

GOVERNMENT OF MAHARASHTRA

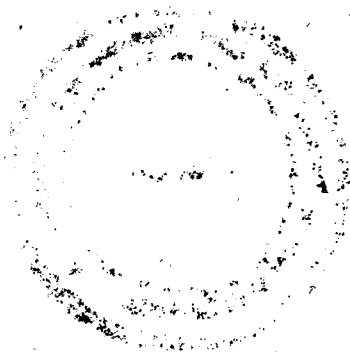
P. W. D. HAND-BOOK

CHAPTER 25

IRRIGATION AND IRRIGATION MANAGEMENT

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P. W. D. HAND-BOOK

FIRST EDITION	..	1876
SECOND EDITION	..	1877
THIRD EDITION	..	1883
FOURTH EDITION	..	1887
FIFTH EDITION	..	1896
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CHAPTER 25

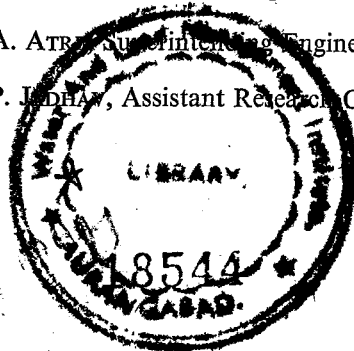
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PREFACE

The P. W. D. Hand-Book was last revised in 1949 as 9th edition which has been in vogue so far. As most of the material in this Hand-Book has become outmoded and considerable technological developments have taken place since then, it was decided to bring the matter up-to-date and publish in the form of a new Hand-Book. The work which was originally being dealt with by a separate unit headed by a Special Officer was subsequently entrusted to the Maharashtra Engineering Research Institute, Nashik, for co-ordination and publication. The accompanying list shows chapters of the revised edition assigned for writing to different officers in the Irrigation, Public Works and Housing, Urban Development and Public Health Departments.

The Chapter No. 25 is split up into following parts:—

- (1) Irrigation,
- (2) Irrigation Management.

In the present booklet the procedure of Rules and Regulations of Irrigation Management as in vogue in the three Regions viz., Western Maharashtra, Vidarbha and Marathwada is explained in detail and systematically. For the economic and maximum utilisation of irrigation water in the command area with a definite AI/DC the procedure laid down, explained in the booklet is very useful for day to day irrigation management and canal field officers.

Previously the recovery of water charges including Irrigation cess and Local cess was entrusted to the Revenue Authorities. Now from July 1976 the recovery of Water Rates (inclusive of Irrigation cess) and Local Fund cess is entrusted to Irrigation Department. Thus, due to one line authority the recovery of water charges will be more effective. The procedure therefore laid down by Irrigation Department for effecting the recovery is also explained in this booklet.

The Irrigation system on volumetric basis in Western Maharashtra and on village or chulk Agreements as in Vidarbha Region is more beneficial to group of irrigators instead of the individuals, is also elaborated in this booklet.

Second Class Irrigation Works are also explained in this booklet. Special reference is invited to "Phad System" of Irrigation which is considered to be ideal as a "Co-operative Irrigation Management" of the oldest pattern of irrigation.

All the latest Government orders regarding the management, specifically on Lift Irrigation Schemes, Water Rates, etc., are enlightened in this booklet.

Efforts are made to incorporate metric units and equivalents brought in force by Government. However, since application of metric units is yet in transition in the field, full conversion to metric has not been possible.

P. W. D. HANDBOOK (REVISED)**List of Chapters**

Chapter No.	Subject
1	Materials.
2	Masonry.
3	Reinforced Concrete Construction.
4	Prestressed Concrete.
5	Plastering and Pointing.
6	Preparation of Projects and Engineering Geology.
7	Surveying.
8	Excavation.
9	Foundations.
10	Buildings.
11	Town Planning.
12	Roads.
13	C. D. Works and Bridges.
14	Ports and Harbours.
15	Runways and Air-strips.
16	Electrical Works connected with Buildings.
17	Soil Mechanics.
18	Hydraulics.
19	Hydrology and Water Planning.
20	Masonry and Concrete Dams.
21	Earth and Composite Dams.
22	Instrumentation.
23	Spilways, Outlets, Gates and Hoists.
24	Canals.
25	Irrigation and Irrigation Management.
26	Soil Survey of Irrigation Command, Land Drainage and Reclamation
27	Hydro-power Scheme.
28	Tunnelling.
29	Urban Water Supply.
30	Rural Water Supply.
31	Sanitary Engineering.
32	Construction Machinery.
33	Quality Control and Safety Measures.
34	Labour Laws.
35	Rate Analysis.
36	Construction Planning.
37	Part-I—Land Acquisition. Part-II—Valuation.
38	Mathematical Data and Miscellaneous Information.

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CHAPTER 25

PART I — IRRIGATION

IRRIGATION

GLOSSARY OF IRRIGATION TERMS APPLICABLE TO THE IRRIGATION SYSTEM IN MAHARASHTRA

1. *A Canal* is the main channel of irrigation scheme from which as a rule, no direct irrigation takes place.
2. *A Branch Canal* is a channel taking off from the main canal, which has the same function as the main canal, viz., carrying water to distributaries.
3. *Distributary*.—(a) *A Major Distributary* is a channel taking off from the main canal or a branch canal and its main function is to supply water to minor distributaries and outlets.
(b) *A Minor Distributary* is a channel taking off from a major distributary and supplying water to outlets.
4. *An Outlet* is a regulating device through which water is supplied to water courses. They are numbered serially from head to tail of the distributary or minor and where two outlets face each other the one on the right bank has the lower number.
5. *A Minor* is a branch of a distributary and has the same function as a distributary. A minor is given the name of the village mainly served by it.
6. *A Water Course* is a channel taking off from a Government channel and irrigates fields.
7. *A Ghat-fed Canal* is a canal fed from a storage which derives its supply from unfailing monsoon rain in the Ghats.
8. *A Tank fed canal* is a canal fed from a storage which obtains an unreliable supply from a non-ghat catchment.
9. *A perennial Canal* is a canal that receives a supply of water throughout the year.
10. *A Non-Perennial Canal* is a canal that normally does not receive a supply of water throughout the year.
11. *A Balance or Balancing Tank* is a subsidiary reservoir for storing excess river-water which is utilised during periods of short supply.
12. *A Tail Tank* is a reservoir supplied with water from a canal whenever in excess of canal requirements, having its own command and usually situated near the tail of canal.
13. *A Pick-up Weir* is a masonry weir constructed across a river at the head of works of a canal to raise the level of water sufficiently high for it to flow into the canal.
14. *A Bandhara or Dharan or Nalla Pick-up Weir* is a weir across a nalla to divert water into a channel for irrigation.

15. *Rotation* is defined as an interval at which water is supplied to the sanctioned crops.

16. A *module* is a device for ensuring a constant discharge of water passing from one channel into another, irrespective of the water level in each, within certain specified limits.

17. A *Semi-module* is a device, the discharge through which varies according to the head of water in the parent channel, but is unaffected by the downstream fluctuation.

Note.—The term 'rateable' may be applied either to modules or semi-modules and means 'that can be rated or set'. A semi-module is said to be proportional when it draws off a supply directly proportional to the discharge flowing in the parent channel.

18. A *meter* is a device for measuring quantities of water passed or rate of flow.

19. *Base* is the period on which a 'Duty' is calculated. There were three bases in common use in the Deccan.

Old Base Periods

(a) Rabi	.. 15th October to 14th February.	1 cusec for 123 days. 10.627 Mcft. 246 acre-feet.
(b) Hot weather	.. 15th February to 14th June.	1 cusec for 120 days. 10.308 Mcft. 240 acre-feet.
(c) Monsoon	.. 15th June to 14th October.	1 cusec for 122 days. 10.541 Mcft. 244 acre-feet.

New Base Periods

(a) Rabi	.. 15th October to 28th February.	0.0283 cumec for 137 days. 334981.44 M ³ (11.8368 Mcft.)
(b) Hot weather	.. 1st March to 30th June	0.0283 cumec. for 122 days. 298304.64 M ³ (10.38528 Mcft.)
(c) Monsoon	.. 1st July to 14th October	0.0283 cumec. for 106 days. 259182.72 M ³ (9.1584 Mcft.)

Classification of Seasons

20. *Daily Discharge* (in cumecs/in cusecs) is the total flow (in cubic metre/cubic feet) in a day divided by number of seconds in 24 hours (86,400).

21. *Discharge* at any section, normal to flow is the quantity of water passing that section in unit time.

22. *Supply* is water which enters a canal head less water escaped into nallas or tail tanks.

23. *Mean Supply* is the sum of the 'daily discharge' utilised (i.e., less escape) divided by the number of days of 'base' period.

24. *Mean Discharge* is the sum of the daily discharges of any 'base' period divided by the number of days.

Note.—If the whole discharge is utilised mean supply and mean discharge are the same.

25. *Open Discharge* is the number of 'day cusecs' passed into a channel divided by the number of days the channel was open or in other words the 'mean discharge' for days in flow.

26. *Day Cusec* is a unit of quantity of water equal to 86,400 cubic feet and equivalent to 1 cusec flowing for 24 hours.

26(a). *Day Cumec* is a unit of quantity of water equal to 86,400 cubic meter and is equivalent to 1 cumec flowing for 24 hours.

26(b). *A cusec* is the unit of discharge and means a discharge of one cubic ft. per second.

26(c). *A cumec* is the unit discharge and means a discharge of one cubic meter per second.

27. *Acre foot* is quantity of water equivalent to one foot depth on one acre.

28. *Capacity* is the full supply discharge of a channel.

29. *Capacity Factor* is the ratio of mean supply to capacity.

30. *Rabi Capacity factor* is the ratio of mean supply of rabi season to 'capacity' (50 per cent to 60 per cent for Deccan Canals.)

31. *Full Supply Co-efficient*. The number of Ha/Acres irrigable per cumecs/cusec of capacity of a channel at its head.

Note.—The controlling factor in the design of a channel is the rabi 'full supply co-efficient'. This varies in the Deccan according to types of crops to be grown being as low as 50 for cane, and as high as 120 for rabi crops only. The record year on the Nira gave 92 and 80 is a fair figure for ordinary proportions of crops on perennial canals.

32. *Time factor* of a channel is the ratio of the number of days the channel is in flow to the 'base'. The most convenient 'base' for this calculation is the normal ten day rotation period. If in a ten day period the channel flows for 4 days and nights and 6 days only and not at night, the time factors is 7/10 th.

33. *Gross area* is the total area included within the farthest limits upto which the canal water is proposed to be supplied.

34. *Gross Command Area* is the area arrived at after deducting from the 'gross area' such areas within irrigation limits as are not commanded by the Project.

35. *Actual command* is the area on which water will flow from complete canal system as constructed or likely to be constructed.

36. Culturable Commanded Area is the portion of 'gross commanded area' which is culturable.
37. Actual Irrigable Command is the portion of the 'actual command' which is suitable for irrigation.
38. Area Irrigated is the area to which water is actually supplied.
39. Area assessed is the area on which assessment is charged.
40. Intensity is the percentage of the 'area irrigated' bears to the 'actual irrigable command.'
41. Block means the whole area of certain specified land to which the block system is applied.
42. Block conditions means the special conditions prescribing, regulating or restricting the irrigated cultivation which may be carried on within a Block.
43. Block Period means a period for which a supply of water is sanctioned under the block system.
44. Block rate means a fixed uniform, annual rate levied for the supply of water to a block.
45. Block System means a system under which a supply of water is provided for carrying on irrigated cultivation under certain conditions throughout a block for a period of years.
46. Plot means one of two or more portions into which block land is divided for the purpose of irrigation, each of such portion being provided with a separate inlet for irrigation water.
47. Unit means one of two or more plots, each of a standard area, into which a piece of land is divided, such sub-division being maintained for a number of years and unitization means dividing into units.
48. Catchment is the area which drains into a drainage.
49. Drainage means the natural lines of depression in the area through which storm water escapes to the river.
50. Drainage channel is a natural drainage when improved by clearance or by excavation.
51. Exchange of blocks means a change of portion of part or whole of sanctioned block area to a new area with the approval of the competent authority.
52. Transfer of block means change in the block holders in the middle of a block period due to (i) Owner after obtaining block sanctions in his name, leasing his land to a tenant, (ii) land reverting from tenant to owner, (iii) Change in ownership of land caused by sale, mortgage or death of blockholder etc.
53. Overlap Occurs when new perennial crop is planted in a block before the old crop has been removed so as to exceed the basic area of perennial crop, in a block.

54. *Khodawa* is the first ratoon of the plant cane.

Khodawa, Nidawa,
Rodwa, Chidawa

55. *Nidwa* is the second ratoon of the plant cane.

56. *Rodawa* is the third ratoon of the plant cane.

57. *Chidawa* is the fourth ratoon of the plant cane.

58. *Ceiling of Block* means a limit of maximum area of a block allowable in the name of an individual as per rules.

59. *Share holder* means a blockholder who is a certified member of the Co-operative Sugar Factory.

60. *Black-listed Irrigator* is an irrigator who has committed two or more offences of unauthorised irrigation of perennial crops within a stipulated period and who is debarred from being a blockholder for a certain period.

61. *Demarcation* is a fixing the boundary of block.

62. '*x*' *Limits* is the maximum area of cane permissible in each catchment or sub-catchment of a channel.

63. '*R-limits*' is a maximum area of cane allowable in the damaged area reclaimed by construction of the land drainage of any other method.

64. *Adsali Sugarcane*.— It is a variety of sugarcane which matures during a period of 16 to 18 months. Plantation for this variety of cane is done between 15th July to 15th September. This is a very common variety practised by cultivators on Deccan Canals.

65. *Suru or Sali Sugarcane*.— It is a variety of sugarcane which matures during a period of 12 to 14 months. Plantation of this variety is done between the period of 15th November to 15th January on Deccan Canals.

66. *Overlapped Cane*. From the definitions of Adsali and Suru Sugarcane it will be observed that cultivators of a sugarcane crop cannot get yield of his crop within 12 months. In order to provide yearly income to the cultivator, additional plantations are granted to the irrigator towards their basic sanctions. Old sugarcane that is standing in the field over and above the basic sanction is called "Overlap".

67. *Tank chart*.— It is a graph showing how the reservoir has been filled during the monsoon and how its water has been consumed during the fair seasons. These are maintained for very large storages under a Management Division.

68. *Duty* is defined as acreage/hectarage of land that is irrigated per cusec/cumec of water.

$$69. \quad AI/DC : - \quad \frac{AI}{DC} = \frac{\text{area irrigated}}{\text{day cusecs}}$$

This is generally 4 for Rabi season and 3 to 3.5 for hot weather season for mixed irrigation, at the distributory head.

70. *Pre-seasonal*.— It is a crop, plantation of which is done in advance of starting of the season.

71. Irrigation Pass. It is a permission in a standard form, issued to an irrigator for supplying water to his sanctioned crops.

72. Demand Statement is a form in which assessment is preferred for the water consumed by the irrigator to his sanctioned crops.

73. Pali-Patruk is a statement showing the turn of rotation of every irrigator to his sanctioned crops on a particular distributory.

74. Sheja-pali. It is a method of supplying water to the sanctioned crops from the irrigation system according to a fixed order in each rotation. This is in operation on the Deccan Canals for over fifty years and has not only stood the test of time but has also acquired acceptance of the irrigators.

2.0. What is Irrigation ?

The process of supplying water to the crops by artificial means is called irrigation. This is also understood by a different terminology called "Irrigated Agriculture or Irriculture". Irrigation is as important to the crops as blood supply to the human body. The water supply to the crops is a primary need for the healthy growth of the crop as the blood in the human body. The need for the regulated timely supplies of water and manure in requisite doses goes a long way in realising increased productivity of the crop. The productivity of a crop depends upon the type of soil, adequate supply of water and employment of labour and proper application of insecticides and pesticides. The Irrigation Engineer has, therefore, a most important role to play in the day-to-day management of Irrigation works.

2.1. Development of Irrigation.—Practice of irrigation has been in existence since times immemorial. Large and small surface tanks have been used for irrigation since ancient times. Lifting of water or diverting the same from small streams and rivers was also pursued in the olden age. In the Western Maharashtra, the first large-scale irrigation work was constructed in the year 1870, on the Krishna river near Karad known as Khodshi Weir and Krishna Canal system. The first storage work was completed on the Mutha river in the year 1875 known as Khadakwasla Storage Reservoir. Thereafter, the storage works at Bhatghar, Chankapur, Darna, Bhandardara were constructed in the British regime. In the Vidarbha area small tanks were taken up near Ramtek, Ghorajhari, Asola-Mendha and Naleshwar. In the Marathwada area no such tanks worth mentioning were constructed. However, since 1954 good impetus for the construction of irrigation works was given and quite a number of schemes got completed.

2.2. Irrigation Acts.—The State of Maharashtra consists of the following three regions:—

- (i) Western Maharashtra.
- (ii) Vidarbha Region.
- (iii) Marathwada Region.

The regions of Vidarbha and Marathwada have merged into the then Bombay State in the year 1956. There was not much irrigation practised in the region of Marathwada before the merger of the State. Even then, Hyderabad Irrigation Act was prevalent in that region till the Maharashtra Irrigation Act, 1976 was passed

First Dam = 1875

First Irrigation Work in Maharashtra = 1870

and made uniformly applicable to all the State from 1st January 1977. In the case of Vidarbha Region, quite an appreciable irrigation was being practised on the old tanks like Ramtek, Ghorazari etc. Generally crop pattern followed was of Paddy and there used to be long term sanctions for Paddy besides sanctions on demand by the irrigators. In this region C. P. Irrigation Act was prevalent till the Maharashtra Irrigation Act, 1976 was passed and made uniformly applicable to all the State from 1st January 1977. In the case of Western Maharashtra, Irrigation has been in existence for over 100 years. Old Bombay Irrigation Act of 1879 and the rules framed thereunder namely 'Bombay Canal Rules of 1934' continued to operate till the new Act was passed. Provisions in the Bombay Irrigation Act and Hyderabad Irrigation Act are broadly comparable and only differ in the matters of details. Rules framed under the Bombay Irrigation Act are very detailed and generally deal with procedure of sanction of water applications, water rates, irrigation cess, assessment, remission and refunds, various forms of different types of sanctions, powers of various officers under the Irrigation Department, notification of rivers, nallas, tributaries, sub-tributaries, etc.

As the Vidarbha Region and Marathwada Region have been merged into the present Maharashtra State, in order to have a uniformity in the Irrigation Rules, all over the State, it was necessary to have a uniform Irrigation Act for all the three regions of the State. Different provisions in the three different Acts have been considered in detail and new unified Irrigation Act styled, "Maharashtra Irrigation Act 1976" has been enacted and is operative from 1st January 1977.

MIA, 1976

2.3. *Types of Irrigation Works.*—Main types of irrigation works are as under:—

- (1) Large storage reservoir and pick-up weirs.
- (2) Medium and Minor Irrigation and Small Pazar Tanks.
- (3) Diversion Bandharas.
- (4) Lift Irrigation and Tube Wells.
- (5) Wells.

2.4. *Introduction of new crops and new varieties of existing crops.*—Irrigation makes possible the introduction of varieties of crops which cannot be ordinarily grown on rains. Sugarcane and most of the fruit trees cannot be grown without irrigation. Similarly, the high yielding varieties of the crops can be introduced where irrigation supply is assured as these varieties of crops cannot depend or wait for the unforeseen vagaries of the monsoon.

2.5. *Cropping Pattern.*—From the foregoing general discussion it would be seen that the cropping pattern on the different Major, Medium and Minor Irrigation schemes has to be very well thought out, as it has a direct bearing upon the agro-climatic environments and the timely and adequate supplies of irrigation water. The Director of Agriculture on this consideration and the trend of cultivation of rain-fed crops and crops grown on wells in the locality certifies the appropriate cropping pattern for the different irrigation schemes before the schemes are approved and taken up for construction.

The cropping patterns are very much helpful to the Management Engineers while assessing quantum of water required to be stored for the fulfilment of the irrigation commitments. The cropping pattern however, as originally prescribed by Agriculture Department, is to be taken as a guide line for the development of a cropping pattern

on the Project, because the cultivators may find some other varieties as most profitable and economical. During the process of irrigation development, the cropping pattern has, therefore, to be adjusted to the day-to-day new varieties of crops which may prove more suitable and profitable as a result of continuing process of research activities. The cropping pattern may also fluctuate according to trend of market conditions and may warrant sudden changes in the cropping pattern and supply of irrigation water. In nut-shell, there should be enough flexibility for the cultivator to adopt new varieties of crops which will give yields and adequate profits.

2.6. *Water requirements.*—The Engineer-in-charge of a management work has to be quite conversant with the water requirement of the different crops in the different seasons. The interval between each rotation and the total number of waterings required by crops, right from its sowing to its maturity has to be regulated depending upon the availability of water.

✓ There are several factors which influence the requirements of the water by the crops. These are summarised to serve as guide-lines.

2.6. (A) *Factors pertaining to Climatology:*

- (1) Rainfall, its insistance and its distribution during the growth period ;
- (2) Atmosphere temperature ,
- (3) Wind movement; and
- (4) Soil evaporation and relative humidity.

2.6. (B) *Factors pertaining to Soil and Topography:*

- (1) Type of soils, its texture and retaintivity ; permeability?
- (2) Soil fertility ;
- (3) Slope of the ground ; and
- (4) Sub-soil water table.

2.6. (C) *Factors pertaining to Cultivation:*

- (1) System of irrigation adopted ;
- (2) Drainage conditions ;
- (3) Extent of mechanisation in operation ;
- (4) Supply of manure ;
- (5) Land preparations ; and
- (6) Extent of irrigation beds.

2.6. (D) *Factors pertaining to Water Supply:*

- (1) Adequate supply of water during the growth period; and
- (2) Method of supply of water.

It would be seen from the above that the Management Engineer has a very important role to play in the day-to-day supply of irrigation. On the basis of the factors enumerated above, the Irrigation Engineer has therefore, primarily to control the supply of irrigation water to each individual according to the rotation of the supply of irrigation water fixed in the different seasons for different crops and the quantum of water available for irrigation. There are two methods by which the irriagation water is supplied to the cultivator :—

- (1) Water supply on area basis.
- (2) Water supply on volumetric basis.

2.7. *Supply on Area Basis.*—In this system, the cultivator is given water supply to his field in a fixed rotation, in such a way that the sanctioned area of his crop is completely irrigated from one end to the other. There is no restriction on the quantum of water he receives for the same. The water supply on the area basis being practised on a very large scale, all individual cultivators on all the canal systems are getting water supply on "Area Basis". The water rate is also charged on area basis for the season and the type of crop irrigated.

