532	17,248	2.56	1,694	8,870	0.86	27,953	156,234	22.29	45,107	214,374	28.30
205†						15,651†					
6,332	49,786	4.29	1,483	12,437	1.01	33,699	258,756	26.30	60,268	313,491	30.67
2,329†						23,370†					

†project figures for comparison may be assumed at, say, 75 per cent. of those given in this statement.

STATEMENT No. 5

Financial Results of Irrigation Works for which Capital and Revenue Accounts are kept, for the year 1936-37

Serial No.	District	Name of work	Storage capacity of tank and weir	Year in which work first came into operation	Capital outlay	Gross receipts	Working expenses	Net revenue	Percentage return	Interest charges on capital outlay (column 6)	Area irrigated	Estimated value of crops
1	2	3	4	5	6	7	8	9	10	11	12	13
		<b>Major Works—Central Division</b>	<b>M. cft</b>		<b>Rs. Lakhs</b>	<b>Rs.</b>	<b>Rs.</b>	<b>Rs.</b>	<b>Per cent</b>	<b>Rs.</b>	<b>Acres</b>	<b>Rs. Lakhs</b>
1	Satara and Sholapur	Nira Right Bank Canal	24,970	1924-25	412.29	2,71,215	3,58,490	— 87,275	.. . .	18,25,005	50,634	22.88
2	Poona	Nira Left Bank Canal (including Shetphal Tank)		1885-86	144.41	7,06,090	2,06,510	4,99,580	3.46	5,83,877	75,690	43.88
3	Do.	Mutha Canals (including Matoba Tank)	3,859	1874-75	69.81	4,12,954	91,244	— 3,21,710	4.61	2,28,967	17,082	16.48
4	Ahmednagar	Pravara Canals	10,557	1909-10	150.23	6,19,528	4,03,895	2,15,633	1.43	5,97,963	53,127	48.01
5	Ahmednagar and Nasik	Godavari Canals	8,287	1911-12	105.72	4,28,680	3,32,234	96,446	0.91	3,43,855	50,283	25.25
6	Nasik	Girna Canal	1,548	1909-10	20.57	90,592	51,087	39,505	1.92	68,529	12,437	4.80
		<b>Total, Major Works</b>	<b>49,221</b>	<b>.. .</b>	<b>903.03</b>	<b>25,29,059</b>	<b>14,43,460</b>	<b>10,85,599</b>	<b>1.20</b>	<b>36,48,196</b>	<b>259,253</b>	<b>161.30</b>
		<b>Minor Works—Central Division</b>										
7	West Khandesh	Shahada Channel	.. . .	1922-23	1.07	14,924	5,764	9,160	8.52	4,008	1,976	0.70
8	Do.	Lower Panjhra River Works	320	1851-52	4.69	25,042	4,148	20,894	4.46	14,810	2,459	0.65
9	East Khandesh	Jamda Canal	.. . .	1870-71	10.51	15,466	17,007	— 1,541	.. . .	33,455	1,731	0.89
10	Do.	Hartala Tank	134	1872-73	0.73	926	949	— 23	.. . .	1,594	21	0.01
11	Do.	Mhaswa Tank	172	1877-78	1.39	1,665	1,348	319	0.23	4,282	51	0.01
12	Nasik	Kadwa River Works	606	1868-69	10.36	23,770	29,673	— 5,903	.. . .	32,393	3,768	2.83
13	Do.	Parsul Tank	119	1889-90	2.15	1,805	1,767	38	0.02	6,917	973	0.43
14	Ahmednagar	Bhatodi Tank	40	1871-72	3.80	6,061	2,092	3,969	1.05	11,725	676	0.40
15	Poona	Kasurdi Tank	5	1869-70	0.46	1,117	951	166	0.36	1,357	19	.
16	Do.	Shirsuphal Tank	351	1879-80	2.25	5,236	2,715	2,521	1.12	7,056	997	0.77
17	Do.	Bhadalwadi Tank	161	1881-82	2.27	4,917	3,057	1,860	0.82	7,087	1,198	0.59
18	Satara	Krishna Canal	.. . .	1869-70	9.49	76,351	21,964	54,387	5.73	29,952	3,647	2.99
19	Do.	Rewari Canal	.. . .	1865-66	0.60	3,240	2,150	1,090	1.82	1,888	566	0.20
20	Do.	Upper Man River Works	192	1872-73	4.39	5,317	15,512	— 10,195	.. . .	13,827	849	0.29
21	Do.	Yerla River Irrigation Works	489	1869-70	7.82	13,819	11,784	2,035	0.26	24,729	4,379	1.88