At present a new method of estimating the water requirement of crop is many times used. The details of this method are given in Appendix-I. The method is used on some Projects of C.A.D.A. Wing. The method is not largely used as large staff is necessary for collecting the data required.

The details of different methods of irrigation used in the field are also given in Appendix-I. However, it needs to be noted that the water requirement for crops calculated for these different methods, varies substantially.

2.8. *Supply on Volumetric Basis.*—In the case of volumetric system of irrigation the cultivator receives water supply on "Measurement basis". The water supply is measured by means of measurement devices either at the distributory head or at the property head. The responsibility of distributing this quantum of water further evenly to the area under irrigation lies with the cultivator. Thus in this case, the water supply is very much economically used and the chances of over-irrigating fields and thereby getting lands damaged due to water logging and soil efflorescence etc., are almost eliminated. This water supply is charged on the basis of Mcft/Mcum. of water supplied to crops, irrespective of the season or the irrespective of crop irrigated.

The areas of the joint stock Sugar Factories now taken over by the Maharashtra State Farming Corporation for irrigation, large sanctions of individual irrigations and co-operative societies are given water supply on volumetric basis. This water supply is measured on S.W.F. or meters or automatic recorders either at the Distributory Head or at the Property Head. Water is supplied at 315 cm. per hectare of sugarcane sanctioned to the above consumers at Distributory head of 284.50 cm. at the property head as the case may be.

The seasonwise break-up of this water supply is as under :—

	Distributory Head	Property Head
(1) Kharif 1.7 to 14.10 (8 July - 14 Oct) ..	66.00 cm. (26")	58.8 cm. (23")
(2) Rabi 15.10 to 28.2 (15 Oct - 28 Feb) ..	114.00 cm. (45")	104.00 cm. (41")
(3) Hot Weather .. (28 Feb to 30 June) ..	350.00 cm. (53")	122.00 cm. (48")
Total ..	315.00 cm. (124")	284.05 cm. (112")
Say ..	315.00 cm. (124")	284.05 cm. (112")

315 - 284 = 31 cm = losses

The Maharashtra State Farming Corporation which has taken over the farms of the joint stock sugar factories is allowed water supply on volumetric basis. The Corporation as a special case is allowed additional water supply during monsoon to the extent of 10 acre inches (1028.00 cm.) of the sugarcane crop. This additional water supply is allowed during the overflow period. Water supply should be allowed as quickly as possible so that the advantage of the short period of overflow could be fully availed of.

2.9. Volumetric Supply to other Crops.—The water supply on the volumetric basis for crops other than sugarcane crop is also permitted on volumetric basis. The quantum of water supply for each individual crop is to be calculated according to the Hectare cm. (acre-inches) allowed for such crops from sowing to maturity. The following table gives the hectare cm. (acre-inches) allowed for such crops :—

Category of Crop	Hectare cm. (Acre-inches) at Distributory Head	Hectare cm. (Acre-inches) at property Head
1. Monsoon Rice	84.00 cm. (33")	76.20 cm. (30" monsoon season only).
2. Monsoon rice, extending in Rabi ..	28.00 cm. (11")	25.04 cm. (10")
3. Monsoon seasonals	28.00 cm. (11")	25.04 cm. (10")
4. Rabi seasonals	33.00 to 46.00 cm. (13" to 18")	30.50 to 40.64 cm. (12" to 16")
5. Hot Weather seasonals	73.50 cm. (29")	66.00 cm. (26")
6. Vegetables	167.50 cm. (66")	152.40 cm. (60")

On the basis of the above hectare cm. (acre-inches) the seasonal water quota is calculated and the water supply is regulated accordingly.

Note.—The units for water supply in F.P. system are in acre-inches and corresponding in M. K. S. are ha-cm.

3.0. Supply of irrigation water terminology used by Irrigation Engineer :

3.1. Duty.—Duty is defined as an area in acres of a crop which 0.0283 cum.sec. (1 cusec) of water flowing continuously throughout the season is able to irrigate. This duty is different for different crops and the same is detailed below for the main crops :—

	Duty in ha. (acres)	
1. Sugarcane/Banana	16.20	(40)
2. Other Perennial crops	18.20	(45)
3. Rice	18.20	(45)
4. Jawar	48.60	(120)
5. Cotton	32.40	(80)
6. Two seasonal crops	32.40	(80)
7. Wheat	32.40	(80)
8. Hot weather crops	20.20	(50)

Duty, Delta and AI/DC

Say 50 & 100 acres

3.2. Delta.—"Delta" means total depth of the water in cm. (inches) on the field required by a crop from sowing to maturity. Appendix-II gives Delta (Water requirement in inches) for different crops.

Duty referred to above is the seasonal duty and gives an idea for the overall water planning on an irrigation scheme. However, Duty as understood by the Irrigation Management Engineers in day-to-day work is AI/DC i.e., area irrigated in Hectares per one Cumec. (per one cusec) of water supplied.

This AI/DC is the key note of irrigation management as the demand and supply of irrigation water is based on these duty figures. These duty figures are for mixed cropping patterns on—irrigation schemes.

3.3. Irrigation Programme.—It is already known that the Major and Medium Irrigation Schemes are designed to store 75 per cent dependable yield, while the minor irrigation works are designed for 50 to 60 per cent dependable yield. The cropping pattern as envisaged at the time of formulation of the irrigation Project is such that all the water available in the storage is fully utilised before the next replenishment is received. However, if the catchment area is not assured with reliable rainfall then a certain quantum of water is allowed to be stored as a carry-over and carried to the next year. This "Carry-over" enables the Irrigation Engineer to tide over the deficient water storage situation in a bad year and to supply water at least to perennial crops and honour the standing commitments.

In case of medium irrigation schemes, while deciding the storage capacity, the irrigation in the Kharif season is allowed water supply to the extent of 20 per cent of the total Kharif requirements from storage while remaining Kharif Irrigation is planned to utilise the water from the overflow or from the run of the river as the case may be.

In order to fix up the programme of utilisation it is necessary to know the irrigation year and the seasons thereunder. The Irrigation Year is reckoned from 1st of July to 30th June next year. The seasons are as under :—

Irrigation Year

Kharif Season	..	..	1st of July to 14th of October.
Rabi Season	..	..	15th October to 28th February of the next year.
Hot weather	..	..	1st of March to 30th of June.

3.4. Classification of Crops.—These seasons are based on the general trends of sowing and maturity of the respective crops.

Following is the classification of the crops generally grown on the irrigation tank :—

(a) Perennials :

- (1) Sugarcane/Banana,
- (2) Pan gardens,
- (3) Fruit trees (Grapes, Oranges) and
- (4) Lucern and Elephant grass etc.

(b) Two Seasonals :

- (1) Turmeric,
- (2) Chilly,

- (3) Vegetables,
- (4) Cotton and
- (5) Tobacco.

(c) *Kharif Seasonals* : ✓

- (1) Jawar,
- (2) Bajara,
- (3) Paddy,
- (4) Karad,
- (5) Mung,
- (6) Udid and
- (7) Kharif groundnut.

(d) *Rabi Seasonals* : ✓

- (1) Wheat,
- (2) Gram,
- (3) Rabi Jawar.

(e) *Hot weather Seasonals* :

- (1) Hot Weather Groundnut,
- (2) Kadawal (Green Fodder)

4.0. Water Planning and Irrigation Programme :

4.1. *Yearly Water Planning on Storage Reservoirs.*—In the northern part of India viz., in Uttar Pradesh and Punjab, the canals are fed continuously from the run of the river and plentiful of water is available to the irrigations. Similarly, in the southern States there are no restrictions on the quantity of water drawn in the canal as the entire area is practically under one crop. However, in the Maharashtra State there is a positive need for the regulation of the quantity of water to be supplied to the crops in the command; because all the variety of crops are grown by the cultivators and the quantum of water available, proportionate to the demand is just adequate, advance water planning has to be done for the entire Irrigation Year.

As explained earlier, the irrigation in the Kharif season has to be done from the available monsoon discharges in the river, while in the case of medium tanks, if necessary, 20 per cent of the Kharif demand is to be fulfilled from the storage. In order, therefore, to achieve the best utilisation of water in the Rabi and Hot weather season, an irrigation programme has to be formulated to maximise the utilisation of the water in the Rabi season for growing of food grains and other perennial crops and to minimise utilisation in the summer season to avoid large scale of evaporation losses in the tank.

On the established irrigation systems, the “Long term” irrigation commitments are made with the cultivators. These long term commitments have therefore, to be given first preference in the above water planning. In the case of established irrigation

80 to 100% irrigation in Kharif season shall be done by Monsoon

systems, the permanent demands for water supply to crops should be taken as that of the average of the last three years' demands including those of occasional seasonal demands. If the permanent commitments, such as blocks or agreements — have not been fully saturated on the system, then the surplus water has to be planned for supply for additional seasonal demands on the system.

However, the tempo of the crop-campaigns taken up by the Zilla Parishad authorities and the trend of irrigators to take up to certain new types of crops depending upon the market conditions and availability of ancillary inputs has to be taken into account for reservation of water for occasional demand.

4.2. *Preliminary Irrigation Programme*.—The preliminary irrigation programme therefore, has to be very realistic and based on the probable demands of the cultivators in the command. The planning has therefore, to be such that all the available water in the storage as on 1st of October is fully utilised by the end of the irrigation year. It is also customary to prepare a supplementary irrigation programme by January every year so as to account for the actual utilisation of the water during the past 3 to 3 1/2 months and to revise forecast of the utilisation of the balance of water completely during ensuing hot weather season.

A typical preliminary irrigation programme for the Nira Canal system is shown in Appendix-III. From the perusal of this programme it will be seen that for the Kharif season no detailed programme is chalked out and all irrigation is expected to be completed from the floods and the run of the river.

4.3. *Rabi Programme*.—All the sanctioned crops under the different categories have been enlisted and these areas are converted on the cane basis. The factors used for converting seasonal crops into cane basis are based on the water requirement of each crop. Under the Rabi programme, the item No. 1, i.e., Sugarcane, includes basic cane area of all cultivators except those on volumetric basis. A new plantation by way of "Suru" overlap is allowed to the extent of 50 per cent of basic area. This is reflected in item No. 2. This is assumed to be 45 per cent instead of 50% based on past averages due to process of harvesting of old cane and overlapping of new cane (Suru or Khodwa).

In cane block, Rabi crops are permitted. 40 per cent of the area of the cane block is considered to be under Rabi crops — based on past average. Other items of crops are self-explanatory. The introduction of new high yielding varieties of crops is a continuing process and the conversion factor will have to be adopted on *prorata* basis of water supply compared with that of cane. The total requirement of water is thus calculated on the basis of formula given below :—

$$Q \text{ in Million Cft.} = \frac{\text{Area reduced to the cane basis} \times \text{base period of season}}{\text{duty} \times 11.57}$$

$$Q \text{ in Million Cu. Metre} = \frac{\text{Area in hectare reduced to the cane basis} \times \text{base period}}{\text{duty hectare/Cu. Metres} \times 10^6}$$

In the case of new canal systems, this duty for sugarcane will have to be taken as indicated on page 10 para 3.1 till established duty is available for that canal system.

4.4. *Hot Weather Programme*.—Similarly, quantity of water required for the Hot weather season is worked out for the sanctioned crops. In the hot weather

programme in addition to basic cane, the over lapped cane beyond the Rabi season i.e., beyond 1st March is accounted upto 15/4. Due to introduction of Co-operative Sugar Factories all the cane of the individual irrigators does not get crushed in time and is allowed to be irrigated upto 15/4 or beyond.

Pre-seasonal water supply to long staple cotton and Rice crop from 15th April and 1st of May respectively has been accounted for in the programme. Post-seasonal water supply to Khapla or new high yielding varieties of wheat crops has also to be accounted for.

After calculating the water requirement for Rabi and Hot weather seasons, the requirements of water for non-agricultural purposes i.e.,

- (i) Domestic water supply to towns.
- (ii) Industrial water supply to factories, Railways etc.,
- (iii) Reservation of water for power generation;

is added to arrive at total 'Q' required for the two seasons. Gross water requirements at the canal head is thereafter arrived at, after adding transit losses in the canal system. These transit losses are also based on the experience of the running of the canal for the past years and are therefore, different for different canal systems. To the gross requirements of the water at canal head losses in the lake due to evaporation are added to arrive at the total quantum of 'Q' required in the storage reservoir for supply of irrigation.

In a bad year, when total requirements of water for the irrigation of average demand of past years is more than the replenishment in the lake, the usual demand of water for the Rabi and Hot weather crops has to be suitably curtailed. While curtailing the demand the water supply to permanent commitments and in particular to the perennial crops are required to be honoured on priority. Domestic water supply has the highest priority and hence water is required to be reserved for the same. After meeting these demands, the following measures need to be taken.

No new Rabi seasonal crops or hot weather seasonal crops need to be sanctioned water supply. In case, the circumstances demand some further reduction of water supply to perennial crops then it has to be done by curtailing the area of Suru or Khodwas (Sugarcane) plantation normally permitted from 15th November to 15th January. This new overlap plantation is allowed to the extent of 50 per cent of the original sanctions. This area therefore, has to be curtailed in such way that the old and new sugarcane crop is not starved and is given water till maturity. Similarly, non-Agriculture commitments are to be suitably curtailed. Advance notice needs to be given in case above curtailments are to be achieved.

4.5. Approval to Irrigation Programme—Yearly irrigation programme is to be got approved by the Executive Engineer from the Superintending Engineer. Preliminary Irrigation Programme for Rabi and Hot weather is to be got approved by about October every year. On approval to the Programme, the Executive Engineer and the Superintending Engineer can have proper and timely control over the withdrawals, of water in every rotation. In order to watch the day-to-day withdrawals as compared to the planned utilisation a chart is kept in the office of the Executive Engineer and the Superintending Engineer. This chart is known as "Tank Chart". This chart gives the very valuable graphical representations of the overall usage from the storage.

Tank Chart

Approval by SE

A typical Tank chart completed in all respects at the end of year is shown in Drg. Plate No. 1. The chart shows the day-to-day level in the lake while it gets filled in by from July to September or so. The F.R.L. is predominantly shown to indicate for how many days the tank is surplussing over the weir. A programme line with withdrawals is also marked to compare actual usage. An experienced Management Engineer with proper foresight can take timely precautions in cases of certain overuse of the irrigation water. The excess withdrawal for the irrigation from the lake may be due to the original presumptions made in the Preliminary Programme going wrong or there is an excessive or unauthorised use of water. These need to be investigated immediately and excess water use has to be compensated by taking strict measures.

In order to have timely and adequate control over the day-to-day withdrawals one of the Sub-Divisional Officer is designated as "Controlling Officer". It is common experience that the tail portion of canal generally suffers from inadequacy of water. Hence a canal officer of the tail-reach is generally designated as "Controlling Officer". The Controlling Officer is empowered to check the gauges in the other Sub-Division in the Upper reaches. This Sub-Divisional Officer has to control the withdrawals from the storage under the directions of the Executive Engineer. Day-to-day withdrawals are noted in the gauge-books and further maintained in Form Spl. PWD 126-e prescribed by Government. These gauge books are kept in the Sectional Offices, Sub-Divisional Offices, Divisional Offices and Circle Offices. The record of the irrigation water supply is maintained and watched through these gauge books.

Gauge Book, PWD
126e

4.6. *Supply and Control of Irrigation Water.*—Generally, an irrigation Division has to control more than one Canal system. In order, therefore, to regulate water requirement for each of the Canal systems in the respective season, the quantity of canal water to be supplied is roughly divided according to the number of rotations fixed in the respective seasons. In a rotation period, the number of days when the canal is flowing is known as the "Flow period" and the period for which the canal is closed is known as the "Closure Period". The flow period in a rotation is therefore, required to be adjusted in such way that the demand of water on the canal for the sanctioned crops is met with fully. The closure period is observed in every rotation to enable the field staff to prepare completion report (Dasawada Patrak) of the past rotation, to plan out for the next rotation and to carry out certain emergent repairs of the canal which may be necessary before starting of the next rotation. After taking into account above requirements of the running of the canal, the following rotation system is generally observed on all canals :—

	Rotation period	Flow period	Closures period
Kharif season	.. 14 days	10 days	4 days
Rabi season	.. 12 to 14 days	10 days	2 to 4 days
Hot weather	.. 10 days	6—8 days	2 days (Min.)

Minimum of 2 days closure is observed during the rotation period except for some time in Rabi season when canal is continuously run to meet the heavy demand known as "Rabi Rush". Rabi rush period is the period when sowing of the crops is done and the first watering after the seeds are germinated is required to be given within a stipulated time.

The rotation programme is to be prepared by the Canal officer and got approved from the Executive Engineer prior to the starting of the season. The rotation programme is to be intimated to all the cultivators in the villages by pasting it on the village Chawdi. The programme has also to be intimated to Canal Advisory Committee, the Agricultural Department, Zilla Parishad authorities and Taluka Panchayats. From the perusal of the rotation programme, it would be seen that the date of opening of the canal at the Head Regulator is indicated. However, date of opening of the canal will gradually shift according to the travel time of the canal from head to the tail sections. This shifting in the opening and the closure of the canal has therefore, to be taken into account and the cultivators in the respective canal zones and outlets have to be informed properly ahead of rotation to avoid confusion in the supply and receipt of irrigation water by the cultivators.

4.7. *Indent of water during rotation.*—Indent of water in each rotation is based on the $\frac{AI}{DC}$ of the irrigation figures. These $\frac{AI}{DC}$ figures vary from canal to canal. However, figures generally adopted are given below:—

	AI/DC	AI/Day Cumecs
Kharif season	4 to 4.5	57.2 to 64.35
Rabi season	3.5	50.0
Hot weather	3	42.9

These AI/DC figures are for the mixed irrigation at the distributory head.

Sectional Officer has therefore, to take into consideration the areas to be irrigated in his Section in a rotation and compute water requirements on the basis of AI/DC figures and put up a "Water Indent" to the Sub-Divisional Officers. The water indent of the Sectional Officer has to be generally in the following form.

Name of Crop				Water indent for rotation area from 15th October 1971 to 29th October 1971	
				ha	Acres
Perennials	..	..	..	202.40	500
Other Perennials	..	..	..	16.20	40
Turmeric	..	..	..	20.20	50
Cotton	..	..	..		
Wheat	..	..	..	404.70	1000
Jawar	..	..	..	485.60	1200
Vegetable	..	..	..	24.00	59
Total ..				1153.00	2849

Duty: 50 (3.50)

$$Q \text{ Required} = \frac{1153.00}{50} = 25.06 \text{ cumecs.}$$

OR

$$(2849/3.5) = 814 \text{ cusecs.}$$

For 10 days flow period at 2.50 cumecs/day = 81.4 = (82 cusecs/day)

The Sub-Divisional Officer on getting these Indents from the sections, compiles them and puts up his Indent of the total requirements to the Executive Engineer. The Indent of water of the Sub-Divisional Officer is at the Distributary Head. The Controlling Officer receives the demands of all the Sub-Divisions and adds up transit losses in the Canal. The total quantum of water required for the irrigation is worked out and released for irrigation. Controlling Officer has to watch daily discharge released in the canal and allowed to the respective Sub-Divisional Officers. Changes if any in the daily demands required by the Sub-Divisional Officers are intimated to the Controlling Officer 24 hours in advance to make necessary adjustments in the release of discharges in the canal.

4.7-A. Shejpali system of irrigation.—Preparation of irrigation programme for the consumption of stored water alongwith the river gains in the fair season has already been discussed. Actual system of Irrigation known as 'Shejpali System of Irrigation' practised widely on the old established irrigation systems in the Western Maharashtra is described below.

Requirement of water for every rotation Sub-Divisionwise is calculated and distributed among the Sub-Divisions by the Executive Engineer in-charge of the management Division. After the quota for each Sub-Division is fixed, it is further distributed among the various sections considering the sanctioned demands, duty normally obtained in each section based on the Karia Registers. (Distributarwise duty registers). The Section Officer who is incharge of the section further divides the quota of each rotation among the various canal inspectors in-charge of irrigation distributarwise and outletwise.

Requirement of water at the outlet head is calculated on the basis of the value of AI/DC as Six. It is considered that four hours should be adequate considering one cusec of flow to irrigate one acre of sanctioned crop. On each outlet, the Canal Inspector in-charge prepares a list of sanction-holders, their sanctions in terms of acreage, calculates the total quantum of water in terms of day-cusecs for each outlet. On the basis of four hour of requirements for one acre, he calculates the total time for which a particular outlet is required to run. On this basis, he gives the data and the time to the sanction-holders. At a particular pre-determined place in his beat, he convenes a meeting of all the sanction-holders and gives them the date and time for which water will be supplied during the rotation. This time-table is known as Pali-Patrak and is prepared for each outlet by the Canal Inspector with the approval of the Section Officer in-charge of the Section. According to this Pali-Patrak, irrigation water for every sanction-holder is supplied during the rotation. This system of preparation of Pali-Patrak and supplying water according to pre-determined date and time is known as Shejpali System of Irrigation. राजपत्री

This Shejpali system of irrigation is practised on the old established canals for years together and has proved to be successful. The irrigators have understood this system and they take water according to the rotations. In Maharashtra, as yet irrigation has not been made compulsory and is optional. It is also the responsibility of Government of supplying water to the sanctioned crop till its maturity. If in any particular rotation, per chance, irrigator is not in a position to get water supply according to the pre-determined time, the Department supplies him water by running the particular outlet for some more time.

पात्री
पत्रक

4.7-B. Warabandi system of irrigation in the north.—A brief description of the warabandi system of irrigation followed in the North is given below:—

Basic principles incorporated in the North India Canal and Drainage Act, 1873, which is applicable to the Irrigation Systems in the North are—

(a) Water Right goes with the land.

(b) Irrigation Officers should generally interfere as little as possible in the internal distribution of water on water-courses. When disputes arise, they should endeavour to persuade the parties to settle the matter by mutual agreement or if a Panchayat has been instituted in the village concerned, to refer the matter to that body.

In Warabandi, water distribution is done as below:—

From the study of contours (at 30 centimeters interval) outlet chaks are proposed so that (a) Chak should not require discharge in excess of two cusecs or so and (b) as far as possible, it should be wholly in one village to avoid disputes among the share-holders which would be the case if an outlet chak lies in two villages or more. Final boundaries of outlet chaks are fixed in consultation with cultivators under section 20 of the Canal Act and suitable sites of outlets for chaks are fixed from consideration of command.

As soon as channels attain their regime, pipe outlets fixed earlier in irrigation channel are replaced by proper outlets that would ensure delivery of designed discharge, independent of the water level in a water course. Discharge through these outlets, such as open flumes and adjustable proportionate module and a few other similarly types, depends only on the water surface level in the irrigation channel and is independent of water level in water course.

Discharge from an outlet in a certain period is distributed among the holdings by the cultivators themselves on the understanding that each cultivator will be entitled to a duration of supply in proportion to the area of his entire holding in the outlet chak. In case there is dispute amongst cultivators regarding distribution of supply from outlet, Warabandi or turn can be fixed under section 68 of the Canal Act.

Method of Framing a Warabandi.—The period of rotation of a Warabandi may be fixed.

(a) *As an integral number of days.*—The numbers most usually used are seven and ten. With seven days period, the farmer has the advantage that when operation is continuous a share-holder's turn always occurs at the same time on the same day of the week. The length should generally conform with that usual in the District which will be suitable for use with the periods of the rotational distribution of the Canal concerned.

(b) *An odd number of half days.*—A disadvantage of the integral number of days is that in the continuous operation it affords no relief from turn occurring at night. This is avoided by this method.

(c) *From the size of the Chaks.*—In this case, the turns are calculated from a fixed time allowance per unit of area, usually 12 hours per square. This system has the disadvantage that in the case of very large or small chak the water received during a turn may be more or less than is suitable for a single watering.

Operations.—Operation may be either:—

(a) Continuous i.e., the turns are considered to be operative whether water is present or not. In this case, the turns occur at regular intervals.

(b) Non-continuous i.e., operative only when water is available. The latter system is preferable if the share holders are sufficiently united to operate it amicably. Where disputes are likely to occur responsibility is more easily fixed under the former system.

Order of Turns.—The order of turns should be definitely laid down in accordance with one of the following systems:—

(a) Down the water course i.e., in order of distance of the off-take from the outlet. In this case, the order proceeds down the main water course to the head of the first Branch, down the Branch before continuing down the main water course. Similarly, as regards sub-branches.

(b) Round the water course i.e., down one bank and up the other, branches being treated as in (a) above.

The latter system has the advantage that it distributes lead and nikal more evenly. But the former system is generally preferable as holdings usually lie on both sides of water course.

Where two or more holdings are served by off-takes close together, and lead or nikal is of importance the order of turn should alternate between the holdings.

Length of Turns.—The length of turns should be strictly proportional to the area of the units and should be regulated by the common village clock. Variation should not be permitted on account of variation in soil and should only be allowed on account of the level of the land in exceptional circumstances.

Plan of Chak.—The sanctioned Warabandi should be accompanied by a copy of Shajra on which the water course, the established off-take, the nakkas and the boundaries of the unit are shown.

10 Form of Warabandi.—The Warabandi should be arranged in tabular form showing the following columns:—

1. Order of turn.
2. Field numbers comprised in unit.
3. Name of Shareholders.
4. Area of Units.
5. Length of turn in strict proportion to area.
6. Any additions or deductions.
7. Length of turn allowed.
8. Remarks.

In the remarks columns, any additions or deductions as per column 6 and any orders of Nikal will be made and every such entry will be signed and dated by the Divisional Canal Officer. The method of operation laid down should be noted on the forms when the period of seven days and operation is continuous, the day and time of commencement of turn may be substituted for 7.

4.8. *Use of Canal Telephones.*—All the major canal systems are equipped with the Canal Telephones. On the olden canal systems in addition to the Telephones, the Canal Telegraph is also provided for quick transmission of messages for the control of water management. These Telephone messages are entered into a register known as "Canal Wire Book". The discharges let down into the canal system are noted in a register known as "Canal Gauge Book".

4.9. *Daswada Patraha.*—After closure of rotation, the Sectional Officer has to compile the usage of the Canal water in a form known as "Daswada Patraha". The Sectional Officer has to give details of water utilised during rotation for every direct outlet for every minor and distributary separately. This Patraha enables the Sub-Divisional Officer to check the performance of Irrigation in his Sub-Division. A specimen of "Daswada Patraha" is given below:—

(Rotation period 27th October 1979 to 7th November 1979—Baramati Section)

Name of Dy.	Water utilised		Crop irrigated		Duty	
	cumecs	cusecs	ha	Acres	ha.	Acres
Dy. No. 27	0.35	(12)	19.4	(48)	57.2	(4.0)
Dy. No. 28	0.45	(16)	24.3	(60)	52.35	(3.66)
Dy. No. 29	2.80	(100)	141.7	(350)	50.0	(3.50)
Dy. No. 30	8.50	(300)	425.0	(1050)	50.0	(3.50)
	12.10	(428)	610.40	(1508)		

4.10. *Efficiency Report of each rotation.*—The Sub-Divisional Officer-in-charge of Irrigation has to submit the "Efficiency Report" (*vide* Appendix IV) to the Controlling Officer. The Controlling Officer has to furnish a consolidated report to the Executive Engineer. This report has to be furnished for each rotation.

4.11. *Yearly Completion Report.*—This is a report which is prepared at the end of Irrigation year, when the water stored in the reservoir is fully consumed. The report gives a comparative idea between irrigation programme as planned and as fulfilled.

In this completion programme, controlling officers have to give account for all the areas irrigated cropwise for each Sub-Division during the Rabi and Hot Weather season. The quantum of water actually supplied and utilised for these crops in the two respective seasons is indicated. A typical completion report is given in Appendix V. The completion programme gives following details:—

- (1) Duty at Distributary head.
- (2) Canal Transit losses.
- (3) Duty at Canal head.

The duty thus arrived at the Canal head gives an idea of the performance on canal systems.

4.12. *Canal Inspector (Daftar).*—The Canal Inspector has a prominent role in day-to-day irrigation management. He receives water applications whenever such

applications are invited. He is concerned with distribution of canal water to the authorised irrigators. He has to note down the dates of receiving of water by the irrigators on the irrigation passes. During the course of irrigation he has to be very vigilant and has to frame Panchanamas of the unauthorised use of irrigation water. In other words he has to perform and to attend multifarious duties during the rotation period and during the closure too. The above irrigation performance has to be noted down by the Canal Inspectors in the different types of books to be maintained by him. These books are detailed below:

4.12.1. *Zade Patrak*.—This is a register in which all the details of sanctioned blocks are given. Each block holder has been given separate page in this book. Against each holder, dates of waterings, the sanctioned crops, dates of plantation, the dates on which the overlap sanctions are allowed etc., are indicated in this book.

4.12.2. *Panchanama Pahani Register*.—In this register, the dates on which the Panchanamas are framed and dates of submission to the Sectional Officer are given.

4.12.3. *Blank Panchanama Register*.—This is a register wherein the blank forms of the Panchanamas as received by him from the Sectional Officer are entered and cross references to its disposal are noted.

4.12.4. *Register of Wells*.—This is a register which gives details of wells in the beat of the Canal Inspector. The area of the different types of crops grown on the wells and whether these crops on well are irrigated by the canal system in any rotation or otherwise is indicated in this register.

4.12.5. *Note Book*.—This is a book wherein the instructions from the superiors are noted for compliance.

4.12.6. *Sketch Book*.—This Sketch Book gives the sketches of all the sanctioned blocks in his beat.

4.12.7. *Control Chart*.—The jurisdiction of the Canal Inspector with Survey numbers, block sanctions, outlet points, pazar sanctions and well sanctions are detailed in the plan known as 'Control Chart'.

4.12.8. *Dasawada Statement*.—Showing details of quantities of water utilised for each distributing channel with different kinds of areas irrigated and AI/DC obtained.

4.12.9. *Shejpali Patrak*.—Shejpali Patrak is list of areas arranged serially to receive water for each rotation, in strict sequence. The sequence should be last survey number of the tail and outlet to be taken first and upper survey number next and so on to reach head of the tail outlet. In this way outlet No. 1 of channel should come last.

4.12.10. *Metallic Tape*.—Metallic Tape should be used for measuring areas of crops irrigated unauthorisedly.

4.12.11. *Stamp Pad*.—Stamp pad to be used for taking thumb impressions in token of acknowledgement.

4.12.12. *Keys of Outlet Gates*.—The bunch of keys of outlet Head Regulator gates should be kept by Canal Inspector.

4.13. *Sanctions to perennials on Pazar.*—(1) Water applications for perennial and other perennial crops should be accepted on Form No. 7 along with an ordinary application in the letter form requesting sanction with details and a sketch showing positions of Nala engine shed, area proposed under Pazar irrigation with S. No. etc.

2. Water applications for these should be sanctioned after fulfilment of the following conditions :—

(a) Flow in the Nala or river should be enough to irrigate the previously sanctioned areas and the area under sanction.

Note.—Every year in mid-summer i.e., in the third week of May, discharges of nalas at conspicuous places as decided by Executive Engineer are to be observed. This is the minimum flow in the year and on the basis of this observed discharge, perennial crops at the rate of 565 Ha. per cumec (40 acres per cusec) flow of water can be sanctioned.

(b) For sanction to cane area twice the basic area of cane should be available in these fields.

(c) The area of cane under sanction should not exceed the ceiling area if the proposed sanction is on Pazar flow.

(d) The proposed area should not lie in 400 metre (1/4 mile) limit of village or town.

(e) The position of the diverting flow of water in the Nala should be such that no more than 22.5 cm. (9") Kachha bund should be required to divert water for flow or lift.

(f) The applicant should give in writing that an intake chamber as per type plan would be constructed at his cost, before start of irrigation on pazar water. He should also construct and maintain channels for leading water to crops under sanction.

(g) There should not be danger of inter-mixing of canal and Pazar water or canal and well water.

Note.—(i) A strip of land of more than 15.24 metres (50 ft.) should be kept between canal irrigation and pazar irrigation under sanction. It is not necessary that the strip of land be kept fallow but dry crops may be raised there.

(ii) No distance is required to be kept when canal or well irrigation is at a lower level than the proposed area under Pazar sanction.

(iii) In non-perennial zone of canal a distance of 3.00 metres (10 ft.) and bund of 0.9 metre (3 ft.) height in between the canal and Pazar irrigation should suffice.

(iv) When Canal channel is crossed by the Pazar Channel, the crossing should be in Pucca masonry on either side with pipes laid for sufficient length of crossing, the Pazar channel should cross over the parent channels to prevent the latter breaching or water leaking into the former.

(v) Applicant should not be a defaulter of irrigation dues.

(vi) Take off arrangement for Pazar water should not be allowed within a distance of 90.0 metres (300 ft.) from the edge of canal or distributary boundary.

5.0. Lift Irrigation :

5.1. *Apportionment of the water.*—The general policy has been laid down for apportioning certain quantum of water for being used by Lift Irrigation in the Irrigation Projects. The apportionment is as under :—

- | | |
|---|--|
| (1) Areas upstream of the storage lakes to be allowed certain quantities for lift irrigation. | For areas upstream of the storage a part of the acreage as provided under the Project under non-perennials is allowed subject to maximum of 1 per cent. |
| (2) Stretches between reservoir and the pick-up weir as well as areas adjacent, but beyond the practicable limits of flow irrigation to be allowed to lift stored water for irrigation. | For stretches between the reservoirs and pick-up weir a part of the acreage as provided in the Project under non-perennials to be allowed on lift irrigation scheme subject to a maximum of 5 per cent. |
| (3) Areas on the upstream of the canals upto 15.24 m. (50 ft.) head of lift to be apportioned certain quantum of water for lift irrigation. | For the areas upstream of the canal apart from the acreage as provided under the Project under non-perennials to be allowed to a maximum of 10 per cent. |
| (4) In stretches along with the river valley, where canals are not feasible, lifts for using portion of water on the river flow allowed upto practicable limits. | River lifts justify on regenerated flow due to irrigation. This type of irrigation should, however, be given last priority. Letting down any stored water into the river for being used for lift irrigation or being stored into the river in these stretches should, however, be not allowed. |

As per policy of the above mentioned apportionment of the storage water, on completion of the project, permissions for lift irrigations are to be granted as they are received from the cultivators.

The following are the guide lines in granting such permissions.

5.2. *New Projects.*—In case of new projects, a period of 3 years from the starting of the irrigation has been allowed to consider demands of lift irrigation. If the demands are not reached to the extent of 11 per cent, reservations, the canal system is to be extended to cover additional area over and above 89 per cent of the command so as to create 100 per cent irrigation potential.

However, in case if the command has been developed to the extent of 100 per cent potential already, then the permissions may be granted for lift irrigation to the extent of 11 per cent of the acreage under non-perennials by reducing intensity of the irrigation under the flow system.

5.3. *Old Canals.*—In case of old canals, it is not possible to change the crop pattern from the duties, hence the permissions to lift the water may be granted either by reducing the intensity or reducing the command whichever is feasible in a particular case.

(Ref. Government Circular, I. D., No. MIC-1569/6313-I (5), dated the 3rd December 1971).

Typical calculations for preparation of Lift Irrigation scheme are enclosed at Appendix-VI.

5.4. *Kolhapur Bandharas*.—A storage reservoir has been constructed in the Kolhapur District in the year 1954 known as 'Radhanagari Hydro Electric Project.' From the reservoir, water is let down through the turbines and hydro power is generated. There are in all 3 turbines. This hydro power station is used as picking station and supplements the power during peak hours. The water released through the generators is used lower down for irrigation on the banks of Bhogawati and Panchaganga rivers.

5.5. *Masonry Weirs*.—Masonry weir each of 3.00 to 4.50 metres (10 to 15 ft.) in height are constructed in the river bed to impound the water released from the generators. The water thus impounded is available for irrigation throughout the year. The Bhogawati and Panchaganga rivers have a flat slope of the order of 0.15 to 0.20 per km. and thus the back water of each weir is of about 16.0 km. on the upstream side of the river. Pumps are installed on the banks of these rivers to lift the water and to irrigate the lands. On these lift irrigation schemes cultivation of sugarcane has been very successfully achieved and cultivators are taking advantage of this tail water for irrigation, year after year with good profits.

5.6. *Norms of sanctions of Sugarcane on Pazar Lift*.—The lift irrigation from 'Pazar' has been very much practised by irrigators. In order, therefore, to arrive at the appropriate sanctions, the following norms have been prescribed.

Normally pumping hours are restricted to 12 only. Hence half the discharge in the Pazar is to be allowed for the calculation of area to be sanctioned of sugarcane.

In case where lift irrigation is contemplated the cane area to be permitted should be $\frac{1}{2}$ of the minimum discharge $\times 16.2$ Ha. (40 acres) of cane.

Where flow irrigation is contemplated the area of sugarcane to be sanctioned should be to the extent of full minimum H. W. discharge $\times 16.2$ Ha. (40 acres) of sugarcane.

In case of lift irrigation where the pumping equipment is provided as 100 per cent stand by a permanent arrangement, the area on the lift may be increased to that of permissible area under the flow condition.

A low duty of 572.0 ha. per cumec (40 acres per cusec) is assumed as it may not be often possible or desirable to divert all the minimum flow in the Pazar for irrigation.

5.7. *Well Irrigation in the Command :*

5.7.1. In case of assessment of crops grown on the wells in the command, the following standing orders are reproduced for guidance. These orders apply for wells sunk within 35.00 metres (100 ft.) of—

(a) A main canal or distributary channels, the latter being defined as a channel designed to carry a discharge of not less than 0.15 cumecs (5 cusecs).

(b) Nallas in the canal area notified or otherwise.

(c) All other notified nallas and rivers where water rates are chargeable as prescribed from time to time.

5.7.2. Before levying water rates on irrigation from such wells it is necessary to verify that the well was sunk after the admission of water in the canal or after

notification of the nalla as the case may be and well does derive benefit by percolation from the canal or the nalla.

5.7.3. As regards wells situated within the specified limit of perennial canal and irrigation channels and nallas in the canal area, notified or otherwise, within the perennial zone, such wells, should usually be assured of benefit of percolation throughout the year and irrigation from them is to be charged accordingly, after verification of the fact of the channel/nalla continuing to flow during the year.

5.7.4. In respect of wells situated within the specified limit in the non-perennial portion of canals and irrigation channels, such wells are likely to get benefit of percolation only in the season/seasons during which the canal or channel runs. Irrigation from such wells is therefore charged on seasonal basis.

5.7.5. Regarding nallas in the non-perennial zones in the canal areas, such nallas would not carry any discharge unless they derive their flow from the perennial zones or from seepage from Government channels or by some regeneration during the season or the year from seasonal crops. Therefore, proper verification would be necessary of nallas in non-perennial zones deciding whether and for which season the wells situated within the specified limit on such nallas derive benefit therefrom and become liable to water charges.

5.7.6. Regarding the other notified nallas and rivers, outside the canal area, each case is to be examined to decide which of these give benefits to the wells on their banks and during which seasons.

5.7.7. Canal officers have, therefore, to inspect such notified nallas and rivers, and the nalla in the non-perennial zone of the canal areas and maintain lists in the Sub-Divisional and Division offices of all such nallas as are likely to benefit wells on their bank and the season/seasons during which such benefit is likely to be available. Maintenance of such lists would obviate mistakes in charging water rates on irrigation from wells within the specified limits of canals or nallas, notified or otherwise.

5.7.8. The Superintending Engineers/Executive Engineers during their inspection of Divisional and Sub-Divisional offices have to check up the proper maintenance of such lists.

5.8. *Exemption of crops grown on levy of water rates.*—Water rates are not leviable on crops grown on wells within 35 metres of such Government channel, if the said well was in existence prior to the admission of water in a canal. It should be noted that no water rate can be levied even if an irrigator has increased the area under irrigation and/or has grown a richer crop than what he was doing before admission of water in the canal. It should, however, be seen that proper documentary proof has to be produced by the irrigators establishing the existence of the well in pre-canal days.

5.9. *Emergency supply to crops on well.*—These wells require canal water during certain emergency and canal water is required to be supplied to save the crops on well. The emergency arises out of when there is—

1. Break down of pumps.
2. Collapse of the Tharola or the Platform of the well.
3. Collapse of sides of the wells.

In all these cases, canal water supply can be given for a period of 1 month at a time to a maximum of 4 months. A Sub-Divisional officer has to certify such water supply and the Executive Engineer has to check personally at least 50 per cent of such cases. Superintending Engineer is empowered to sanction such water supply.

(Ref., Govt. letter No. S. 98-4-25198-I(B)(I), dated the 22nd May 1950).

6.0. Second class Irrigation on Bandharas, phad-system or/and Kayam Bagayat in Nashik, Dhule Districts.

6.1. *Second class irrigation works.*—The Irrigation works where the area under irrigation command is less than 100 Ha. (250 acres) is classed as "Second Class Irrigation Work". The construction and the irrigation management is under the officers of the Zilla Parishads. The Zilla Parishads, therefore carry out irrigation management and levy the consolidated water charge on the irrigators. The consolidated water charge includes Land Revenue and the Water rate leviable for the irrigation facility. The consolidated revenue is recovered by the Revenue Department.

6.2. *Phad and Kayam Bagayat.*—In Nashik and Dhule Districts there are very old Bandharas on perennial streams and rivers. These bandharas are very old and their year of construction is not known. According to local information this type of irrigation dates back to 17th Century. It is said to have first started in Mosam river—Baglan taluka and then spread in Northern part of Nashik and Khandesh. Horse-shoe type of bandharas varying in height from 2.80 m to 3.00 m. (9' to 10') are constructed in the river bed. There are no storages upstream of the bandharas and as such, irrigation is dependent on the natural flow in the stream or the river. At times, the irrigation suffers if flow in the river dwindles down. The area under irrigation is therefore, adjusted on the long experience of availability of flow in the river. These works are classed as "Second Class Irrigation Works" and people have rights of irrigation as per entries in the Record of Rights.

6.3. *Irrigation.*—The land lying between the channel and river is the irrigable command and is called "That". This "That" on the bandhara is divided in 3, 4 or 5 suitable blocks called "Phads". One Phad is reserved for basic cane. Seasonal crops are grown in other Phads. Enough area is left in one Phad for cane overlap. The crops are rotated in the various Phads year to year. Almost each and every beneficiary has a small strip of holding in almost all Phads. A map showing the Phads on a typical bandhara is shown in Drg. Plate No. 2.

The management of irrigation on these Second Class bandharas is done by the beneficiaries which are mostly from one village by forming a Water Management Committee (Called Pani Panchayat Committee) and is done in more or less in a spirit of family work. The Committee holds meetings and decides what crop is to be taken in each Phad and act accordingly. Meetings are also held from time to time for deciding distribution of the available flow in the river. One Phad consists of only one crop. Available water is distributed to various crops and Phads according to needs and according to the unanimous opinion of all.

The beneficiaries employ 2, 3 or 4 (according to necessity of the Ayacut) persons called Salwane (Patkaries) for water distribution and about equal number of chowkidars (called Jagalyas) for watch and ward of the crops. In some places one Inspector called (Havaladar) is also employed to supervise the work of all these. These persons

are employees of the beneficiaries and are paid in kind by the beneficiaries at the time of harvesting the crop. Sometimes but rarely they are paid in cash.

6.4. *Maintenance of Irrigation.*—The maintenance of the irrigation channel is also done by the beneficiaries in a family spirit. Thus beneficiaries behave like family members and take advantage of available flow for irrigation benefits. It is an excellent example of co-operation existing since long. It is a sort of moral binding on all beneficiaries to act according to agreed decisions taken by themselves.

If any of the beneficiaries irrigates his land out of turn the Pani Panchayat Committee asks him to pay some fine which he readily pays. If any person is found to take water to area outside that in record of rights and Pani Panchayat Committee reports the matter to the Tahsildar who charges them for the unauthorised irrigation as Tahsildar is the canal officer for Second Class Irrigation works.

The entire water distribution and annual repairs are done by the beneficiaries. Government has to carry out 'major repairs' which may be due to damage due to floods or old age of the masonry structures.

6.5. *Water rates and assessment.*—At the time of 'settlement' the Settlement Commissioner fixes the consolidated water rate on the Ayacut. It is entered in Revenue Record e.g. 7/12 and the Revenue Department recovers this assessment along with normal Land Revenue Assessment. The recovery is made by the Revenue Department like "Land Revenue". No demand statements or No Assessment papers are required to be prepared by Irrigation Department.

Because there is no storage upstream for assured irrigation and all management of irrigation is done by the beneficiaries themselves and maintenance of canal is also done by the beneficiaries, the assessment is comparatively less as compared to water rates on flow irrigation under First Class Irrigation. A Register showing the name of the Nalla, Bandhara, area irrigated, assessment (Irrigation + Land Share) is maintained in the Division.