22	Do.	Main Tank	193	1875-76	4.96	9,563	4,625	4,938	0.99	15,786	893	0.31
23	Do.	Chikhli Canal	..	1870-71	0.57	3,704	1,489	2,215	3.86	1,789	353	0.24
24	Sholapur	Ekrak Tank	2,616	1872-73	13.40	1,48,884	10,066	1,29,818	9.68	40,837	4,318	2.44
25	Do.	Mhaswad Tank	2,601	1884-85	20.96	20,900	13,996	6,913	0.33	66,688	4,504	0.75
26	Do.	Koregaon Tank	.88	1868-69	0.39	2,359	1,894	465	1.19	1,261	63	0.04
27	Do.	Ashti Tank	1,419	1881-82	8.41	17,869	11,496	6,373	0.76	25,445	3,767	0.92
28	Do.	Pathri Tank	407	1906-07	6.43	11,795	3,523	8,272	1.29	20,876	675	0.12
Total			9,903	....	117.14	4,14,739	1,76,968	2,37,771	2.03	3,67,762	37,883	17.46
Total, Central Division			59,124	..	1020.17	29,43,798	16,20,428	13,23,370	1.30	40,15,958	297,136	178.76
Minor Works—Northern Division												
29	Ahmedabad	Hathmati and Khari Canals	481	1873-74	13.19	37,069	39,701	-2,632	....	41,398	129	0.07
30	Ksira	Wangroli Tank	212	1904-05	2.93	2,451	6,856	-4,405	....	8,123	68	0.04
31	Do.	Tranza Nagrama Tank	177	1904-05	2.81	977	1,935	-958	....	7,915	1	*
32	Do.	Savli Tank	172	1908-09	2.55	1,402	5,564	-4,162	....	7,787	266	0.12
33	Do.	Shastri Tank	130	1910-11	1.84	2,179	3,307	-1,128	....	5,269	148	0.06
34	Broach and Panch Mahala	Futelao Tank	56	1915-16	1.16	23	1,277	-1,254	...	3,570	....	....
Total			1,228		24.48	44,101	58,640	-14,539	...	74,062	612	0.29
Minor Works—Southern Division												
35	Bijapur	Muchkundi Tank	624	1884-85	1.59	882	1,502	-620	....	4,663	8	*
36	Belgaum	Gokak Canal 1st Section and Storage Works	1,469	1884-85	14.66	66,312	11,959	54,353	3.70	47,339	8,293	2.39
37	Do.	Gadikeri Tank	28	1892-93	0.17	1,833	321	1,512	8.94	544	418	0.19
38	Dharwar	Medleri Tank	58	1884-85	0.81	664	626	38	0.05	2,605	44	0.06
39	Do.	Madag Tank	55	1866-67	1.68	2,905	3,173	-268	....	5,362	604	0.30
40	Do.	Asundi Tank	74	1884-85	0.75	1,395	826	569	0.76	2,020	203	0.03
41	Do.	Dambal Tank	97	1890-91	0.64	2,061	29,135	-26,474	...	2,023	444	0.11
42	Do.	Dharma Canal	....	1913-14	0.98	5	2,134	-2,129	...	3,341	5,703	0.95
43	Kanara	Mavinkop Tank	44	1882-83	0.33	2,085	1,186	899	2.68	1,004	479	0.11
Total			2,449		21.61	78,742	50,862	27,880	1.29	68,901	16,196	4.14
Grand total for 1936-37			62,991	...	1075.12†	30,66,641	17,29,930	13,36,711	1.24	41,88,754‡	313,944	183.19
Average for 3 years ending 1936-37			62,470		1071.86	29,64,264	16,66,116	12,98,148	1.21	42,30,297	247,273	180.50

\* Asterisks in column 13 indicate amounts less than Rs. 500.