CHAPTER 25

PART II—IRRIGATION MANAGEMENT

IRRIGATION MANAGEMENT

7.1. *Classification of Irrigation Works.*—Irrigation works are classified at present according to different criteria. They are summarised as under:—

Cost Criterion.—On the basis of capital cost of irrigation works, they are classified into three different categories:

- (a) Major ;
- (b) Medium ;
- (c) Minor.

(a) *Major Irrigation Works.*—Major Irrigation work is one having the C. C. A. above 10,000 ha. is classified as “Major Irrigation Works”.

(b) *Medium Irrigation Works.*—Medium Irrigation work is classified as one having C. C. A. upto 10,000 ha. and above 2,000 ha. classified as “Medium Irrigation Work”.

(c) *Minor Irrigation Works.*—Rest of the works having C. C. A. upto 2,000 ha. is classified as “Minor Irrigation Work.”

Management Criteria.—Under this criterion the irrigation works are classified as:—

- (1) First Class Irrigation Works.
- (2) Second Class Irrigation Works.

(1) First Class Irrigation Works are those of which the maintenance and management of irrigation is with the Irrigation Department. Second Class Irrigation works are those of which the management and the maintenance rests with the concerned Zilla Parishad of the District.

Under Second Class Irrigation Works, works irrigating 100 ha. (250 acres) or less are handled by the Zilla Parishad for the management and maintenance of irrigation Works. In the case of Second Class Irrigation Works the consolidated water charge is levied inclusive of Land revenue and the same is collected through Revenue Department along with land assessment.

Accounting Criterion.—Under the criterion the works are classified as “Commercial” and “Non-Commercial”.

Capital Non-Commercial Works.—The works of which capital cost is less than Rs. 2 lakhs or the irrigation under command is 100 ha. (250 acres) or less are classed as “Capital Non-Commercial Works”.

Capital Commercial Works.—All other works are classified as “Capital Commercial Works”.

Non-Capital Works.—Works upto Rs. 1.00 lakhs are classified as “Non-Capital Works”.

7.2. *Irrigation Management.*—On completion of the Irrigation Schemes, as cultivators are new to the Canal irrigation, water supply to the crops is allowed after

giving sanction to the water applications of the cultivators. This form of water application is known as Form No. VII, in the Western Maharashtra. In the Vidarbha Region similar sanction is accorded on form called "G". This water supply is called as on "Demand". Form No. VII is the application form on which water supply is sanctioned for a crop from its sowing to its maturity. Thus in the case of Kharif or Rabi seasonal crops, the water supply is allowed for complete season while in the case of sugarcane crop, the water supply allowed is for the entire year.

In the case of sugarcane crop when the crop is standing beyond a period of full year, the additional sanction is also given separately for the period of over and above the year on Form VII.

As time passes, the cultivators become irrigation minded and get fully conversant with the rotation and cycle of the crops to be cultivated. Thus a situation is reached on the canal system when the tendering of the water application for every season or for every crop becomes a mechanical process to the cultivators. Similarly, to invite such water applications for every season and for every crop and to sanction them also becomes a botheration and extra unnecessary paper work to the management staff. Hence on established irrigation systems, the irrigation sanctions are given on "Long Term Basis" to avoid unnecessary paper work.

These "long term" sanctions in the Western Maharashtra are known as sanctions on "Block system". In the Vidarbha Region these "long term" sanctions are known as sanctions on "Agreement". In the Marathwada Region though the Block System is agreed to be introduced the irrigation sanctions are at present given on Form No. VII.

Eventhough the sanctions are given on "long term" basis either on block system or the "Agreement" the cultivators have to apply separately for the additional water supply to the crops not covered under the "Block System". In the case of perennial sanctions additional water supply is usually required for the overlapping sugarcane crops and Banana crops while pre-seasonal or post-seasonal water supply is to be given to long staple cotton, paddy, groundnut and wheat crops as the case may be. The additional water supply is allowed on Form No. VI.

7.3. *Western Maharashtra*.—In the Western Maharashtra Region the following types of blocks are in force:—

- (1) Sugarcane Block 'A' Type (1 : 4 cane Block).
- (2) Sugarcane Block 'B' Type (1 : 3 cane Block).
- (3) Fruit Block.
- (4) Garden Block ($1/3 : 1/3 : 1/3$).
- (5) Garden and seasonal Block ($1/2 : 1/2$).
- (6) Three seasonal block.
- (7) Two seasonal block.
- (8) Rabi block.

The following crops are permitted under the different Block systems.

7.3.1. Sugarcane Block 'A' Type:

(1) Basic cane or Plantains	..	..	0.40 ha. (1 acre)
(2) Overlap cane	..	..	0.20 ha. ($\frac{1}{2}$ acre)
(3) Long staple cotton	..	..	0.40 ha. (1 acre)
(4) Any crop (excepting long staple cotton or perennial crops in Kharif or Rabi season).			0.60 ha. ($1\frac{1}{2}$ acre)

Total .. 1.60 ha. (4 acres)

Under the Sugarcane Block 'A' Type' Banana crop is permitted to be grown. In the case of Banana Crop, 100 per cent new plantation (overlap) is permitted from 1st/July for a period of 4 months.

7.3.2. Cane Block 'B' Type in Block of 3 Acres:

(1) Sugarcane (Basic)	..	..	0.40 ha. (1 acre)
(2) Overlap	..	..	0.20 ha. ($\frac{1}{2}$ acre)
(3) Any crop (excepting sugarcane and long staple cotton) in Kharif or Rabi.			0.60 ha. ($1\frac{1}{2}$ acre)

Total .. 1.20 ha. (3 acres)

Under the sugarcane Block 'B' Type, no canal water is to be permitted for any seasonal crop which requires water before 1st of July. Hence normally no water supply is permitted by way as pre-seasonal or the H. W. seasonal for growing long staple cotton and H. W. Supply to Ground nut or fodder crop in this block.

7.3.3. Fruit Block.—Entire area of the block will be under long term fruit trees such as Mosambi, Oranges, Gauvas, Grapes etc.

7.3.4. Garden Block.—Under this Block 1/3rd of the area will be under perennial crop other than sugarcane, plaintains and long term fruit trees. Other 1/3rd area will be under long staple cotton and the remaining 1/3rd will be under seasonal crops excepting long staple cotton or perennial crops.

7.3.5. Garden and Seasonal Block.—In this block, half the area is allowed water supply to perennial crops other than Sugarcane, Banana or long term fruit trees. The remaining half of block area is allowed water supply in Khariff and Rabi seasons. In this block, vegetables are permitted in the area in which water supply is permitted for other perennial crops.

7.3.6. Three Seasonal Block.—In the case of three seasonal block, 1/3rd area is allowed water supply under Khariff seasonals. 1/3rd under the Rabi seasonals and remaining 1/3rd is allowed in Hot weather for cash crops like, long staple cotton, ground nut and onions.

7.3.7. Two seasonal Block 'B' Type.—In this block the entire area of the block is allowed water supply in Khariff and Rabi season for seasonal crops except long staple cotton or perennial crops.

7.3.8. *Rabi Block*.—In this block, the entire area is allowed water supply to the Rabi crops depending upon the storage position in the respective years.

7.4. *Marathwada Region*.—In the Marathwada Region above blocks are yet to be introduced on the canal system and the water supply is permitted on Form No. VII. However, on the Purna Canal system which has commanded area in the Parbhani and Nanded Districts, the following special type of Blocks are proposed to be introduced:—

- (1) Sugarcane block (1 : 4).
- (2) Rice Block.
- (3) Other Perennials Block—
 - (i) Fruit Block.
 - (ii) Grass Block.
- (4) Long Staple Cotton Block.
- (5) Turmeric Block.
- (6) Rabi Block.

7.4.1. *Sugarcane Block 'A' Type (1 : 4 Sugarcane Block)*.—In a Block of 4 acres of the following will be the crops:—

Sugarcane or Banana	..	..	0.40 ha. (1 acre)
Kharif or Rabi crops	..	..	0.40 ha. (1 acre)
Overlap cane	..	..	0.20 ha. ($\frac{1}{2}$ acre)
Long stapl cotton	..	..	0.40 ha. (1 acre)
H. W. Fodder	..	..	0.20 ha. ($\frac{1}{2}$ acre)

Total .. 1.60 ha. (4 acres)

7.4.2. *Rice Block*.—Under this block full area will be supplied water for Paddy in Kharif season. However, no water will be supplied in Rabi season in this block.

7.4.3. *Other Perennial Blocks*.—Under this block system two types of block systems are included:—

- (i) Fruit Block and (ii) Grass Block.

(i) *Fruit Block*.—In the Fruit Block, long term fruit trees, such as oranges, mosambi, guavas and grapes etc., are permitted.

(ii) *Grass Blocks (4 : 1)*.—In this Block, the area is divided into 4 equal parts. In the $\frac{3}{4}$ th of the area of block green grass fodder, except perennial crops like cane, banana, long term fruit trees, are permitted. In the remaining $\frac{1}{4}$ th of the block light Rabi seasonal crops is permitted.

7.4.3. *Long Staple Cotton Block (1 : 2 Rabi Crops)*.—Under this block, area is divided in 3 equal parts. In $\frac{1}{3}$ rd area, long staple cotton is permitted and the remaining $\frac{2}{3}$ rd area, Rabi crops in the Rabi seasons are permitted. In the Kharif

season, this 2/3rd area may be sown with rain fed Kharif crops as no canal water is supplied in Kharif season in this 2/3rd area.

7.4.5. *Turmeric Block (1 : 1).*—Under this block 50 per cent of the area is allowed to be put under turmeric crop in Kharif season and the remaining 50 per cent of the area Rain fed Kharif or Rabi crops are permitted. No canal water will be supplied to this 50 per cent of area. The intention is to keep the 50 per cent area available for rotation of the Turmeric crop.

7.4.6. *Rabi Blocks.*—Under this block, entire area is allowed to be sown with light Rabi seasonals. Rain fed Kharif crops can be grown under this block.

7.5. *Overlap.*—In case of perennial crops like Sugarcane and Banana, new plantations are required to be given every year to have continuous cultivation of crop. The 'Overlap' has thus a significant meaning when these crops i.e., Sugarcane and Banana are allowed in the block system. When the old crop is still standing in the block beyond the period of one year and when the new cultivation is required to be allowed, the extra sanction over and above basic sanction is called the 'Overlap'. As soon as this cane overlap is allowed, it gets merged into the basic sanction and the old cane crop from the basic crop getting due for harvest in the ensuing season gets converted into the 'Overlap' crop.

In the case of Sugarcane block new plantation allowed from 1st of July to 15th of September is known as "Adsali Cane". The Adsali overlap is allowed to the extent of 50 per cent of the basic cane allowed in the block. Similarly, between 15th of November to 15th of January, 50 per cent of the remaining cane is allowed to be planted. This 50 per cent plantation is permitted either as new crop called 'Suru' plantation or is allowed to be retained 'Ratoon' crop of the previous years Adsali crop known as 'Khodwa'.

(a) *Exceptions.*—Exception to the above rule is made in case of those who are having three acres of cane blocks, where 100 per cent overlap is permitted in the Kharif season. Similarly, of 0.40 ha. (1 acre) overlap is permitted to those who are having 1.80 ha. (4½ acres) of sugarcane block in the Kharif season and the balance of 0.20 ha. (20 Gunthas) is allowed as "Suru" or 'Khodwa' overlap.

The Maharashtra State Farming Corporation (M.S.F.C.) who is given water supply on Volumetric basis is allowed 60 per cent overlap in Kharif, of the actual standing cane and not on guaranteed sanction of cane. Guaranteed sanction in the area of sugarcane which is permitted under the agreement.

[Ref. Government, I & P. Deptt. Resolution, No. MIC-4462-I (4), dated the 12th August 1965].

(b) *Period of Overlap.*—Adsali overlap is allowed to be continued for a period of 5 months while the Suru overlap or the Khodwa is permitted for a period of 3 months. If water is available then the period of overlap could be increased further for a period of 2 months for which additional assessment is required to be paid. However, in no case overlap should be continued beyond 15th April.

[Ref. Government (I. & P. Deptt.) Circular, No. SGF-4766/84785-I (4), dated the 3rd January 1969].

(c) *Banana Overlap*.—In case of Banana crop, special feature is that overlap is required to be given during the Kharif season. Hence 100 per cent overlap is allowed for Banana crop from 1st of July for a period of 4 months.

[Ref. Government (I. & P. D.eptt.) Circular, No. SEF-196869-IP (4), dated the 27th June 1969].

1. The overlap is a concession to block holder and that the overlap will not be given as a matter of right.

2. Unauthorised overlap shall be charged at the rate of not exceeding triple the crop rate.

3. Overlap is normally granted, but when there is shortage of water, a percentage out is applied or it may be completely refused.

4. Overlap is allowed when the standing crop is 9 months old.

7.6. *Vidarbha Region—Old Irrigation Tank Works*.—In the Vidarbha Region water supply to irrigated crops is at present allowed by field to field method of irrigation. Field to field method is that where the irrigation water is supplied from one field to other and not by water courses and individual outlets.

In the olden tank constructed in the Chanda, Bhandara and Nagpur districts, the irrigators demand water supply mostly to rice crops and in some few cases to wheat crop. In the initial years the cultivators are not sure about the adequency and the method of water supply. In such cases water supply is given from year to year on the request of cultivators. The water application for this request is called form 'G' and the supply system is known as 'Demand System'. As the time passes and the cultivators get conversant with the water supply to the crop they enter into the long term commitments with the Irrigation Department for the supply of irrigation to either the Rice crop or the Wheat crop. This long term commitment is known as 'Agreement System'. In this system agreement is executed between the village panchayat and the Government for a period of fixed number of years preferably 5 to 10 years.

Agreement system is taken to the block system in Eastern Maharashtra except that water supply in the agreement is for one single crop at a fixed rate throughout agreement period with the village panchayat while in the case of Block system agreement is with an individual for the different types of crops incorporated in the different blocks mentioned earlier. The rate for the water supply is also not fixed but is variable according to the rates that may be fixed by Government from time to time. The rate for the supply of water under the Demand system is however, double the rate permissible under the "Agreement System".

7.7. *Agreement System*.—In the Agreement system if and when the permanent holder occupying not less than 2/3rd of the irrigable land or 95 per cent of the total No. of permanent holders of the irrigable land in village Mahal (Part of the village) chak (Command of an outlet) apply for the water supply to crop (mostly rice) an agreement is executed for a period of years for the supply of irrigation water at a fixed rate on the canal system. The rate at which the water supply is made under the agreement is known as "Agreement Rate". The rest of the occupiers or permanent holders who do not join the agreement are compelled to do so.

7.8. *Irrigation Agreement.*—Irrigation Agreement is made for the irrigation of rice and/or wheat for a period of fixed years and is renewable on the same terms and conditions or with the changes as may be necessary due to consolidation of holdings or change in the water rates as may be prescribed by Government. The agreements are made in Form 'A' or 'A-1' depending upon the conditions as described in the Form-A, Part-I, Item 3 or Form A-1 Part-III Item 3 and 4. Supplementary agreements are made in the form 'B' for the cultivators who desire to enter into the agreement at a later date. The agreement comes in force after the enquiry is made by the Irrigation Inspector or Canal Deputy Collector and declaration of his findings made under Form 'C'.

7.9. *Wet Land.*—The lands which are irrigated by smaller individual owned tanks are known as "Wet Lands" in the Vidarbha Region. These are called locally "bahara, jhilan, bandhwas, narbhanda, tagar-bandhia or talas. For these Wet land consolidated land revenue is fixed by Revenue Department. Similarly, some of the lands of the permanent holders are not commanded but being capable of irrigation from the canal or the water course by means of an mechanical contrivance for lifting the water. These two types of land holders, if desire to get water supply from the main canal system can apply and get included under the agreement. However, full agreement rates are not levied to these land holders but a deduction from agreement rate is made to account for its separate entity. In case of "Wet Lands" deduction from the Agreement rate is 50 per cent of the amount of agreement rate or Rs. 1 whichever is less. This deduction is made in the respect of one crop only i.e., for the crop grown on an area assessed as "Wet".

In case of water rate for the area under the Lift 50 per cent of the rate shall be charged for the rate payable under the command in the agreement, for the same crop. Wet land included in the agreement if subsequently classed as "dry land" and land revenue assessed, will be charged at full "Agreemental water rate".

7.10. *Water Supply to Supplement Village Tanks.*—Water supply is allowed to fill in the village tank in order to prevent the desertion of the village or other calamities. When the water is available the Executive Engineer can supply such water. Water rate payable for such water is calculated on the quantum of water supplied. An agreement form is to be furnished by the villagers or the applicants.

7.11. *New Irrigation Works in Vidarbha Area.*—In the New Irrigation works which have been taken for construction by the Government of Maharashtra are designed to receive the water supply through distributaries and individual outlets, similar to that of the irrigation work in the Western Maharashtra. Here water supply is being given to different crops on an application Form No. VII (or the form known as "Demand") and the seasonal water rates are being charged for such supply. The irrigators who desire to have water supply under the Agreement system are free to apply and receive such supply as in the case of old tanks.

7.12. *Revision of Irrigation Blocks.*—In the Western Maharashtra Region, where the block system is predominantly in force the sanctions to the irrigation blocks are given for a period of 6 years, except for the blocks of the long term fruit trees where the sanction is given for a period of 12 years. Before the end of the block period a year in advance, notices are issued to the cultivators to get their blocks

renewed. This process of giving fresh sanctions to the blocks and renewing old sanctions is known as "Revision of Block". In this revision the land owners get an opportunity to shift their block sanctions according to their convenience in the same survey number or to other survey number owned by them. The following are the advantages in the Revision of Blocks.

(1) Crop like sugarcane and grass use plant food from the soil by continuous rotation of the crops during the block period, by shifting the block to the other survey numbers the old land gets rest and new land gives better utilisation of plant food to the root zone of the system.

(2) It avoids weak growth and pest and other diseases peculiar to one kind of crop.

Revision of block is required to be carried out because :

(1) Right of block sanctioned is deemed to have been extinguished after the expiry of the block period and the water sanction lapses back to Government.

(2) During the Revision of block the lands declared suitable for irrigation blocks are deemed to be eligible for fresh sanction unless the same would be required to be reduced due to revision in the "X" Limit.

(3) Blocks sanctions may or may not be restricted to the old areas only and may be allowed to be shifted in the subcatchments if it allows compact irrigation, by one or more or group of cultivators.

The following are the general orders for reducing the block sanctions in relation to reduction of "X" limits.

Sanctioned area of Sugarcane	Cut to be applied
(1) 8.00 to 10.00 ha. (20.20 acres)	Cut 1.20 ha. (3 acres).
(2) 6.00 to 8.00 ha. (15.20 acres)	Cut 0.80 ha. (2 acres).
(3) 4.00 to 6.00 ha. (10.15 acres)	Cut 0.40 ha. (1 acres)
(4) 2.50 to 4.00 ha. (6-10 acres)	Cut 0.20 ha. (20 gunthas).

[Ref. Govt. Memo. I. & P. Deptt., No. BKS-12061-11070-I(4), dated the 24th May 1962.]

The above cut is to be applied starting with upper most slab and moving to the lower slab till total reduction in "X" limit is met with. It is also further necessary to observe that in no case the reduction in the upper slab should bring the sanction to less than maximum in the lower slab after reduction.

If the reduction in the "X" limit is still not met with, then further reduction of 0.20 ha. (20 gunthas) should be applied in main sanction for irrigators under item No. 1 to 4. However, in case of areas of less than six acres (2.40 ha.) of sugarcane no cut should be applied to protect the interest of small irrigator.

The above procedure has to be followed by giving 12 months notice to the cultivators to arrange for the changes and preparation and plantation of new cane.

7.13. *Procedure for receiving water applications.*—Applications of the cultivators desirous of receiving fresh sanctions of water supply to the blocks are received at the Sectional Offices by the Sectional Officer. These are registered into a book known as "Application Register". Similar registers are maintained at the Sub-Divisional and

the Divisional Offices. After scrutiny of the applications by the Sectional Office, the same are passed on to the Sub-Divisional Offices from where they are recommended to the Divisional Offices with necessary remarks whether to be "Sanctioned" or to be "Rejected". Eligible applications are given sanctions by the Executive Engineer, and passes issued to the irrigator as a token of permission. All these sanctions are entered in a register known as "Block Register". These block registers are signed by the Canal Officers as token of record.

Irrigators who hold the block sanctions on getting the public notice, have to apply in the different types of applications forms for the different types of blocks prescribed by Government. Public notice is issued for renewal of "Block". Details of the different forms of applications are given in Appendix VII.

The irrigator has to attach the following documents for establishment of his right for renewal and fresh sanctions to the irrigation block.

(1) 7/12 form (Revenue record) to establish his ownership or the tenancy to the survey No. wherein the irrigation block is requested.

(2) Reference to the previous sanction if exists.

7.14. *Exchange of Blocks.*—Exchange of Blocks means shifting of a block of a cultivator from the original block land to different survey number, during the currency of the block period. Generally, exchange of seasonal blocks is not very much asked for. However, in case of sugarcane block the demand for exchange of block is quite often.

In case of fruit trees if there is tendency of their getting damaged due to dye back disease exchange of the block from such land to other land is requested.

Formerly no exchange of the block was permitted during the first or last two years of block period. However, recently Government has permitted the exchange of block in time during the block period (Government Circular No. BKS 1365/3554-I(4), dated the 6th June 1966).

The exchange of block is ordinarily allowed within the limits of the same irrigation Sub-Division and the canal.

(a) If it helps concentration.

(b) If the crop is affected by insects, pests (Pest means the disease within the meaning of Bombay Pests and Disease Act of 1957),

(c) If the original "X" limit is reduced or perennial irrigation on the channel is discontinued to avoid water logging,

(d) If the holder of cane sanction within the Factory zone wishes to convert the sanction into equivalent cane block outside factory zone, and

(e) To avoid suspicion of mixing of canal water with well water.

7.15. *Transfer of Blocks.*—The transfer of block means the change of the name of the block holder when the possession of a block land goes in the name of other person by—

(1) Purchase of the land;

(2) Lease of the land;

(3) Hereditary right or due to partition of the land due to demise of the original block holder.

This change of name of the block holder is to be effected in time during the block period as soon as the new person possessing the block land applies for the same.

The exchange and the Transfer of blocks are regulated as per directions contained in the Government Memorandum No. BKS 1068/52402-1 (4) dated the 23rd April 1968 and No. BKS 1068-83026-I (4) dated the 15th November 1971.