† Includes Rs. 86 lakhs capital outlay on incomplete works.

‡ Includes Rs. 29,533 interest on outlay on incomplete works.

**STATEMENT**  
**Forecast of Financial Results**

Name of work	Capital outlay	Culturable area	Area annually irrigated.		
			Cane including equivalent areas of overlap (a)	Other perennial crops	Seasonals
1	2	3	4	5	6
	Rs. Lakhs	Acres	Acres	Acres	Acres
<b>Section (i) Forecast according to latest</b>					
Nira Right Bank Canal (b) ..	512.17	447,726	20,000	....	128,500
Nira Left Bank Canal (including Shetphal Tank) (b)	173.81	149,821	9,000	..	70,000
Mutha Canals including Matoba Tank	68.99	49,800	5,800	1,000	4,000
Pravara Canals ..	151.83	182,976	10,000	....	42,000
Godavari Canals ..	105.43	219,380	10,900	....	30,540
Girna Canal ..	20.56	25,200	1,800	..	6,700
<b>Total ..</b>	<b>1032.79</b>	<b>1,074,913</b>	<b>57,500</b>	<b>1,000</b>	<b>281,740</b>
<b>Section (ii) Actuals</b>					
Nira Right Bank Canal ..	412.29		5,789	307	41,861
Nira Left Bank Canal (including Shetphal Tank)	144.41		9,208	614	60,774
Mutha Canals including Matoba Tank	69.81	Same as above	3,055	3,435	9,803
Pravara Canals ..	150.23		13,376	2,402	31,595
Godavari Canals ..	105.71		6,956	1,768	39,357
Girna Canal ..	20.57		1,862	374	9,407
<b>Total ..</b>	<b>903.02</b>		<b>40,246</b>	<b>8,900</b>	<b>192,787</b>
<b>Section (iii) Results Anticipated</b>					
Nira Right Bank Canal ..			18,813	3,224	78,205
Nira Left Bank Canal (including Shetphal Tank)	Same as above but will slightly increase with remodelling	Same as above.	12,657	2,717	66,116
Mutha Canals including Matoba Tank			2,816	845	20,557
Pravara Canals ..			15,557	1,967	47,866
Godavari Canals ..			8,287	2,486	60,495
Girna Canal ..			2,585	215	5,241
<b>Total ..</b>	<b>928.02(d)</b>	<b>....</b>	<b>60,715</b>	<b>11,444</b>	<b>278,480</b>
<b>Section (iv) Results for five Major Canals only</b>					
Forecast figures ..	520.62	627,187	37,500	1,000	153,240
Actuals of 1936-37 ..	490.73	627,187	34,457	595	180,926
Results now anticipated ..	490.73	627,187	41,902	8,230	200,275

(a) Figures in column 4 section (i), are obtained by adding 1/4th for short term overlap and 3/8th for long term overlap to the area of basic cane as reported during the year.

(b) The 1922 project includes irrigation and revenue from the proposed Vir Storage Reservoir also. Until the reservoir is constructed the project figures for purposes of comparison may be taken at, say, 75 per cent. of those given in this statement.