In view of the above orders the exchange and the transfer of the blocks from lease land to other land is not permitted by Government as a rule, the sanctions are to be lapsed to Government and would redistribute such block area to the applicants.

8.0. Panchanama

8.1. Panchanama.—For an efficient and smooth running of an irrigation system and to enable to administer day-to-day control over it, by the Canal Officers, it is necessary for the Department to have rules for water supply to the sanctioned crops. At the same time, there should be rules available with the Department by which unauthorised irrigation could be set right by way of levy of certain punishment.

The following are the broad aspects giving guide lines for the control of irrigation management.

- (1) Water supply to the crop should not be given unless there is a sanction from competent authority.
- (2) To ensure smooth and systematic water supply the irrigation should start with the tailend irrigators and then gradually supplied towards head. This method of irrigation is known as 'Tail to Head System'.
- (3) For every outlet the Shejpali Patrak should be prepared for completing tail to Head irrigation serially.
- (4) No irrigator should be allowed to obstruct flow of water or open outlet out of turn.
- (5) No irrigator should be allowed to irrigate more than once in the same rotation.
- (6) If however, any irrigator is found not to follow the above rules then penal action is required to be taken in conformity with the rules made under the Irrigation Act. For the booking of such offences, Panchanama is required to be framed in order to levy of penal rate of assessment on the offender.

The following are the rules in connection with the framing of the Panchanamas.

8.1.1. An Inspector or any higher official on noticing an irregularity in the use of water such as waste of water, water taken without permission or out of turn, shall make a note of the same in his note book (Inspection notes for Panchanamas Form No. PWD 350m. This form should be carried by all staff when on Inspection work).

Notes of all irregularities noted by authorities higher than the Inspector shall be supplied to the Inspector who shall enter them on a Panchanama form.

8.1.2. The official concerned shall forthwith call to the place 2 Panchas from the constituted irrigation Panchayat where such exist or from among the cultivators where no regular Panchayat is constituted to witness the offence and complete the Panchanama.

8.1.3. If the offending irrigator or his agent be present in the field, irregularities shall be brought to his notice and entered in his Pass Book and his explanation obtained in writing on the Panchanama form.

8.1.4. If the offending irrigator or his agent be not present on the spot, a note to that effect should be made on the Panchanama and an intimation in form No. PWD 448-m should be handed to the Chairman of the Panch or his nominee for serving on the irrigator within 3 days of the Panchanama. The offender on receipt of the above intimation shall submit his statement within 8 days failing which it shall be assumed that he accepts the Panchanama and has no complaint to make.

8.1.5. When the offending irrigator refuses to sign the Panchanama, or to give his explanation, or on distributaries where no irrigation Panchayats are constituted and no Panchas are available, the Panchanamas form as filled by the Inspector or other official shall be sent through the Sectional Officer to the village officers for completion as heretofore. In all such cases, the intimation in Form No. PWD 448-m. must be given to the offending irrigator or pasted on his vasti by the Inspector. The Inspector shall send daily a copy of all Panchanamas of his beat in Form No. PWD 350-m. to the Sectional Officer.

The Panchanama sent to the village officers shall be got completed by them and returned to the Sectional officer by the village officers within 8 days of receipt.

8.1.6. The Panchanama completed in either of the manners described above shall, after being registered by the Sectional Officer in Form PWD 349-m. be forwarded by the Sectional Officer to the Sub-Divisional Officer who will submit the Panchanama (Discontinued vide G. R., No. 6390/27 of 11th May 1932) to the sanctioning authority (Executive Engineer or Canal Officer).

8.1.7. The Sectional Officer or in his absence the person entrusted to do the work shall send every alternate day to the Sub-Divisional Officer a complete list of all offences in his beat during the previous two days in form No. PWD 350-m (Notes for Panchanamas)

The Canal Officer need not be sent copies of the above, but will ascertain from the Note Books of his staff what offences have been committed and will inspect those he considers to be important.

In very serious cases such as the taking of water by force, the Canal Officer should be informed immediately.

8.1.8. The sanctioning authority shall take into consideration the difference explanations and recommendations of the irrigation officials and finally sanction or cancel the Panchanama noting in the former case the penal rate that is to be charged for the offence.

8.1.9. On receipt back of the Panchanama from the sanctioning authority the Sub-Divisional Officer will send a written intimation of the Panchanama and the rates to be charged, to the owners of the land or registered occupants on Samaj Form No. PWD 463-m.

The following are the instructions regarding the duties of the irrigation officers with regard to the cases of Panchanamas.

1. Gazetted officers of the Irrigation Department shall make it a point to inspect as many cases as possible, calling on their staff to produce their inspection notes and registers and initial the entries which they have personally checked on the spot or otherwise.

2. In no case shall the penal rate be charged unless the Samaj form No. PWD 463-m has been sent to the owners in advance.

N.B.—Any minor variation from the procedure laid down that may be required on any particular irrigation work shall be dealt with the sanction of the Superintending Engineer.

3. The object of fining is not to increase revenue but to prevent loss and to make those who ignore rules realise that they can not do this with impunity.

4. Fines should be on a sliding scale according to the seriousness of the offence and if an offence is repeated a heavier fine should be imposed. To make this possible, it should be stated on the Panchanamas whether it is the first, second or third offence of the offender.

5. Waste at night is not such a serious offence as when it occurs by day and waste over the top of a bund is a worse offence than when it occurs through holes.

6. The fairer the fines are made the less the waste will be, because the irrigators will then realise that if they reduce waste to a minimum they will be fined less.

7. The old practice of finding full double assessment on every case and on a minimum area of 0.1012 ha (10 gunthas) even when the waste was small made the cultivators feel that there was no use to in trying to reduce waste once a little and occurred and so led to no improvement.

8. Every case should be dealt with on its merits and the cultivators should be given the benefit of the doubt in doubtful cases.

9. Canal officers must inspect not less than 4 per cent Sub-Divisional officers not less than 8 per cent. Sectional Officers not less than 20 per cent of Panchanamas. Selecting serious cases as far as possible.

10. Areas of Panchnamas of over 0.80 ha. (2 acres) should be inspected by Sectional Officers of over 2.00 ha. (5 acres) by Sub-Divisional Officers and of over 4.00 ha (10 acres) by Canal Officers.

The Inspector should immediately report these cases to the proper authorities mentioned above to enable them to inspect the areas in time.

(Ref. Govt. P.W.D., Resolution No. 1556, dated September 1928).

8.2. *Types of unauthorised irrigations.*—The following are the types of unauthorised irrigations for which the Panchanamas are required to be held.

8.2.1. *Technical Panchanama.*—An irrigator has submitted his water application, but is not immediately sanctioned and he takes canal water and the crop is irrigated without regular pass. In this category Panchanamas are framed before receipt of sanction to the water application and issue of regular pass. The Panchanamas are either cancelled or sanctioned as Gairkayada on the merits of the case.

8.2.2. *Bigar Palis*—(i) Panchanama is required to be held when irrigator takes water out of turn when fixed by the Department.

(ii) When a Bagayatdar takes water without dating his pass.

8.2.3. *Gairkayada Panchanama*.—The following offences are classed as Gairkayada:—

- (1) The irrigator opens the outlet without permission or obstructs water way.
- (2) Canal water is taken from a place other than the sanctioned or allowed one, on the water course and outlet.
- (3) When the lock of the outlet is broken.
- (4) When water is taken from the channel of the well water.
- (5) Or when the canal and the well channel are mixed or when the well water and canal water is admixed.
- (6) When the Bagayatdar has not put out side bund of 0.50 m. (1' 6") to the cane crop.
- (7) When the distance between canal and the well channel is less than 3.00 m. (10 ft.)
- (8) Panchnama is to be held when the water is supplied to the field to a high rated crop in lieu of low rated crop.
- (9) When the canal water is taken without keeping the pass book on site.
- (10) If more than three sugarcane crops are taken in the same plot in a period of five years.

8.2.4. *Double Waterings*.—Panchanama is held when the cultivator takes water to sanctioned crop twice or more in the same rotation.

8.2.5. *Waste of Water*.—Panchanama is required to be held when water is allowed to be wasted by a cultivator.

8.2.6. *Purely unauthorised Irrigation*.—Purely unauthorised irrigation means use of water to the crops without "sanction" of the Department. Some irrigators are in the habit of stealing canal water and supplying it to their crops either on well or rainfed. Such offence is charged at 3 times sanctioned rate of the crops.

8.3. *Pahani Tippan*.—As soon as the unauthorised use of canal water is noticed by the field staff of the irrigation Department the same is noted immediately and intimation sent to the superior Officers. Form on which this intimation is to be submitted to the higher authorities is called "Pahani Tippan". Pahani-Tippan is usually to be filled in by the Canal Inspector and submitted to higher authorities. On the receipt of the Pahani-Tippan in the Sectional office and the Sub-Divisional Offices, the same should be entered into a Register, known as Panchanama Register, for every Panchanama framed by the field officer, Panchanama will be given to the offender irrigator for scrutiny of the Panchanama.

8.4. *Scrutiny of the Panchanama*.—The Sub-Divisional officer or the Executive Engineer who in turn has to sanction the Panchanama should scrutinise the same very carefully. The note should invariably be written on the Panchanama as to why it is sanctioned or cancelled. No Panchanama should be kept pending unless there are valid reasons for holding it in abeyance.

8.5. *Irrigation Notices*.—Irrigation notices are served on the cultivators when the policy decision of the Government is required to be conveyed to the cultivators.

It is also given when applications are required to be received from the cultivators for allowing additional water supply over and above the permanent commitments. These notices are to be given wide publicity through beat of drums through villages and pasting the same on the village Chawadies. Copies of these notices should also be given to Zilla Parishad authorities, District Agricultural authorities, members of the Advisory Committees.

9.0. Irrigation Revenue—Water Rates

Major, medium and minor irrigation projects are constructed and maintained by Government. Water is supplied to the cultivators on the basis of their demands received through water applications invited by the management staff from time to time. Government, therefore, has to deploy the services of Revenue Establishment for smooth running of the canal system and efficient water supply to the cultivators. It is therefore, very necessary that the expenditure incurred by Government on the running and maintenance of the irrigation works is met with from the irrigation revenue. Government has, therefore, to levy a water tax on the supply of water to:—

- (i) Irrigators.
- (ii) Industries and domestic consumers.

The income derived from all the above resources is classified as "Irrigation Revenue".

9.1. Water Rates.—The main consideration for fixing the water rate is as under:—

(1) The total recoveries on account of water rates should not be less than the annual cost incurred by Government for providing the service.

(2) The water rate for the crop should be equitable and should be related to the ability of the crop to bear it.

(3) Water rate should be so pitched as not to leave any irrigation potential unutilised on account of either the system of charging rates or the level of particular rates, in fixing the crop rate following considerations are taken into account.

(1) Cost of irrigation water required by the crop.

(2) The level of average gross income obtained from the crop under the usual conditions of fertility, supply of manure and water and efficiency of cultivation and the market price of the crop. After due considerations of the above factors, the water rates are fixed for the different crops and for the different seasons in which the crops are grown.

The following are main crops prevalent in the three different Regions:—

1. Sugarcane,
2. Banana,
3. Pan gardens,
4. Other perennials,
5. Vegetables,
6. Cotton,
7. Groundnut,
8. Kharif Bhusar,
9. Rabi Bhusar
10. H. W. sessionals,
11. Two seasonal crops (Turmeric and Chillies)

9.2. *Water rates in Maharashtra.*—The present rates levied for the different crops for flow irrigation schemes and lift irrigation schemes in Maharashtra State are indicated in the statement enclosed; Please *vide* Appendix VIII.

9.3. *Irrigation cess.*—As has been stated earlier, most of the irrigation schemes constructed prior to First Five Year Plan being of protective nature, they used to be unremunerative or unproductive i.e., revenue through water rates was not sufficient to meet the interest charges on the capital invested on these irrigation schemes. This question was engaging the attention of Government. A Cabinet Sub-Committee appointed in the year 1947 to probe into this problem. On studying this problem recommended the levy of Irrigation Cess on all the areas under the command of irrigation systems to meet the maintenance cost of the irrigation systems in the State. It was difficult to delineate the exact land that would be assured water every year under the irrigation systems, hence recommendations of the Cabinet Sub-Committee to levy the irrigation Cess on all the areas under the command, could not be implemented. The Government considered this question and decided to levy irrigation cess on the area actually supplied with water. Uniform irrigation cess on all the crops could not be proposed as revenue therefrom was too meagre to meet the maintenance cost. Therefore, different rates were prescribed for different crops for irrigation cess, perennial crops being obviously charged more than the seasonal crops. Rs. 30 as irrigation cess per year per acre of sugarcane was being charged whereas for seasonal crops irrigation cess of Rs. 3 per acre only was being charged. There is no provision for irrigation cess either in the C. P. Irrigation Act or Hyderabad Irrigation Act.

Maharashtra State Irrigation Commission recommended that Irrigation Cess should be abolished which recommendation has been accepted by the Government and this cess has been abolished from 1st July 1973. Element of Irrigation Cess, however, has been incorporated in the water rates.

9.4. Betterment levy

9.4.1. Due to advent of irrigation systems value of land under their command increases. In order to meet the rising cost of irrigation Projects as well as to raise the capital for the new irrigation schemes, Government has to tap various sources. As irrigators derive benefit of increased value of their land, it is justifiable that Government should share some part of the unearned increment to irrigators. It was therefore, thought to impose the betterment levy on the lands coming under the command of irrigation systems. In fact, in the Western Maharashtra a bill to this effect was also enacted.

9.4.2. *Western Maharashtra.*—The betterment charges to be levied on a land shall be one half of the increase in the value of the land on account of the construction of an irrigation work i.e. one-half of the amount by which the value of the land on the completion date of the work is likely to exceed the value of the land on the construction date of the work. The charges are required to be paid within 60 days from the date they become payable under the Act or if the owner executes an agreement it can be paid in annual instalments not exceeding 20 in number with interest at 5 per cent.

9.4.3. *Vidarbha Region*—The betterment charges are payable annually at a rate to be determined in accordance with the following formula viz, :—

$$Z = \frac{X}{Y \times 100} \times \frac{3}{1} \text{ for first 5 instalments}$$

$$Z = \frac{X}{Y \times 100} \times \frac{9}{2} \text{ for the next 10 instalments}$$

X = Cost of construction, improvement or extension of new canal incurred during the period of five years next preceding the date of issue of the notification under section 58-D of C. P. Irrigation Act.

Y = Acreage of area benefited by new Canal.

Z = Rate of betterment contribution per acre per year.

The above betterment contribution is payable consecutively for 15 years, excluding the years in which the recovery may be postponed by the State Government. The arrears instalments of betterment contribution shall bear interest at the rate of 6 per cent per annum. The State Government is empowered under the Act to appoint an officer to fix the exact amount of betterment levy.

9.4.4. *Marathwada Region*.—The exact amount of betterment charges are fixed by the Collector under the advice of the Committee to be constituted for the purpose, after taking into account the increase in the capital value of the land, benefitted or capable of being benefitted by the completion of any irrigation or drainage work provided that the contribution shall in no case exceed one half of the net increase in capital value of the land in the case of new lands served by the irrigation works one fourth in the case of old wet lands. The contribution may be paid in one lump sum or in not more than fifteen equal instalments free of interest. If the entire amount of contribution is paid within six months of its determination, a rebate of 10 per cent shall be allowed.

9.4.5. Due to the difficulty of exactly delineating lands which will be assured of water every year Government could not levy the betterment charges on these lands. This question was also referred to the Maharashtra State Irrigation Commission for their consideration. The Commission has recommended that this betterment charge should be included in the water rates and there should be only one charge namely "Water Rates". Maharashtra State Irrigation Commission has recommended that the water rates that will be charged for various crops should be between 6 per cent to 12 per cent of gross income from the crop, the higher percentage being for the Cash crops and lower for the seasonal food crops.

9.5. Water Rates to be charged for Government Lift Irrigation Schemes :

The following are the principles based on which lift irrigation water rates are worked out. Such rates should be revised every 3 years to enable to account for variations in prices.

Bases for working out Water Rates.—1. (a) The determination of water discharge required for any particular scheme, as well as Horse Power of the machinery required may be calculated as per the design practice on force.

(b) The total expenditure for pumping is to be considered in two parts.

2. *Fixed Charges and Running Costs.*—The fixed charges will consist of following items :—

(i) *Interest on capital cost* of work at a rate of $5\frac{1}{2}$ per cent (This rate may vary from time to time as per orders in force).

(ii) *Depreciation Cost* worked out as annual contribution to a sinking fund for redemption of capital at the end of fixed number of years. This period may be taken as 40 years for civil works and 15 years for mechanical portion.

(iii) *Maintenance and Repairs* for the scheme may be proposed at the following rates per year :—

(1) $1\frac{1}{2}$ per cent for Civil works, (2) 3 per cent for machinery.

(iv) *Cost of Maintenance of staff* may be taken as Rs. 2.50 per year per 0.4046 Hectare (per acre) with a minimum of Rs. 2,000 per year.

3. *Running Cost.*—Electricity Drive or Diesel Drive—

The total running cost for the scheme should include “Electrical charges” or Diesel cost” together with all duties and lubricating oil charges, other service charges and rents etc.

4. The total water charge should be worked out cropwise as per the total water requirement of crop. The rate should include fixed, charges and running cost.

In case of Zilla Parishad works a royalty charge on all notified rivers as per existing rules should be added.

5. It is seen that in the scheme with diesel power, the water rates are much higher than with electric drive. It is therefore, desirable to have electric pumping wherever possible.

[Ref. Government, I. & P. Deptt. No. CLI-1065/51047-MI (I), dated 7th October 1966.]

10.0. Recovery of Irrigation in Revenue :

On the basis of water supply sanctioned to different crops water rates are leviable as indicated above. Before the crops are actually harvested, the areas that are cultivated by the respective irrigators are required to be measured. For this purpose, the measures appointed by the Department go round the irrigated areas by middle of each season, measure the areas and record the results of crop measurements in a sort of irrigation field book. This book is called ‘Tippan Book’.

In order to exercise appropriate check on the work of the measurers, irrigation officers have to give prescribed percentage check on the measurement and assessment of crops. The percentage check to be given is as under :—

Name of Officer	Percentage check on crops
1. Executive Engineer ..	1 % of the area on canal.
2. Sub-Divisional Officer ..	2 % of the area in each section.
3. Sectional Officer ..	7 % of the area in each village..
Total ..	10 %

The overall 10 per cent of check of the area irrigated is required to be given by the officers of the Irrigation and Power Department. The check given by the respective officers is known as 'Nimtana'. After the crops are measured by the measurers, the sanctioned areas as well as the area booked under the Panchanamas are assessed on the basis of the sanctioned rates. This assessment payable by the respective cultivator is worked out and abstracted in a statement called 'Demand Statement'. Demand Statements are prepared Khatedarwise, Villagewise and Talukawise.

10.1. *Kulrujuwat*.—Demand statements are initially prepared in the Sectional Office and passed on to the Sub-Divisional Office and in turn passed on to the Divisional Office. The Daftar Karkoon in the Divisional Office check at least 33 per cent of the total Khatas from each village. These Demand statements after due checking in the Divisional Office are returned to the Sub-Divisional Office for getting the concurrence of the respective cultivators. This concurrence is known as 'Kulrujuwat'. Notice is given to the cultivators in advance through the Talathi for holding Kulrujuwat in village Chavadi. Objections of the cultivators are heard and duly considered by the Sub-Divisional Officers. The certificate has to be recorded by the village officer on the demand statements.

10.2. *Dates of Submission of the Demand Statement*.—The following are the dates of submission of the Demand Statement :—

Kharif Season (Late Kharif)	..	..	..	1st February.
Rabi Season	..	..	..	1st May.
H. W. Season (Early Kharif)	..	..	..	1st October.

Demand Statements are prepared by the Deputy Engineer and approved by the Executive Engineer, only in Form No. 13 (I. P. D. 166-m) and these are sent back to the local officer of the Department for the recovery.

Copies of Form No. 13 are to be given to the Superintending Engineer and to the Accountant General. The Executive Engineer shall also furnish general return in Form No. 14 to the Superintending Engineer and the Accountant General.

The following are the dates of the recovery of irrigation dues :—

1. H. W. Season	..	..	..	15th October.
2. Kharif Season	..	..	..	15th February.
3. Rabi Season	..	..	..	15th May.

The irrigator is declared as defaulter if he does not pay the arrears before 31st May. While assuming arrears at 31st May the fresh demand sent for recovery as on 15th May i.e., for Rabi Season is to be excluded. It being fresh demand.

10.3. *Remissions and Refund*—Whenever areas are wrongly assessed and demand statements are already sent to the Revenue Department and if the irrigator represents for the wrong assessment, remission is required to be granted to such irrigators. Before granting such remission, the Executive Engineer makes an enquiry with the Mamlatdar whether the assessment has been already recovered. If the assessment is not recovered the Executive Engineer sanctions the remission, if it is within his competency and intimates the Mamlatdar concerned through the Treasury Officer for effecting short recovery to the extent of amount of remission granted. The

Executive Engineer has the power to grant remission upto Rs. 100 in each individual case whereas the Superintending Engineer has unlimited powers. A copy of the remission statement is also required to be sent to the Accountant General for his information.

If assessment is already recovered then refund is required to be sanctioned to the irrigator. The power to sanction refund of the Executive Engineer is Rs. 100 in each individual case whereas that of the Superintending Engineer is unlimited.

Exemption of levy of Penal Assessment over excess areas over the sanctioned areas.—When sanctions have been given to irrigate the specified area and the applicant irrigates an area in excess of such sanctioned area, the Executive Engineer may charge in respect of such excess area, a rate not exceeding triple rate chargeable for the supply as if the supply has been sanctioned.

If the Executive Engineer is satisfied that the excess area was irrigated through *bonafide* mistake, no charge shall be made in respect of the following excesses:—

Sanctioned area	Excess permissible
1. For an area 60 are or less ($1\frac{1}{2}$ acres) or less	.. 1 are (1 guntha)
2. For an area of 60 are to 2 ha.	.. 2 ares (2 gunthas)
3. For an area of 2.0 are ($4\frac{1}{2}$ acres) to (9 acres)	.. 3 ares (3 gunthas)
4. For an area of 3.50 ha. (9 acres) to 6.00 ha. (15 acres).	4 ares (4 gunthas)
5. More than 6.00 ha. (15 acres)	.. 5 ares (5 gunthas)

10.4. *Vidarbha Region—Procedure for collection of Revenue under the Agreement System.*—(1) Canal revenue payable on account of water supplied for the irrigation of a Kharif crop shall fall due on the 15th February and that payable on account of water supplied for the irrigation of Rabi and all other crops shall fall due on 15th May.

(2) A postponement of these dates may be allowed by the Superintending Engineer, acting on the advice of the Deputy Commissioner.

(3) Payment of the supply of water to supplement a village tank shall be made with the Kharif kist when it is due on account of supplies made between the 1st March and the 31st October and with the Rabi kist when it is due on account of supplies made between the 1st November and the 28th February.

(4) The Sectional Subordinate shall enter in parchas for irrigation under agreement the date on which he will visit the village to hear objections to assessment.

(5) On receipt of a parcha for irrigation on demand an objection may be made within ten days of the delivery of the parcha. Such objections shall be made in writing to the Amin or Section Subordinate and shall be accompanied by the original parcha. The Amin shall forthwith forward all objections received by him to the Section subordinate. On receipt of any such objection the Section subordinate, shall enter on the parcha the date on which he will visit the village to hear objections and shall return the parcha to the Amin who shall forthwith return it to the occupiers concerned.

(6) The amount due from each occupier shall be calculated to the nearest five paise. Any occupier who is in doubt regarding the correctness of the sum demanded from him may inspect the registers maintained by the Amin.

(7) During the Section subordinate's visit to a village to hear objections any occupier may make an objection concerning any entry in his parcha in regard to irrigation under agreement and the Section subordinate shall forthwith inquire into such objection and into all objections which have been made under rule 4. If the Section subordinate allows an objection he shall correct the parcha accordingly, shall initial each correction and shall deliver the amended parcha to the occupier concerned.

(8) The Sectional Subordinate may at any time, correct any entry in a parcha which he considers to be incorrect provided that, if such correction involves an increase in the amount payable, he shall not do so until he has given the occupier concerned an opportunity of being heard.

(9) If for good reason a Section Subordinate is prevented from visiting a village to hear objections on the date fixed by him he shall fix a new date for his visit and shall intimate it to the occupiers concerned.

(10) The statement showing the amounts due from each occupier shall be sent to the Sarpanch. The Sarpanch and members of the Panchayat on receipt of this statement shall at once proceed to collect the revenue and to credit it in the Sub-Treasury either direct or by miscellaneous revenue money order through the Post Office. The sums collected and the dates on which they are paid into the Sub-Treasury shall be entered on the statement and a receipt given for them on the form of Parcha.

(11) Within five days after the dates fixed under rule in force the statements (Kistbandi Khatooni) of sums due and sums collected shall be collected by the Amin from the Sarpanchas.

11. Water logging and Salt efflorescence

Due to restriction on sanctioning of perennial crops, there is no appreciable water-logging and salt efflorescence experienced in this State. Even then in the area, where sugarcane has been practised since last 50 years, some water logging and salt-efflorescence have been noticed. In fact, an area of 30,000 to 35,000 ha. is already affected due to water-logging and salt-efflorescence in the Western Maharashtra. Remedy adopted by the State Government to remove water-logging is to provide drains in the water-logged areas. Once the drains start functioning the sub-soil water table gets gradually lowered and after some years these water-logged areas can become cultivable. Of the recent past, because of constructing of a number of major irrigation projects in the centres of the major river valleys, with deep soil commands, the problems of water-logging has started assuming proportions. In the estimates of these major projects, provision, therefore, limited to 6 per cent of the cost of the distribution system is made for drainage. Directorate of Irrigation Research and Drainage has been entrusted with the work of preparation of plans and estimates of drainage schemes. The Directorate is adequately staffed for this purpose.

12. Irrigation on Drains

Once the drains start functioning there is water available throughout the year in these drains. Irrigators in the command of established irrigation schemes being

irrigation conscious desire to utilise water from the drains for lift irrigation. Government considers their requests and sanctions are granted for irrigation purposes on drains. While according such sanctions minimum discharge in the month of May is considered for granting sanctions for the next year. Mostly, sugarcane and cash crops are planted on these drains, with some proportion of seasonal crops.

13.0. Notification of rivers, tributaries, sub-tributaries, nallas etc.

Whenever any irrigation project is constructed on river, tributary or sub-tributary, it is obligatory for the Government to notify the river, tributary, sub-tributary, stream etc. from its source upto the point where the irrigation work is constructed under section 5 of the Bombay Irrigation Act, 1879. After such notification is published in the Gazette, all the quantity of water i.e., available upto the point, where irrigation work is constructed is notified so that people may not utilise it without permission of the concerned officers. All Nallas, tributaries, sub-tributaries etc., of the parent river are required to be brought under the notification specially, or also if any nallas, tributary, sub-tributary or the parent river remain through oversight, for inclusion in notification, people can use water therefrom without the permission from the officers of the Irrigation Department. According to the latest provision in the Maharashtra Irrigation Act, 1976, only the main source of water across which the storage is constructed is required to be notified.

14.0. Role of an Irrigation Engineer

The popular notion that has come to stay by an environ of circumstances, both in the official circles and in public is that the Irrigation Engineer is responsible for the ultimate use of irrigation facilities. He is not only responsible for the creation of irrigation facilities but in addition is responsible for the ultimate utilisation of the irrigation waters. Hence beyond the maintenance and operation of irrigation structures such as dams, canals, distributaries, minors, head regulators etc. he has to deal with the less informed mass of cultivators, who require to be properly guided not only in the direction of economic use of water but also in other allied aspects of irrigated farming, requirement of water for different crops interval between two waterings. He has also to keep account of the day-to-day use of the stored water. He should be able to keep the record of various block sanctions and other papers pertaining to Irrigation Management.

An organisational set up of the Irrigation Management is given below:

Administrative set up for Irrigation Management.—A chart detailing out the Administrative set up for the irrigation management right from the level of Chief Engineer down to the lowest Government servants in the fields is enclosed at Appendix IX. The Chief Engineer at Regional level deals with the general administration and the development and utilisation of the irrigation projects. The Chief Engineer is assisted by the Superintending Engineer at regional level. The Superintending Engineer is the Administrative Head at the regional level. He has full powers within the regulation laid down by Government to sanction use on irrigation water for the different activities in the region. The Superintending Engineer has to approve the yearly utilisation of the storage in reservoirs and to modify and approve irrigation programmes from year to year as per availability of water. The Superintending Engineer has full administrative and financial control over the budget provisions

allocated by Government. In addition to above, the Superintending Engineer has to certify the safety of Major and Medium Irrigation dams by inspecting them during pre and post monsoon periods.

The Superintending Engineer executes a controls irrigation policy through the Executive Engineer who are stationed in each district. Executive Engineer is responsible for maintenance of irrigation works and management of irrigation in the field. Apart from technical duties, the Executive Engineer has to perform duties under the irrigation Act and rules thereunder. The management of irrigation is a very important work assigned to the Executive Engineer and has to play a very important role in day-to-day sanction and distribution of canal water to each individual irrigator.

The set up for the Field organisation is given in Appendix-XI.

14.1. *Duties and Functions of the Field Officers in the Irrigation Management—*

(1) The Executive Engineer has to prepare timely forecast (Preliminary irrigation programme) for the utilisation of storage water.

(2) The Executive Engineer has to keep constant vigilant watch over the gauges in the canal and special situation points in large canal lengths.

(3) He has to give surprise inspections at least once in a month to the field irrigation and to note down the following points.—

(a) Working of the S. W. Fs., and the Head Regulator.

(b) Conditions of the distributing channeals and whether any repairs are needed.

(c) Whether the irrigator's passes are dated up-to-date.

(d) Whether the irrigation is generally in good order.

(e) Whether the well and pazar irrigation is having any suspicious contact with canal irrigation and to take action to remove it.

(4) The Executive Engineer has to watch the progress of realisation of the assessment and to keep watch over recovery of arrears.

(5) The Executive Engineer has to give percentage check of 2 per cent of number of the Panchansmas in a season.

(6) The Executive Engineer has to check 50 per cent of the number of cases of emergency canal water supply allowed to crops on wells and pazar.

14.2. *Sub-Divisional Officer.*—(1) The Sub-Divisional Officer has to be in direct touch and to control the field staff of the Irrigation Department.

(2) The Sub-Divisional Officer has to keep vigilant watch on the gauges of water depths in the storage reservoirs and at the off-take points of canal and major distributaries and to regulate the rotations and the discharges in the system under his control.

(3) The Sub-Divisional Officer has to inspect field irrigation at least once in a rotation and to observe the following points in particular:—

(i) General condition of the Head Regulator, the S. W. Fs. and Canal.

(ii) The discharges in the channel, sub-channels and the rotation and schedule of operation of the system.

(iii) Whether the irrigators passes are dated up-to-date.

(iv) Whether unauthorised irrigation, Gairkayada, waste of water and excess utilisation of irrigation water is brought on books and panchanamas are framed in time.

(v) To control the unauthorised use to crops on wells and pazar.

(4) The Sub-Divisional Officer has to give necessary check on 8 per cent on number of Panchanamas in a season and 2 per cent on seasonwise crop measurements, as prescribed under the rules.

14.3. *Sectional Officer*—(1) The Sectional Officers are responsible to the superior officers for carrying out orderly irrigation management and to prevent and detect misuse of canal water.

(2) The Sectional Officer has to inspect field irrigation in his beat very frequently and to keep with him—

(i) Schedule programme of rotation and the running of the distributaries in his beat.

(ii) Discharge table of the S.W.Fs. of the channels.

(iii) "Shejpali" Patrak

(iv) Control Chart.

(v) Panchanama Pahani Tippan.

(vi) Note book containing statistical and hydrological information of channels in his beat.

(3) During the course of inspection, the Sectional Officer has to check the following items:—

(i) Up-to-date dating of the irrigators passes and duplicate thereof, the latter being with canal Inspector.

(ii) Proper, neat and up-to-date maintenance of Zade Patrak by the Canal Inspectors.

(iii) Working conditions of the S. W. Fs., with their gauge plates.

(iv) Working conditions of Government owned channels, and irrigation water courses.

(v) Waste of water and misuse of canal water if any.

(vi) Demarcation and utilisation of the fields.

(vii) Conditions of the outer bunds and water tightness of various areas under irrigation.

(viii) Excess over permissible than sanctioned.

(ix) Irrigation on wells and pazar.

(4) The Sectional Officer should immediately note the irregularities noted above in the Pahani Tippan form and give to the Canal Inspectors for holding Panchanamas. If there is urgency and special circumstances, the Sectional Officer may himself hold Panchanama.

(5) The Sectional Officer in case of misuse of Canal water to crops and pazars or likely inter-mixture, should note his findings in the Inspection Note and should send a copy to the Sub-Divisional Officer before the start of next rotation.

(6) The Sectional Officer should note down working conditions of the pumps, motors, with their capacity of irrigating the areas. The Sectional Officer should note crops grown on wells and on pazar. In case of suspicious contact with canal irrigation, the Sectional Officer should take steps to remove them.

(7) The Sectional Officer should check the seasonwise area under crops to the extent of 7 per cent and to check Panchanamas to the extent of 20 per cent for individual areas of 0.8096 Hect. (2 acres) above, as prescribed.

14.4. *Sectional Inspectors.*—Sectional Inspectors are upgraded Canal Inspectors, at times placed in-charge of an irrigation Section. Their duties in respect of irrigation management, control and supervision, are the same as those specified above in the case of Sectional Officers.

14.5. *Canal Inspectors.*—These are Class-III Government servants borne on "VII" or "XVIII-Irrigation". The minimum educational qualification needed for the sake of recruitment is standard Xth passed.

(a) Duties of Canal Inspectors are—

(i) To prepare a "Pali Patrak" and to get it approved by the Sectional Officer for each distributing channel before the irrigation season starts.

(ii) To submit to the Sectional Officer at least 4 days in advance of the ensuing rotation, indent for supply of water in that rotation at the head of each distributing channel in his beat.

(iii) At an appointed hour and place "to-date" irrigators' water passes for their next following day turn of irrigation, according to Pali Patrak.

(iv) Where no Patkari or other assistant is given, to open the gates of the outlet channels at the scheduled hours, to let down adequate discharge of water and to close them at the appointed hours.

(v) To go round and inspect the field irrigation. Here, he should see if the irrigation of all those areas for which dates were given on water passes on the preceding day is completed. In case, an Irrigator actually takes no water though due, for such reasons as (Khurpani, rains) etc., a note to that effect should be recorded against the entry of the date, in the irrigators' pass and duplicate with the Canal Inspector. Same procedure should be followed where part area is actually irrigated.

(vi) To bring on book, any type of misuse or waste of water, or detectable excess irrigation, as soon as it is noticed and to follow the procedure prescribed.

(vii) To give an immediate possible intimation to the Sectional Officer where such misuse or waste of water in any individual case involves an area of 0.81 Ha. (2 acres) or more.

(viii) To see that no channel, once closed at the scheduled time, is reopened in the same rotation except with the orders of his superiors.

(ix) To see that demarcation, unitisation and corner stones of areas under blocks are intact and that the outer bunds round irrigated areas are strong enough to prevent waste of water, otherwise, to record a suitable note in the irrigators' water pass, and to inform the Sectional Officer to enable service of the necessary written notice on the irrigator. To take similar action where an irrigators' channel is out of repair.

(x) To keep under frequent and vigilant watch the irrigation on wells and pazar in the irrigated tract of his beat, and to keep the Sectional Officer, constantly and and fully informed in writing of it.

(xi) After the irrigation of a rotation period is over, to submit to the Sectional Officer the Discharge AI/DC Dasawada.

(xii) To submit the diaries of their work.

Note.—(1) This elaborate procedure, is not necessary on Minor Tanks and even in non-parennial zones of major canals. The Executive Engineer may with the approval of the Superintending Engineer, prescribe for such irrigation works, such short procedure as in his opinion would suit best.

Note.—(2) On Minor Irrigation Works in charge of the Irrigation and Power Department, where there is normally monsoon and/or Rabi irrigation, only, where the "Canal Karkoons" are equivalent to "Canal Inspectors". They have to look to the maintenance work of the canal, etc., in addition to their duties in respect of irrigation management.

14.6. *Measurers.*—Class-III Government servants, borne on "XVIII" or "XVII Irrigation".

(a) *Duties of a Measurer are.*—Where the crop areas under irrigation are not demarcated, the measurers acting under the orders of the Sectional Officer or the Sub-Divisional Officer are to actually measure the irrigated areas with the help of cross staff and chain, and to enter the measurements with a rough sketch in the field book called "Crop Measurement Book". Every page of measurements in the field book shall be signed and dated by the Measurer taking the measurements. The areas to be so measured should be recorded cropwise; the calculations (बसुले गुणाकार) to find out each such area, in group or in parts should be done and the actual areas should be worked out by the measurers themselves.

(b) Where the sanctioned areas are demarcated and unitised and the demarcation sketches are duly prepared and approved by the Sub-Divisional Officer, the measurers have to take requisite copies thereof and have to fill in all the requisite preliminary details thereon, before they proceed for co-opmeasurements under the orders of the Sub-Divisional Officer, or the Sectional Officer. Unless they have doubts that the demarcation and the plots are in any case disturbed on the site and such cases will be very few requiring regular measurements as in (a) above, they shall only fill in the details of the plotwise crops and their areas on the backside of the form in columns 4, 5, 6, 9 or 10 and put their dated signature below the entries.

(c) If in any case, an unauthorised irrigation not booked by the Canal Inspector is noticed by a measurer he should immediately measure it and take it on the crop

measurement book, with a simultaneous reports to the Sectional Officer concerned. It will be only after the personal inspection and inquiries by Sub-Divisional Officer, that such measurements can be confirmed.

In case, those cannot be confirmed, the Sub-Divisional Officer shall report the matter to the Executive Engineer, who may issue orders to confirm or cancel it as he deems fit.

(d) After the crop-measurements work allotted to him, is over, the measurer shall prepare assessment papers in accordance with the programme and orders issued by the Sub-Divisional Officer or the Sectional Officer.

(e) Before starting of measurement work under the orders of the Sub-Divisional Officer, he himself shall take for his guidance, a list of areas to be measured by him, in the beat or beats allotted to him by the Sub-Divisional Officer or the Sectional Officer. The Canal Inspectors need not accompany him at the time of crop-measurements.

(f) The measurers shall also do, when called upon by the Sub-Divisional Officer or the Executive Engineer, the work of demarcating and unitising areas sanctioned under block-system, and preparing sketches thereof, to the prescribed scale.

(g) They shall also do such office work as finding out and keeping ready on record, the acreages of various irrigated crops, their assessment etc., if and when called upon to do so, by the Sectional Officer or the Sub-Divisional Officer when free from their work, specified at (a) to (h) above they shall help the Sectional or Sub-Divisional Officer staff in their work, if and when the Sectional Officer of the Sub-Divisional Officer directs them to do so.

(h) When on out-door duty, the measurers shall submit punctually to their superiors the diaries of their work.

14.7. *Patkaries*.—Class-IV Government servants borne on “XVII or XVIII-Irrigation”.

(a) Patkaries are meant to assist Canal Inspectors in-charge of heavier or more important beats. They are to open and close the outlets channels in the beat of the Canal Inspector, according to the instructions of the Canal Inspector acting under the orders of the Sectional Officer. They are to go round the fields under the irrigation to see that the irrigation is going on in an orderly manner. They are to immediately report to the Canal Inspector, the cases of misuse or waste of water, if they detect any. They can even hold Panchanamas subject to personal inspection by the Canal Inspector.

14.8. *Keymen*.—Class-IV Government servant borne on “XVII or XIII Irrigation”.

(a) The Keymen are to work directly under the Sectional Officer. Their duties are :—

(b) To open, regulate and close in each rotation the distributing channels in a Section, strictly according to the orders of the Sectional Officer, i.e., according to the programme given to him by the Sectional Officer.

(c) To leave all the keys in the custody of the Sectional Officer and to take them back to with his permission according to necessity.

(d) To note down in the gauge register the gauge readings of water depths in the S. W. Fs. at the heads of each such channel preferably between 6-00 a.m. to 6-00 p.m. at least once in a day (a second-time reading at about 12 hours interval may be insisted upon in the case of important distributaries) and to report those every day to the Sectional Officer.

(e) To see if the head regulators of the channels are working satisfactorily if the gauge plates are in tact; if the stilling chamber of the S. W. F. is clean and the pipes admit free flow of water into it. Defects if any, to be immediately reported to the Sectional Officer.

(f) If and when the necessity arises and the above mentioned duties permit, to help the Canal Inspector as would be directed by the Sectional Officer.

(g) To carry with him—

(i) authorised programme of rotational runnings of different distributing channels in the section.

(ii) an order book in which the inspecting officers may note their orders and instructions.

(iii) Gauge registers for noting down the gauges.

(h) When there are no duties to be performed as per (b) to (f) above, to deliver local tapal of the Sectional Officer to the Canal Inspectors, village officers etc., away from Sectional Head Quarters.

14.9. The Canal Advisory Committees and Water Panchayat Committees are established on the different major canal systems for advising Government on the management of the canal water. The construction and rules of business of Canal Advisory Committees are specified under Government, Irrigation Department, Resolution, No. CME-1081/(1902) IMG-3, dated the 17th March 1982 (in Marathi)—Please vide Appendix-X.

14.10. Duties of Field Officers in Vidarbha Region—

Executive Engineer.—Same as for Western Maharashtra.

Sub-Divisional Officer (Irrigation).—Same as for Western Maharashtra.

Canal Deputy Collector.—The Canal Deputy Collector is a senior Tahsildar, posted to look after one or more tanks spread over one or more Sub-Divisions. He is a subordinate to the Executive Engineer. He has to discharge the following duties :—

(a) To hear appeals under Sections of Irrigation Act regarding main incidents of Irrigation agreement.

(b) To accept Irrigation agreements as authorised by the Executive Engineer.

(c) To preside over the election meetings of Irrigation Panchayats and keep watch of working of Panchayats in General.

(d) To check wet areas for purpose of Irrigation agreements.

(e) To check if necessary the position and circumstances under which unauthorised use of canal water is made.

(f) To supervise the work of irrigation Inspector Amin etc., in respect of timely preparation and submission of assessment papers at various stages.

(g) To check when on tours the working of Irrigation Panchayats in respect of collection of Revenue and its remittance in the Government Treasury within reasonable period, issue of receipts by Panchayats to the Irrigators, etc., and to visit the villages in which the unsatisfactory collections are reported.

Irrigation Inspector.—An Irrigation Inspector is a Senior Junior Engineer posted to each Sub-Division to assist the Sub-Divisional Officer (Irrigation) and Canal Deputy Collector in discharging their duties. He has to perform the following duties.

(a) To accept Irrigation Agreements on authorisation by an Executive Engineer.

(b) To supervise the working of Irrigation Panchayats in respect of collection and remittance of revenue issue of receipts etc., and bring to the notice of the Canal Deputy Collector which Panchayat, it is desirable that he should visit in order to expedite collections.

(c) To preside over the election meeting of Irrigation Panchayats if authorised by Executive Engineer.

(d) To prepare preliminary report of authorised use of Canal water if he is in the vicinity at the time of incidence.

(e) To inspect and report the areas in respect of which applications for remission have been made.

Sectional (Subordinate) Office.—Sectional Officer is in-charge of one Section. He comes from Junior Engineer's cadre. His duties are as in Western Maharashtra.

Amin.—The Amin is a lower most post in the administrative set up in the work of Irrigation management. He is directly in touch with the irrigators and Panchayats. He has to discharge various duties concerning irrigation agreements, assessment papers and collection of revenue etc., which is given below :—

(a) To prepare list of persons who are entitled to the electors from the village at least once a month before the date of election and paste the same at prominent places in the village. The names of the elected Panchas should be pasted also at prominent places in the village by him. These names should be communicated to the Canal Deputy Collector by him.

(b) To prepare detailed tracings from Patwari maps for the areas under agreements or likely to come under agreements and to collect maps already prepared annually.

(c) To prepare Khasra Shudkar, Ledger Kistabandi, Khatoni and Parchas for assessment purposes.

(d) To measure areas on demand and part areas under agreements on Form 'A'.

(e) To collect the objections to the parchas served to the Irrigation for irrigation under the agreements and submit them to the Sectional Officer for due corrections.

(f) To receive water applications for areas on demand and forward the same to the Sectional Officer with recommendations.

(g) To report any misuse of canal water viz., unauthorised irrigation or waste of water to the Sectional Officer and Irrigation Inspector.