## No. 6

## on the six Major Canals

Total	Percentage of area irrigated to culturable area	Gross revenue	Working expenses	Net revenue	Percentage return on capital outlay	Remarks
7	8	9	10	11	12	13
Acres	Per cent.	Rs. Lakhs	Rs. Lakhs	Rs. Lakhs	Per cent	
<b>Revised Project or Completion Report</b>						
148,500	33.2	25.47	3.71	21.76	4.25	The capital outlay on Nira Left Bank Canal and Nira Right Bank Canal has been arrived at after distributing expenditure on the old and new Bhatgar Dam and the proposed dam at Vir, in the ratio of 31 per cent and 69 per cent respectively.
79,000	54.7	16.12	2.23	13.89	7.99	
10,800	21.6	3.95	0.84	3.11	4.51	
52,000	28.5	7.81	2.00	5.81	3.83	
41,440	18.9	6.58	1.55	5.03	4.77	
8,500	33.7	0.93	0.34	0.59	2.86	
340,240	31.6	60.86	10.67	50.19	4.86	
<b>of 1936-37</b>						
47,957	10.7	2.71	3.58	-0.87	....	
70,596	47.1	7.06	2.07	4.99	3.46	
16,293	33.0	4.13	0.91	3.22	4.61	
47,363	25.9	6.20	4.04	2.16	1.43	
48,081	22.0	4.28	3.32	0.96	0.91	
11,643	46.6	0.91	0.51	0.40	1.92	
241,933	22.5	25.29	14.43	10.86	1.20	
<b>under the changes now proposed. (c)</b>						
100,232	22.4	13.05	4.35	8.70	2.12	
81,496	54.3	9.62	3.21	6.41	4.44	
24,218	48.6	3.82*	1.27	2.55	3.65	*Including an approximate revenue of Rs. 1,25,000 on account of water supply to Poona City and Cantonment.
65,390	35.7	9.75	3.25	6.50	4.33	
17,268	22.9	7.36	2.45	4.91	4.64	
8,041	31.9	1.02	0.34	0.68	3.32	
350,639	32.6	44.62	14.87	29.75	3.20	
<b>i.e. excluding Nira Right Bank Canal)</b>						
191,740	30.6	35.39	6.96	28.43	5.46	
193,976	30.9	22.58	10.85	11.73	2.39	
250,407	39.9	31.57	10.52	21.05	4.29	

(c) As regards crop areas estimated as irrigable by one million cubic feet of storage, reference is invited to paragraph 28 of the report.

(d) Includes Rs. 25 lakhs for proposed extensions and improvements.

STATEMENT No. 7

Particulars of working of Sugar Factories in the Canal Areas of the Province of Bombay during 1936-37

(Compiled from information supplied by the Sugar Factories)

Serial No.	Name of factory	Present crushing capacity of plant	Guaranteed basic annual cane area as on 15th February 1938	Actual area of cane crushed during working season, 1936-37	Total tonnage of cane crushed	Total out-turn of sugar	Yield of sugar per acre of cane	Yield of sugar per ton of cane.	Irrigation assessment	Excise duty	Crushing capacity of plant recommended	Guaranteed basic cane area recommended	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Tons	Acres	Acres	Tons	Tons	Tons	Tons	Rs.	Rs.	Tons	Acres	
1	Belapur Co. Ltd.	600	2,750	2,701	(a) 1,10,939 (b) 3,453	13,072	4.693	0.114	1,56,397	4,19,255	750	3,375	(a) Grown by factories
2	The Maharashtra Sugar Mills Ltd.	600	2,350	1,501	(a) 61,250 (b) 14,503	8,341	4.488	0.110	85,890	2,68,615	750	3,375	(b) Purchased from irrigators
3	The Saswad Mali Sugar Factory Ltd.	300	1,200	884	(a) 35,221	3,497	3.955	0.099	72,206	1,24,929	450	2,025	(c) On nalla lift
4	The Phaltan Sugar Works Ltd.	500	2,500	1,620	(a) 54,723 (b) 7,648	6,855	3.712	0.1099	1,12,148	2,41,704	600	2,700	(d) On wells
5	Messrs. Marsland Price & Co. Ltd.	300	1,400	1,483	(a) 62,730 (b) 10,506	7,533	4.360	0.103	82,490	2,21,367	600	2,700	(e) Exclusive of guarantee to Belvandi Sugar Farm
6	The Ravalgaon Sugar Farm Ltd.	200	1,400	1,069	(a) 42,529 (b) 2,159	4,416	3.951	0.0988	75,208	1,42,994	300	1,400	(f) This factory is on Visapur Canal which is a second class work in Ahmednagar District.
7	The Belvandi Sugar Farm Ltd. (f)	200	3 of the quantity of water in the Visapur tank to be given to the Coy.	279	(a) 14,251	1,398	4.084	0.099	8,178	42,896	200	Same as column 13	
				(c) 48									
				(d) 14									
8	The Brihan Maharashtra Sugar Syndicate Ltd.	300	1,250	(Factory not yet erected)					2,861	722	300	1,350	
	Total ..	3,000	(e) 12,850	9,599	(a) 3,81,643 (b) 38,269	45,112	....	0.108	5,95,378	14,62,492	3,950	(e) 16,925	

**STATEMENT No. 8**

**Areas damaged by Water-logging and Salt-efflorescence under some of the Major Canals**

(Figures obtained from actual surveys are shown in bold figures ; others are interpolated)

Serial No.	Name of Canal	1931-32			1932-33			1933-34			1934-35			1935-36			1936-37		
		Water-logged	Salt affected	Total	Water-logged	Salt affected	Total	Water-logged	Salt affected	Total	Water-logged	Salt affected	Total	Water-logged	Salt affected	Total	Water-logged	Salt affected	Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

**Area in acres damaged under each Major Canal**

1	Nira Right Bank Canal	1,238	2,182	3,420	1,684	2,841	4,525	2,130	3,500	5,630	2,920	5,660	8,580	3,710	7,820	11,530	3,710	7,820	11,530
2	Nira Left Bank Canal	8,400	8,200	16,600	8,400	8,200	16,600	8,400	8,200	16,600	7,360	8,695	16,055	6,320	9,190	15,510	6,320	9,190	15,510
3	Pravara Canals ..	3,778	10,845	14,623	3,778	10,845	14,623	3,489	10,478	13,947	3,160	10,110	13,270	4,255	10,425	14,680	5,350	10,740	16,090
4	Godavari Canals ..	3,632	12,560	16,192	3,881	11,765	15,646	4,130	10,970	15,100	3,630	11,830	15,460	3,130	12,690	15,820	3,130	12,690	15,820
	<b>Total ..</b>	<b>17,048</b>	<b>33,787</b>	<b>50,835</b>	<b>17,743</b>	<b>33,651</b>	<b>51,394</b>	<b>18,129</b>	<b>33,148</b>	<b>51,277</b>	<b>17,070</b>	<b>36,295</b>	<b>53,365</b>	<b>17,415</b>	<b>40,125</b>	<b>57,540</b>	<b>18,510</b>	<b>40,440</b>	<b>58,950</b>

**Area in acres damaged in each Sugar Factory area**

1	Phaltan (old area)	..	..	243	..	..	731	..	..	731	..	..	913	..	..	1,095	..	..	931
2	Phaltan (extension area)	..	..	176	..	..	325	..	..	473	..	..	488	..	..	503	..	..	459
3	Saewad Mali ..	..	..	..	..	..	65	..	..	188	..	..	310	..	..	425	..	..	540
4	Kalamb ..	..	..	..	..	..	199	..	..	1,181	..	..	2,163	..	..	1,768	..	..	1,828
5	Belapur ..	..	..	..	..	..	1,252	..	..	1,104	..	..	955	..	..	1,050	..	..	1,701
6	Maharashtra ..	..	..	..	..	..	1,350	..	..	1,204	..	..	1,057	..	..	1,345	..	..	2,176
	<b>Total ..</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>3,922</b>	<b>..</b>	<b>..</b>	<b>4,881</b>	<b>..</b>	<b>..</b>	<b>5,886</b>	<b>..</b>	<b>..</b>	<b>6,186</b>	<b>..</b>	<b>..</b>	<b>7,135</b>

*Note.*—Figures for the Mutha and Girna Canal, Brhan Maharashtra Sugar Syndicate, Belwandi Sugar Farm and Ravalgaon Sugar Farm are not available.

STATEMENT No. 9

Cost of Cultivation and Value of Outturn of Crops with and without Irrigation

(Compiled from information supplied by the Department of Agriculture)