(h) To report the progress of collection of revenue weekly with all relevant details to the Irrigation Inspector, while the collection of Irrigation revenue in its progress.

(i) To see that the revenue collected is remitted to the Government Treasury and report to the Irrigation Inspector if not done.

Panchayat.—Panchayat is an elected body from the Village Chak or Mahal under agreement. The member of Panchas in a Panchayat is fixed according to the area in village, normally the No. is 3 including one Sarpanch. The Panchayat has to perform duties in respect of Irrigation Management as follows:—

(a) To compound offences as detailed under Sections 60 and 74 of the Maharashtra Irrigation Act, 1976 and recover the amount from the offender.

(b) To distribute water so as to complete all irrigation in the jurisdiction of the Panchayat in the efficient way.

(c) To avoid misuse of water and report to Amin if any such misuse is occurred anywhere.

(d) To show Kistabandi Khatoni to the irrigators, issue receipts and collect the irrigation revenue and remit the same in Government Treasury within minimum period from collection.

(e) To receive water applications for irrigation on demand and forward the same to Amin.

(f) To maintain the documents regarding proceedings of Panchayats, compounding offences, Canal Revenue realised and remitted, Panchayat fund etc., and

(g) To prepare and send applications for remissions in Form-X and send them to Amin for further disposal.

APPENDIX I

Note on estimating Water Requirement of Crops

The estimation of the water requirement (WR) of crops is one of the basic needs for crop planning on a farm and for the planning of any irrigation project. Water requirement may be defined as the quantity of water, regardless of its source, required by a crop or diversified pattern of crops in a given period of time for its normal growth under field conditions at a place. Water is needed mainly to meet the demands of evapo-transpiration (ET) and the metabolic activities of the plant, both together known as consumptive use (C_u or U). Since the water used in the metabolic activities of the plant is negligible ET is practically considered equal to C_u . Water requirement, includes the losses due to ET (or C_u) plus the losses during the application of irrigation water (unavoidable losses) and the quantity of water required for special operations such as land preparation, transplanting, leaching etc. It may thus be formulated as follows:—

$$WR = ET \text{ or } C_u + \text{application losses} + \text{Special needs} \dots (4.0)$$

Water requirement is, therefore, a 'demand' and the 'supply' would consist of contributions from any of the sources of water, the major sources being the irrigation water (IR), effective rainfall (ER) and soil profile contribution (S) including that from shallow water table. Numerically therefore, water requirement is given as:—

$$WR = IR + ER + S \dots (4.1)$$

The field irrigation requirement of a crop refers to the water requirement of crops exclusive of effective rainfall and contribution from soil profile, and it may be given as:—

$$IR = WR - (ER + S) \dots (4.2)$$

The farm irrigation requirement depends on the irrigation need of individual crops, their area and the losses in the farm water distribution systems, mainly by way of seepage. The irrigation requirement of an outlet command area includes the irrigation requirement of individual farm holdings and the losses during conveyance in the distribution system.

*Evapo-transpiration (ET) or Consumptive use (C_u or U).—*In designating water use by crops, evaporation and transpiration are combined into one term evapotranspiration (ET) as it is difficult to separate these two losses in cropped fields. The term consumptive use is used to designate the losses due to evapotranspiration and the water that is used by the plant for its metabolic activities. Since the water used in the actual metabolic processes is insignificant (about 1 per cent of ET or less) the term consumptive use is generally taken equivalent to ET. It thus includes all water consumed by plants plus the water evaporated from bare land and water surfaces in the area occupied by the crop. The relative amount of direct evaporation from the land and water surfaces and transpiration depends usually on the extent of ground cover. For most crops completely covering the soil surface only a very small amount of water is lost from the ground surface as evaporation. Under field conditions in coming solar radiation supplies the energy for the evapotranspiration process.

Wind is important in removing water vapour from the cropped area and the prevailing temperature and humidity conditions result from the interaction of the two processes. Usually a close relationship exists between net incoming solar radiation and evapotranspiration. In general, the factors influencing evaporation and transpiration also govern the evapotranspiration process.

Other factors being equal the stage of a crop's growth influences its consumptive use rate substantially. This is particularly true for annual crops which generally have three rather distinct stages of growth. These are (1) emergence to development of complete vegetative cover during which time the consumptive use rate increases rapidly from a low value and approaches its maximum. (2) the period of maximum vegetative cover during which the consumptive use rate may be maximum and practically constant if adequate soil moisture is available and (3) crop maturation stage, when for most crops, the consumptive use rate begins to decrease.

The interception of solar energy by row crops is a function of their orientation with respect to the sun. Depending on the surrounding crop areas particularly those upwind of the crop in question air masses passing across the field will vary in humidity and temperature. Thus if the surrounding fields are bare more water will be lost than if they were cropped and irrigated. This therefore, stresses the need for developing compact blocks for irrigation.

Seasonal Consumptive use (U).—The total amount of water used in evaporation and transpiration by a crop during the entire growing season is called seasonal consumptive use. It is expressed as depth of water in cm. or volume in hectare-cm. per hectare. Seasonal consumptive use values are required to evaluate and determine seasonal irrigation water supplies.

Estimating Evapotranspiration from Evaporation data.—It has been observed that a close relationship exists between the rate of consumptive use by crops and the rate of evaporation from a well located evaporation pan. Evaprimeters incorporated the effects of all climatic factors and hence are more accurate in estimating the short-term fluctuations in KT than empirical formulae that depend on fewer of the climatic factors involved.

Estimating Evapotranspiration from Climatological data.—Owing to the difficulty in obtaining accurate direct measurements of pan-evaporation under field conditions evapotranspiration is often predicted on the basis of climatological data. The approaches followed are to relate the magnitude and variation of evapotranspiration to one or more climatic factors such as temperature, day length, humidity, wind, sunshine etc. Many formulas have been developed and used from time to time (Table 4.2) and have been critically reviewed by various workers (Singh et al 1980 Isrealsen and Eansen—1982; Tanner—1967; Change—1968; Dastane—1972; Taylor and Ashcroft—1972; Doorenbos and Pruitt—1975). Broadly these approaches fall in two classes (i) purely empirical attempts to correlate evapotranspiration with one or more climatic factors and (2) the application of a more theoretical approach. Such formulae have often to be used under agro-climatic conditions different from those for which they were originally developed. It is therefore, necessary to test the adoptability of these formulae and modify suitably before using them under a new set of conditions.

The formulae most commonly used in estimating evapotranspiration are those proposed by Blaney-Criddle Thorathwaite Penman and Christiansen.

✓ *Effective Rainfall.*—In its simplest sense, the term effective rainfall indicates the proportion of total rainfall which is useful or utilisable for productive purposes. It has been interpreted differently by the workers in different disciplines. From the point of view of the water requirement of crops, the Food and Agricultural Organisation (FAO) of the United Nations has defined the effective rainfall as that part of the total annual or seasonal rainfall which is useful directly and/or indirectly for crop production at the site where it falls.

✓ *Irrigation Requirement.*—Irrigation requirement is the total amount of water applied to the land surface in supplement to the water supply through rainfall and soil profile, to meet the water needs of crops for optimum growth. The water to be thus applied to the fields can be directly measured with the help of water measuring devices like flumes, notches, orifices and water meters.

✓ *Net Irrigation Requirement.*—The net irrigation requirement is the amount of irrigation water just required to bring the soil moisture content in the rootzone depth of the crops to field capacity. Thus net irrigation requirement is the difference between the field capacity and the soil moisture content in the rootzone before application of the irrigation water.

✓ *Gross Irrigation Requirement.*—There are various systems and methods of water application to field crops but none of these are cent per cent efficient and it has been found that considerable losses do take place during the conveyance, distribution and application of water in the fields. The total amount of water, inclusive of these losses, applied through irrigation is termed as "Gross Irrigation Requirement" which in other words is net irrigation requirement + application and other losses. The gross irrigation requirement can be worked out for a field, for a farm, for an outlet command area or for an irrigation project depending on the need, by considering the appropriate losses at various stages as explained at the beginning of this Chapter.

The gross irrigation requirement (IR) at the field head, for instance can be determined as follows:—

$$IR = \sum_{1}^n \frac{d}{E(\text{application})} \quad \dots \quad (4.12)$$

where IR = Seasonal gross irrigation requirement (cm) at the field head.

d = net amount of water to be applied at each irrigation.

E (application) = water application efficiency and

n = number of irrigations in a season.

The knowledge of various irrigation efficiencies is important in determining the irrigation water requirement of crops and the losses occurring at various stages in an irrigation project. The design of irrigation system, the type of soil and the degree of land preparation, and the skill and care of the irrigator are the principal factors influencing irrigation efficiency. Loss of irrigation water mainly occurs in the conveyance and distribution system, non-uniform application of water in the field,

percolation below crop rootzone and the evaporation and drift during sprinkler irrigation. In case of large fields, loss of water may occur by surface runoff at the end of irrigation borders and furrow also. All these losses could be minimised by adequate planning and efficient operation of the irrigation system, proper design of the irrigation method and good land preparation. Various efficiency terms used in the field of irrigation (Israelsen and Hansen 1962) are discussed in the following pages.

Field Capacity—Field capacity of the soil is the water, the soil can hold in its effective rootzone after 60—75 hours after application of water.

Design Irrigation Frequency—In designing irrigation systems, the irrigation frequency to be used is the time (in days) between irrigations for the period of highest consumptive use by the crops grown. Irrigation frequency depends on how fast soil moisture is extracted when a crop is transpiring at its maximum rate. The average moisture use rate during this period is used for planning irrigation systems. For an irrigation system to be adequate, it must have sufficient capacity to supply the water required during this period. The design irrigation frequency may be computed as follows:—

$$\text{Design irrigation frequency (days)} = \frac{\frac{\text{Field capacity of the soil in the effective crop root zone.} \times \text{Moisture content of the same zone at the time of starting irrigation}}{\text{Peak period moisture use rate of crop}}}{1}$$

Water Application Methods—Irrigation water may be applied to crops by flooding it on the field surface by applying it beneath the soil surface, by spraying it under pressure or by applying it in drops. The common methods of irrigation are indicated schematically as follows:—

Irrigation Methods			
Surface	Sub-surface	Sprinkler	Drip
Border	Check Basin	Furrow	

The water supply, the type of soil, the topography of the land and the crop to be irrigated determine the correct method of irrigation, it is necessary to design the system for the most efficient use of water by the crop.

Surface Irrigation Methods.—In the surface methods of irrigation, water is applied directly to the soil surface from a channel located at the upper reach of the field. Water may be distributed to the crops in border strips, check basins or furrows. Two general requirements of prime importance to obtain high efficiency in surface methods of irrigation are properly constructed water distribution systems to provide adequate control of water to the fields and proper land preparation to permit uniform distribution of water over the field.

Border Irrigation

8.1. **Basic Details of Border Method of Irrigation.**—The Border method of irrigation makes use of parallel ridges to guide a sheet of flowing water as it moves down

the slope. The land is divided into a number of long parallel strips called borders that are separated by low ridges. The border strip has little or no cross slope but has a uniform gentle slope in the direction of irrigation (Fig. 8.1). The essential feature of border irrigation is to provide an even surface over which the water can flow down the slope with a nearly uniform depth. Each strip is irrigated independently by turning in a stream of water at the upper end. The water spreads and flows down the strip in a sheet confined by the border ridges. The irrigation stream must be large enough to spread over the entire width between the border ridges without overtopping them. When the advancing water front either reaches the lower end or a few minutes before or after that the stream is turned off. The water temporarily stored in the border moves down the strip and infiltrates thus completing the irrigation.

The border method of irrigation is adapted to most soils where depth and topography permit the required land levelling at a reasonable cost and without permanent reduction in soil productivity. It is however more suitable to soils having moderately low to moderately high infiltration rates. Usually it is not used in coarse sandy soils that have very high infiltration rates because of the stringent limitations in design. It is also not well suited to soils having a very low infiltration rate since to provide adequate infiltration opportunity time without surface runoff at the lower end the irrigation stream may be too small to completely cover the border strips.

The border method is suitable to irrigate all close-growing crops like wheat, barley, fodder crops and legumes. It is however not suitable for crops like rice which requires standing water during most parts of its growing season.

The border method has a number of advantages. They include :—

- (i) border ridges can be constructed economically with simple farm implements like a bullock drawn A-frame ridger or bund former or tractor-drawn disc ridger;
- (ii) labour requirement in irrigation is greatly reduced as compared of the conventional check basin method of irrigation;
- (iii) uniform distribution and high water application efficiencies are possible if the system is properly designed;
- (iv) large irrigation streams can be efficiently used;
- (v) operation of the system is simple and easy and
- (vi) adequate surface drainage is provided if outlets are available.

Width of border strip.—The width of a border usually varies from 3 to 15 metres, depending on the size of the irrigation stream available and the degree of land levelling practicable. When the size of the irrigation stream available is small the width is reduced. It is however not economical to keep the width less than about three metres; as otherwise, too many ridges will have to be formed per unit area of the field surface.

Border length.—The length of the border strip depends upon how quickly it can be wetted uniformly over its entire length. This in turn depends on the infiltration rate of the soil, the slope of the land and the size of the irrigation stream available. For moderate slopes and small to moderate size irrigation streams the following border lengths are suggested :—

Sandy and sandy Loam soils ..	.. 60 to 120 metres.
Medium Loam soils ..	.. 100 to 180 metres.
Clay loam and clay soils ..	.. 150 to 300 metres.

Border Slope.—The borders should have a uniform longitudinal gradient. Excessive slopes will make the water run to the lower end quickly causing insufficient irrigation at the upstream and deep percolation losses and breach the bund at the downstream. They also cause soil erosion in borders. On the other hand too flat slopes will result in the very slow movement of the border stream causing deep percolation losses at the upper reaches and inadequate wetting downstream. Recommended safe limits of land slopes in borders are given below :—

Sandy loam to sandy soils	..	..	0.25 % to 0.60 %
Medium loam soils	..	..	0.20 % to 0.40 %
Clay to clay loam soils	..	..	0.05 to 0.20 %

Check Basin Irrigation.—Check basin irrigation is the most common method of irrigation in India and in many other countries. This is the simplest in principle of all methods of irrigation. There are many variations in its use, but all involve dividing the field into smaller unit areas so that each has a nearly level surface (Figs. 8.10 and 8.11). Bunds or ridges are constructed around the areas forming basins within which the irrigation water can be controlled. The basins are filled to the desired depth and the water is retained until it infiltrates into the soil. When irrigating rice or pending water for leaching salts from the soil, the depth of water may be maintained for considerable periods of time by allowing water to continue to flow into the basins.

Water is conveyed to the field by a system of supply channels and lateral field channels. The supply channel is aligned on the upper side of the area and there is one lateral for every two rows of check basins (Fig. 8.11). Water from the laterals is turned into the beds and is cut off when sufficient water has been admitted to the basin. Water is retained in the basin until it soaks into the soil.

Adaptability.—Check basin irrigation is suited to smooth gentle and uniform land slopes and for soils having moderate to slow infiltration rates. Steep slopes require complex layouts and heavy land levelling. Both row crops and close-growing crops are adopted to be used with basins as long as the crop is not affected by temporary inundation or is planted beds so that it will remain above the water level. The method is especially adapted to irrigation of grain and fodder crops in heavy soils where water is absorbed very slowly and is required to stand for a relatively long time to ensure adequate irrigation. It is also suitable in very permeable soils which must be covered with water rapidly to prevent excessive deep percolation losses at the upstream end.

Furrow Irrigation.—The furrow method of irrigation is used in the irrigation of row crops with furrows developed between the crop rows in the planting and cultivating processes. The size and shape of the furrow depends on the crop grown, equipment used and spacing between crop rows. Water is applied by running small streams in furrows between the crop rows.

8.7. Adaptability, Characteristics and Types of Furrow Irrigation.—Furrow irrigation can be used to irrigate all cultivated crops planted in rows, including orchards and vegetables (Drg. 3). Amongst the common cultivated crops of India, the method is suitable for irrigation of maize, sorghum, sugarcane, cotton, tobacco, groundnut, potatoes and other vegetables. Furrows are particularly well adapted

to irrigating crops which are subject to injury from ponded surface water or susceptible to fungal root rot. Furrow irrigation is suitable to most soils except stands that have a very high infiltration rate and provide poor lateral distribution of water between furrows.

As compared to other methods of surface irrigation, the furrow method has several distinct advantages (i) Water in the furrows contacts only one-half to one-fifth of the land surface, thereby reducing puddling and crusting of the soils and evaporation losses and (ii) earlier cultivation is possible which is a distinct advantage in heavy soils. The furrow method may be adapted to use, without erosion, on a wide range of natural slopes by carrying the furrows across a sloping field rather than down the slope. The method reduces labour requirements in land preparation and irrigation. Compared to check basin method, there is no wastage of land in field ditches.

Irrigation furrows may be classified into two general types based on their alignment:

Straight Furrows.—Straight furrows, like borders, are laid down the prevailing land slope (Drg. 3). They are best suited to sites where the land slope does not exceed 0.75 per cent. In areas of intense rainfall, however, the furrow grade should not exceed 0.5 per cent so as to minimise the erosion hazard. The ranges in furrow slopes for efficient irrigation in different soil types are the same as those recommended for borders.

Contour Furrows.—Contour furrow method is similar to the graded and level furrow methods in that the irrigation water is applied in furrows; but the furrows carry water across a sloping field rather than down the slope. Contour furrows are curved to fit the topography of the land (Drg. 3). The furrows are given a gentle slope along its length as in the case of graded furrows. Field supply channels run down the land slope to feed the individual furrows and are provided with erosion control structures.

Contour furrow method can be successfully used in nearly all irrigable soils. The limitations of straight furrow irrigation are overcome by contouring to include sloping lands. Light soils can be irrigated successfully across slopes up to 5 per cent.

Contour furrows may be used on most soil types, except on light sandy soils and soils that crack.

Furrow Irrigation in Black Cotton Soils.—In heavy black soils a combination of border strip irrigation with furrows is usually preferred. These soils crack badly, so it is desirable to have furrows within the border strips, so cracking will not allow the water to escape from furrow to furrow.

APPENDIX

Duties of

No.	Seasonal Crops	Deccan duties with rainfall in command less than 62.5 Cm and its relation between "Acre per cusec and depth over area"					
		Kharif period base 122 days		Rabi period base 123 days		H. W. period base 120 days	
		Seasonal duty in Acre/cusec ha.	Equivalent depth in inches/cm	Seasonal duty in Acre/cusec ha.	Equivalent depth in inches/cm	Seasonal duty in Acre/cusec ha.	Equivalent depth in inches/cm
1	2	3	4	5	6	7	8
1	Sugarcane	$\frac{65}{26.00}$	$\frac{45''}{115}$	$\frac{70}{28.00}$	$\frac{42''}{105}$	$\frac{50}{20.0}$	$\frac{57.5''}{144}$
2	Other Perennials—						
	(a) Pan garden	$\frac{97.5}{39.0}$	$\frac{30''}{75}$	$\frac{105}{42.0}$	$\frac{28''}{71.0}$	$\frac{75}{30}$	$\frac{38.4''}{144}$
	(b) Plantain garden						
	(c) Vegetable						
	(d) Lucerne grass						
3	Two Seasonals—						
	(a) Groundnut and Cotton	$\frac{130}{52}$	$\frac{22.5''}{57.00}$	$\frac{140}{56}$	$\frac{21''}{53.0}$	....	....
	(b) Turmeric and Chillies						
	(c) Sweet Potatoes						
	(d) Tomato						
	(e) Onions						
4	Kharif Seasonals—						
	(a) Bajri, Maka, Dals and Kadwal etc.	$\frac{195}{78}$	$\frac{15''}{38.00}$	....	....	....	....
	(b) Maize						
5	Kharif Rice	$\frac{65}{26.0}$	$\frac{45''}{114.0}$	....	....	....	....
6	Rabi Seasonals—						
	(a) Wheat	....	....	$\frac{210}{84.0}$	$\frac{14''}{36.0}$	....	....
	(b) Jawar						
	(c) Gram						
7	H. W. Seasonals—						
	Hindi Fodder etc.	....	....	....	....	100	$\frac{28.8''}{73.0}$

11

Various Crops

Duties derived on the basis of actual rotation depth No. of waterings required for maintaining Crop in each season						
Kharif period (Base 122 days)						
Rotation period in days	No. of waterings required	Average depth required for maintaining crop in each watering	Evaporation 0.08" per day	Total depth of each watering in inches	Total depth in inches for the season	Seasonal duty derived in Acre/ha.
9	10	11	12	13	14	15
12	$\frac{10}{15}$	$\frac{3.50"}{9.0}$	$\frac{0.98"}{2.5}$	$\frac{4.46"}{12.50}$	$\frac{45.3"}{115.0}$	$\frac{84.5}{26}$
12	$\frac{10}{15}$	....	$\frac{0.9"}{2.0}$ $\frac{0.8"}{2.0}$ $\frac{2.5"}{6.0}$ $\frac{1.9"}{5.0}$ $\frac{2.3"}{6.0}$	$\frac{86"}{7.0}$	$\frac{29"}{74}$	$\frac{100.1}{40.0}$
12	$\frac{10}{15}$	....	$\frac{1.7"}{4.0}$ $\frac{1.1"}{3.0}$ $\frac{1.2"}{3.0}$ $\frac{2.8"}{7.0}$ $\frac{2.2"}{6.0}$	....	$\frac{23"}{58}$	....
30	4.5	$\frac{3.0"}{8.0}$ $\frac{1.4}{4.0}$	$\frac{2.0}{0.96}$	$\frac{3.16}{800}$	$\frac{14.2"}{36.00}$	$\frac{206.0}{82.0}$
12	$\frac{10}{15}$	$\frac{4.58}{12.0}$	$\frac{0.96}{2.00}$	$\frac{5.76}{15.0}$	$\frac{58.5"}{149.0}$	$\frac{50.0}{20.0}$
....						
....						

II—contd.

required for maintaining Crop in each season

Hot Weather Period (Base 120 days)						
Rotation period in days	No. of waterings required	Average depth required for maintaining crop in each watering	Evaporation 0.12" per day	Total depth of each watering in inches	Total depth in inches for the season	Seasonal duty derived in acre/ha.
23	24	25	26	27	28	29
10	12	$\frac{3.5}{9.0}$	$\frac{1.20}{3.00}$	$\frac{4.75''}{12.00}$	$\frac{57''}{145}$	$\frac{50.5}{20.00}$
10	12	$\frac{1.90}{5.00}$	$\frac{1.20}{4.00}$	$\frac{3.10}{8.00}$	$\frac{37.2''}{94.50}$	$\frac{77.2}{31.0}$
....						
....						
....						
....						
15	8	$\frac{2.2''}{5.00}$	$\frac{1.2}{3.00}$	$\frac{3.4}{9.0}$	$\frac{27.2''}{68.0}$	$\frac{105}{42}$

APPENDIX III.