Serial No.	Name of Crop	Cost of Cultivation per acre		Outturn per acre		Increase of outturn on account of irrigation	Value of increase of outturn due to irrigation			Net profit after deducting increase in cost of cultivation	Water rates	Remarks
		Without irrigation	With irrigation including water rates	Without irrigation	With irrigation		Rate	Per	Value			
1	2	3	4	5	6	7	8	9	10	11	12	13
		Rs. a. p.	Rs. a. p.	lbs.	lbs.	lbs.	Rs. a. p.		Rs. a. p.	Per acre Rs. a. p.	Rs.	
1	Sugarcane .. ..	*381 0 0	400 0 0	6,250	11,250	5,000	9 8 0	250 lbs. (palla) ..	190 0 0	171 0 0	45 + 10 (a) = 55	* On wells
2	Rice .. ..	Not available		300	800	500	6 10 0	80 ,, (Maund) ..	41 10 0	....	12 (b)	(a) For overlap
3	Cotton .. ..	16 12 0	46 4 0	250	750	500	62 0 0	782 ,, (Khandi) ..	39 9 0	12 2 0	3 + 5 (c)	(b) Widely varies from work to work. The rate given is for major canals
4	Groundnut .. ..	24 0 0	54 4 0	600	1,800	1,200	8 0 0	240 ,, (Palla) ..	40 0 0	9 12 0	3 (d)	
5	Jowar .. ..	17 12 0	48 4 0	450(e)	1,500(e)	1,050(e)	2 8 0	80 ,, (Maund) ..	46 0 0	15 8 0	5	(c) Pre-seasonal watering from April 25th
				900(f)	3,000(f)	2,100(f)	3 0 0	500 ,,				(d) Erect variety
6	Wheat .. ..	17 8 0	46 12 0	300	1,000	700	5 5 0	80 ,, (Maund) ..	46 10 0	17 6 0	5	(e) Grain
7	Gram .. ..	Not available		500	900	400	3 5 0	,, ,, ( ,, ) ..	16 9 0	....	5	(f) Fodder
8	Bajari .. ..	15 8 0	39 8 0	350(e)	1,000(e)	650(e)	3 3 0	,, ,, ( ,, ) ..	29 3 0	5 3 0	3	
				900(f)	2,500(f)	1,600(f)	1 0 0	500 ,,				
9	Nilva Fodder .. ..	Not available		3,000(f)	6,000(f)	3,000(f)	1 0 0	150 ,,	30 0 0	....	3	
				200(e)	600(e)	400(e)	2 0 0	80 ,, (Maund)				



STATEMENT No. 10

Particulars of Expenditure incurred on Famines and Remission of Land Revenue during years of drought in four districts of the Bombay-Deccan

N. B. F. 11-13

BOMBAY : PRINTED AT THE GOVERNMENT CENTRAL PRESS

Years of famine 1	Details of expenditure incurred in lakhs of rupees											
	Poona District			Nasik District			Ahmednagar District			Sholapur District		
	Direct and Indirect famine expenditure 2	Remission of land Revenue 3	Total 4	Direct and Indirect famine expenditure 5	Remission of land Revenue 6	Total 7	Direct and Indirect famine expenditure 8	Remission of land Revenue 9	Total 10	Direct and Indirect famine expenditure 11	Remission of land Revenue 12	Total 13
1896-97 .. .. .	12.52	*	12.52	6.81	....	6.81	26.05	*	26.05	36.73	0.01	36.74
1899-02 .. .. .	31.38	12.48	43.86	31.27	11.83	43.10	105.75	24.07	129.82	65.72	4.99	70.71
1905-06 .. .. .	5.00	0.64	5.64	0.81	2.35	3.16	3.83	1.28	5.11	1.99	0.89	2.88
1911-12 .. .. .	0.09	1.77	1.86	0.02	1.94	1.96	0.18	2.42	2.60	0.01	1.24	1.25
Total ..	48.99	14.89	63.88	38.91	16.12	55.03	135.81	27.77	163.58	104.45	7.13	111.58
1918-21 .. .. .	13.12	....	13.12	1.55	....	1.55	24.86	....	24.86	1.95	....	1.95
1921-26 .. .. .	1.27	....	1.27	1.07	....	1.07	5.69	....	5.69	3.53	...	3.53
Total ..	14.39	....	14.39	2.62	....	2.62	30.55	...	30.55	5.48	...	5.48
1926-28 .. .. .	0.57	....	0.57	....	....	....	0.79	....	0.79	0.70	....	0.70
1936-38 (a) .. .. .	1.53	....	1.53	....	....	....	4.76	....	4.76	3.50	....	3.50
Total ..	2.10	....	2.10	....	...	....	5.55	....	5.55	4.20	....	4.20

(a) The figures for these years are approximate as final reports have not been received.  
\* Amount less than Rs. 500.