**Preliminary Irrigation Programme for Nira Left Bank Canal
For the Year 1978-79**

Statement showing the Share of Water for Nira Left Bank Canal

Rabi Season 15th October 1978 to 28th February 1979.

Hot Weather Season 1st March 1979 to 30th June 1979.

A. Bhatghar Reservoir—

			Mcft.
(i) Gross contents on 15th October 1978	..	..	23,614
(ii) Deduct reservation for fish	..	..	250
Available contents	..		23,364
(iii) (a) Share of Nira Right Bank Canal including losses 57%	..		13,317
(b) Share of Nira Left Bank Canal including losses 43%	..		10,047
(iv) Losses in transit upto VIR in Rabi & H.W.	..		1,580
Share of losses assumed and accepted	{ (a) N.R.B.C.	..	1,053
	{ (b) N.L.B.C.	..	527
(v) Inflow into Bhatghar reservoir and releases from Bhatghar reservoir.			209
Share assumed and accepted	{ (a) N.R.B.C.	..	119
	{ (b) N.L.B.C.	..	90

Water Distributed as 57 & 43 %, but losses distributed as 67 & 33 % Why?

B. Vir Reservoir—

(i) Contents on 15th October 1978	..	..	9,242
(ii) Deduct dead storage and evaporation losses	..	..	450
Net Available contents	..		8,792

C. *Share of N.R.B.C. and N.L.B.C.—*

Mcf.

(a) *Nira Right Bank Canal—*

(i) Contents available from Bhatghar Reservoir	13,317
(ii) Deduct losses	1,053
Net available contents from Bhatghar	12,264
(iii) Add share of inflow and releases from Bhatghar reservoir	119
	12,383
(iv) Contents available from Vir	8,792
	21,175
(v) Add water drawn before 15th October 1978	371
Total share	21,546

100% given to NRBC

B. *Nira Left Bank Canal—*

(i) Contents available from Bhatghar Reservoir	10,047
(ii) Deduct losses	527
Net available contents from Bhatghar	9,520
(iii) Add share of inflow and releases from Bhatghar Reservoir	90
	9,610
(iv) Deduct water drawn before 15th October 1978	185
Share of N.L.B.C.	9,425

Sr. No.	Name of Canal	Rabi requirement in MCFT 15-10-78 to 28-2-79	Hot Weather requirement in MCFT 1-3-79 to 30-6-79	Total irrigation requirement in MCFT	Total share in MCFT	Saving in MCFT	Shortfall in MCFT
1	N.L.B.C.	6259.00	3452.00	9711.00	9425	.....	286.00

*Statement showing the Standing Crops in Kharif Season 1978-79 on
Nira Left Bank Canal*

Sr. No.	Name of Crop	Sanctioned Block in Acres	Standing crop in Acres
(1) Sugarcane Block		13,213	
(i) 1/4th Basic cane			3,303
(ii) Overlap cane at 80%			2,642
(iii) Cane on F. No. VII		20	20
(iv) Overlap cane at 80%			16
			<u>5,981</u>
(2) Other Perennials—			
(i) Fruit Block		303	303
(ii) Garden Block		75	75
			<u>378</u>
(3) Vegetable in Block			60
(4) Kharif seasonals—			
(i) Paddy & Tur (4000 × 2 i.e., two waterings in a Rotation)			8,000
(ii) Hy. Jowar			7,200
(5) Hot Weather Seasonals following in Kharif			6,100
(6) Kharif Bhusar—			
(i) Three seasonal Block		3,600	1,200
(ii) Two seasonal block		22,000	8,000
(7) Canal Lift			550
M.S.F.C.—			
(1) Basic Cane		1,470	1,103
(2) Overlap 60%			662
			<u>1,765</u>
(3) Kharif crops			250

Sanctioned Block Area on Nira Left Bank Canal
Year 1978-79

(A) Local Irrigation—

(1) Cane Block	..	..	..	..	13,213	Acres
(2) Fruit Block	..	..	..	..	303	„
(3) Garden Block	..	..	..	..	75	„
(4) Two seasonal Block	..	..	..	..	22,000	„
(5) Three seasonal Block	..	..	..	..	3,600	„
(6) Cane on Form No. VII	..	..	..	..	20	„
(7) Bhusar on Canal lift	..	..	..	..	1,000	„

(B) Sanctions of Maharashtra State Farming Corporation
Lt.—

Shivpur on Nira Left Bank Canal—

(1) Guaranteed area	..	..	..	..	1,470	„
(2) Area of cane standing (after 25% cut)	..	..	..	..	1,102.20	„
(3) Permissible overlap — Kharif season	..	..	..	..	60%	
	Rabi season	..	..	..	30%	
	Hot Weather	..	..	..	30%	
(4) Bhusar Area	..	..	..	..	2,000	„

(C) Total Share allotted for Rabi and Hot Weather for Nira
Left Bank Canal for the year 1978-79—

Share allotted—	..	..	..	..	9,425	Mcft.
(1) Requirement of Rabi season	..	..	..	..	6,259	„
(2) Requirement of Hot Weather	..	..	..	..	3,425	„
Total requirement for Rabi & Hot Weather	..	..	..	..	9,711	„

**Preliminary Irrigation Programme of Nira Left Bank Canal for Rabi
Season (1978-79)**

Period :—15-10-1978 to 28-2-1979 = 137 days.

(All figures are in Acres)

Sr. No.	Name of Crop	Sanctioned area in Acres	Area standing in acres	Conversion factor	Area reduced to cane Basic
(1) Sugarcane Block		13,213			
(1) 1/4 cane in block			3,603	100%	3,303
(2) Average overlap 50% ..			1,652	100%	1,652
(3) Cane on Form No. VII		20	20	100%	20
(4) Average overlap 50% ..			10	100%	10
(2) Fruit Block		303	303	67%	203
(3) Garden Block		75	25	67%	17
(4) Vegetables in Blocks			200	67%	134
(5) Wheat of high yielding in Block and on Form No. VII.			20,000	67%	13,400
(6) Hybrid Jawar in Block and on Form No. VII			5,000	50%	2,500
					<u>21,239</u>
(7) Bhusar (seasonal food crop) in sanctioned block on Form No. VII—					
(1) In cane block		13,213	6,607		
(2) In two seasonal Block		22,000	22,000		
(3) In three seasonal Block		3,600	1,200		
(4) On Form No. VII inclusive of Canal lift			11,000		
			<u>40,807</u>		
Deduct high yielding wheat, hybrid jawar (20,000 + 5,000) item 5, 6 above.			<u>-25,000</u>		
(8) Area of local Jowar in Block and on Form No. VII			15,807	33%	5,216
				5,216.00 Acres	
(9) Post seasonal watering to Sal and Tur (Two water-ings = $3000 \times \frac{67\%}{4}$ = at 25%)				502.00	
			Total	<u>5,718.00</u>	

Water required for Rabi season for local irrigation :—

(i) Water required at Canal head for Rabi with duty 80 at Distributary head and losses at 35% at distributary head for—

1. Perennial and high-yielding varieties—

$$21239 \times \frac{137}{11.57 \times 80} \times 1.35 = 4,244 \text{ Mcft.}$$

2. For light Bhusar with duty 65 at distributary head and losses at 35% at distributary head—

$$\frac{5718.00 \times 137 \times 1.35}{11.57 \times 65} = 1,406.00 \text{ Mcft.}$$

Total water requirement for local irrigation i.e., 1 + 2 above = 5650.00 Mcft.

*Statement showing sanctions to the Maharashtra State Farming Corporation
Shivpuri (Walchandnagar) for Rabi 1978-79*

Area of cane standing	1,103
Overlap at 30 Per cent	331
	<u>1,434</u> acres.

Bhusar Crops in Rabi :—

(1) Wheat	1,000	acres.
(2) Hybrid jawar	500	acres.
(3) Local jawar	500	acres.
Total	<u>2,000</u>	acres.

Inch Depth required for Rabi :—

Cane	45"
Wheat	26"
Hybrid jawar	18"
Local jawar	15"

Water requirement :—

(1) Cane	$\frac{1434 \times 45 \times 43560 \times 1.35}{12 \times 10^6}$	= 316 Mcft.
(2) Wheat	$\frac{1000 \times 26 \times 43560 \times 1.35}{12 \times 10^6}$	= 127 Mcft.
(3) Hybrid Jawar	$\frac{500 \times 18 \times 43560 \times 1.35}{12 \times 10^6}$	= 44 Mcft.
(4) Local jawar	$\frac{500 \times 15 \times 43560 \times 1.35}{12 \times 10^6}$	= 37 Mcft.

Total quantity of water .. 524 Mcft.

Total requirement of Rabi season 1978-79:—

(1) Local irrigation	5,650	Mcft.
(2) M.S.F.C.	524	Mcft.
(3) Non-irrigation	85	Mcft.
Total	<u>6,259</u>	Mcft.

*Assumptions made for calculating the water requirement for hot weather season
1978-79 on N.R.B.C.*

A. Location Irrigation:—

Serial No. 1	Name of Crop 2			Conversion Factor 3
1	Cane and overlap	..	..	100%
2	Fruit block	..	..	67%
3	Garden block	..	..	67%
4	Hot Weather seasonal	..	..	67%
5	Post seasonal watering to wheat	..	..	1/7th
6	Vegetables standing in Hot Weather (two waterings)			67%
				<u>4</u>
7	Average seasonal duty	..	..	45
8	Percentage losses at Distributary head	..	..	40
9	Base period (1-3-79 to 30-6-79)	..	..	122 days.

B. Maharashtra State Farming Corporation:—

1	Inch depth adopted for cane at distributary head	..	53"
2	Permissible overlap	..	30%

Preliminary Irrigation Programme of Nira Left Bank Canal for Hot Weather Season (1978-79)

Period : 1-3-1979 to 30-6-1979 = 122 days.

(All Figures are in Acres)

Serial No.	Name of Crop	Sanctioned block area	Standing crop area	Conversion factor	Area reduced to cane basis
1	Sugarcane—				
	(a) 1/4th cane in block	13,213	3,303	100%	3,303
	(b) Overlap (10%)		330	100%	330
	(c) Cane on F. No. VII	20	20	100%	20
	(d) Overlap 15%		3	100%	3
2	Fruit Block	303	303	67%	203
3	Gardan block	75	25	67%	17
4	Vegetables standing in hot weather (two waterings).		200	67%	34
				4	
5	Post seasonal watering for Wheat		8,000	1/7	1,143
6	Not weather seasonals on Form No. VII		6,000	67%	4,020
	Total ..				9,075

(A) Water requirement for Hot Weather Season 1978-79 Water required at canal head for hot weather season with duty 45 and 40 per cent losses at Distributary head—

$$= \frac{9075.00 \times 122 \times 1.50}{11.57 \times 45} = 2,976 \text{ Mcft.}$$

(B) M.S.F.C., Cane	1,103	
Overlap 30 percent	351	
Total ..	1,434	Acres.

Water required for M.S.F.C. $\frac{1434 \times 53 \times 43560 \times 1.40}{12 \times 10^6} = 386 \text{ Mcft.}$

Requirement of hot weather season local irrigation, M.S.F.C. and non-irrigation:

(1) Local	2,976.00	Mcft.
(2) M.S.F.C.	386.00	Mcft.
(3) Non-irrigation	90.00	Mcft.
Total ..	3,452.00	

COMPLETION OF IRRIGATION PROGRAMME OF NIRA LEFT BANK CANAL

*Statement showing assumptions of water requirement for calculating water
for Rabi Season—1978-79 on Nira Left Bank Canal*

(A) Local Irrigation:

Serial No. 1	Name of Crop 2	Conversion factor 3
1	Cane area and overlap	100 per cent
2	Fruit block	67 per cent
3	Garden block	67 per cent
4	Vegetable in all types of blocks	67 per cent
5	Wheat of high yielding varieties	67 per cent
6	Hybrid Jawar	50 per cent
7	Local Jawar (Maldandi)	33 per cent
8	Post-seasonal watering to Sal Tur (two waterings) ..	64/4 per cent
9	Seasonal duty adopted with 21 days rotation period for perennial and high yielding varieties (Distributary head).	80 per cent
10	Seasonal duty adopted with 21 days rotation period for light bhusar (distributary head).	65 per cent
11	Percentage of losses at Distributary head	35 per cent
12	Base period (15th October 1978 to 28th February 1979) ..	137 days.

*With normal rotation of 14 days, duty is 65, with 21 days rotation for sugarcane, duty increases to 80, however, for bhusar crops water is required to be given every 28 to 35 days hence duty for high bhusar crops is 65, irrespective of the extended rotation period.

(B) Maharashtra State Farming Corporation:

1	Inch-depth adopted for sugarcane at distributary head ..	45"
2	Permissible overlap	30 per cent

APPENDIX IV

A Specimen of efficiency report for rotation period.

STATEMENT I

Baramati Sub-Division,
Baramati.

No.

Date:

To

The Executive Engineer,
Poona Irrigation Division,
Poona-1.

Subject.—Efficiency Report.....

Rotation period.....

(From 1st January to 15th January).

Rabi Season—Rotation No. 6.

Sir,

The efficiency report for the rotation period mentioned above is submitted herewith for favour of further disposal.

2. Area irrigated in this rotation is 13826 Acres/
and Quantity utilised in 6138 days.

Quantity utilised during last rotation was 9840.
Rainfall as proforma No. 126-e attached.

- | | |
|---------------------------------------|--------|
| 4. Losses in transit at head of Canal | 137.3% |
| and AIDC achieved at Canal head is | 2.28 |
| while the same for last rotation | 33.8% |
| were and 2.21 respectively. | |

Yours faithfully,

Sub-Divisional Officer.

Efficiency Report

STATEMENT 2

Proforma No. 1

*Efficiency Report of Nira Left Bank Canal for the Rotation Period from
(1st January 1972 to 15th January 1972)*

Sub-Division and Section	Areas irrigated ((in Acres)				Total area irrigated Acres	Total day cusecs	AI/DC	
	Cane	O.P.	N.B.	L.B.				
Nira Sub-Division:								
Pimptra	..	342.00	4.00	118.20	462.20	927.00	231.75	4.00
Total	..	342.00	4.00	118.20	462.20	927.00	231.75	4.00
Pandhara Sub-Division:								
Vadgaon	..	367.00	16.00	214.00	480.20	1077.20	302.50	3.57
Pandhara	..	700.00	23.00	200.00	528.00	1451.00	385.00	3.76
Malegaon	..	56.00	....	116.00	104.00	276.00	76.50	3.63
Malad	..	545.00	45.00	151.00	764.00	1505.00	421.00	3.56
Total	..	1668.00	84.00	681.00	1876.20	4309.20	1185.00	3.64
Baramati Sub-Division:								
Baramati	..	490.00	151.30	143.20	159.00	944.20	265.50	3.56
Sansar	..	787.00	28.00	204.20	550.20	1570.00	459.50	3.42
Haturna	..	212.00	9.20	34.20	755.00	1011.00	295.75	3.42
Dy. 46 (Local)								
M.S.F.C.D./45	..	13.00	..	..	..	13.00	5.25	Vol.
M.S.F.C.D./46	..	963.00	..	..	..	963.00	385.22	basis
Ningaon	..	..	..	..	2924.00	2924.00	911.00	3.20
Bawada (D/59)	..	..	..	..	1018.00	1018.00	386.00	2.83
Canal lift	..	6.00	30.00	..	110.00	146.00	41.00	3.56
Total	..	2471.00	219.10	382.20	5516.30	8589.20	2723.22	3.26
Grand total	..	4481.00	307.10	1182.00	7855.30	13826.00	4149.97	3.43
Shetphal Tank	..				1556.00			
Bawada	..	447.00	16.20	0.20	+ 25.25	2045.25	704.00	2.90
Baramati Sub-Division, Pune Zone, AI/DC						3.48		
Baramati Sub-Division, N.P. Zone, AI/DC						3.12		

STATEMENT 3
Efficiency Report
Proforma No. 2

Total quantity drawn at head of Canals 6138 daycusecs.

Rotation Period from 1st January to 15th January.

Sub-Division	Cane	O.P.	M.B.	L.B.	Total area irrigated in Acres	Total discharge drawn in day-cusecs
Nira	342.00	4.00	118.20	462.20	927.00	231.75
Pandhara	1668.00	84.00	681.00	1876.20	4309.20	1185.00
Baramati	2471.00	219.10	382.20	5516.30	8589.20	2723.22
Grand Total ..	4481.00	307.10	1182.00	7855.30	13826.00	41.3957

(A) Discharge drawn of Distributary head	..	4139.97
Discharge let down in shetphal Tank	..	Nil
Discharge let down in Tarangawadi Tank	..	Nil
Discharge utilised for N.A. purposes.	..	Nil
Discharge let down through scuring sluices	..	75.00 (Approx)
Total	..	4214.97 days.

(B) Losses in Transit (6138—4215)=1923 daycusecs.

(C) Losses in Transit at head of Canal 31.3 per cent.

(D) Losses in Transit at head of Disty, 45.6 per cent.

(E) AIDC at head of Canal 2.28

(F) AIDC at head of Disty. 3.43

O.P.—Other Perennials

M.B.—Medium Bhusar

L.B.—Light Bhusar

(Signed)

Sub-Divisional Officer.

STATEMENT

Water demand during the Rotation period from

Distributary No.	Area to be irrigated in Acres				Total	required AI/DC 3.5
	Cane	O.P.	M.B.	L.B.		
						in day cusecs
26-B	21.00	5.20	2.00	13	41.20	12
26-C	9.20	..	1.00	20	30.20	9
27	3.00	21.10	0.20	3	27.30	8
28	34.00	5.20	2.20	90	132.00	40
28-A	1.00	13.00	1.00	5	20.00	6
28-B	..	..	..	8.25	8.25	2.50
28-C	16.20	10.20	..	14	41.00	12
29	185.00	29.00	~~40.00~~	230	~~884.00~~	140
30	387.19	73.20	94.20	1100	1655.19	500
Total	657.10	158.10	141.20	1485.25	2440.34	729.50

O.P.—Other Perennials.

M.B.—Medium Bhusar.

L.B.—Light Bhusar.

4

1st January to 15th January (Baramati Section)

Dates														
1/1	2/1	3/4	4/1	5/1	6/1	7/1	8/1	9/1	10/1	11/1	12/1	13/1	14/1	15/1
3	3	3	3	..	..	..	..	..	..	..	..	..	..	..
3	3	3	..	..	..	..	..	..	..	..	..	..	..	..
2	2	2	2	..	..	..	..	..	..	..	..	..	..	..
4	4	4	4	4	4	4	4	4	4	..	..	..	..	..
3	3	..	..	..	..	..	..	..	..	..	..	..	..	..
1	1	0.50	..	..	..	..	..	..	..	..	..	..	..	..
3	3	3	3	..	..	..	..	..	..	..	..	..	..	..
20	20	20	20	20	20	20	..	..	..	..	..	..	..	..
42	42	42	42	42	42	42	42	42	42	42	38	..	..	..
81	81	77.50	74	66	66	66	46	46	46	42	38	..	..	..

Sectional Officer
Section.

STATEMENT

Water Account of the rotation from

Dy. No.	Area irrigated in acres						Quantity utilised in day cusecs
	Cane	O. P.	M. B.	L.B.	Panchnama	Total	
26-B	.. 21.00	5.20	2.00	2.20	..	31.00	8.00
26-C	.. 9.20	..	1.00	8.20	..	19.00	5.00
27	.. 3.00	20.10	0.20	..	..	23.30	6.50
28	.. ..	..	..	..	..	..	..
28-A	.. 1.00	13.00	1.00	7.20	..	22.20	6.00
28-B	.. ..	..	..	..	..	..	..
28-C	.. 16.20	10.20	..	10.00	0.10	37.10	10.00
29	.. 161.00	29.00	40.00	35.00	..	265.00	75.00
30	.. 278.00	73.20	99.00	95.20	..	548.00	135.00
Total	.. 490.00	151.30	143.20	159.00	0.10	944.20	265.50

No. 5

1st January to 15th January (Baramati Section)

Dates of Actual Utilisation in day cusecs											Quantity in day cusecs Area irrigated in acres				AI/DC
1/1	2/1	3/1	4/1	5/1	6/1	7/1	8/1	9/1	10/1	11/1	12/1	13/1	14/1	15/1	
..	..	..	..	..	..	..	..	..	..	..	$\frac{2}{8}$	$\frac{3}{12}$	$\frac{3}{11}$	..	387
..	..	..	..	..	..	..	..	..	..	..	$\frac{2}{7.20}$	$\frac{3}{11.20}$	..	..	3.80
..	..	..	..	..	..	..	..	..	..	..	$\frac{2}{7}$	$\frac{3}{11.0}$	$\frac{1.50}{5.30}$	..	6.66
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	$\frac{1.50}{5.20}$	$\frac{1.50}{6.0}$	$\frac{1.50}{5.20}$	$\frac{1.50}{5.20}$	..	..	..	..	..	..	..	..	..	..	3.75
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	$\frac{2.25}{9}$	$\frac{2.25}{9}$	$\frac{2.25}{8}$	$\frac{2.25}{8}$	$\frac{1.0}{3.10}$	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	$\frac{14}{48}$	$\frac{21}{72}$	$\frac{20}{71}$	$\frac{20}{74}$	3.83
..	..	..	..	..	..	..	..	..	..	..	$\frac{29}{109}$	$\frac{42}{144}$	$\frac{42}{145}$	$\frac{42}{148}$	3.55
..	$\frac{3.75}{14.20}$	$\frac{3.75}{18.00}$	$\frac{3.75}{13.20}$	$\frac{3.75}{13.20}$	$\frac{1.0}{3.10}$	..	..	..	..	..	$\frac{49}{179.20}$	$\frac{72}{250.20}$	$\frac{66.50}{232.30}$	$\frac{62}{222}$	3.56

S. O.
Baramati

APPENDIX V

A Specimen of Completion Irrigation Programme.

STATEMENT No. 1

Pune Irrigation Division, Pune

Completion Irrigation Programme of Nira Left Bank Canal for the year 1978-79

Serial No.	Particulars	Rabi season period 15-10-1978 to 28-2-1979		Hot Weather season Period 1-3-1978 to 30-6-1979	
		Day cusecs	Mcft.	Day cusecs	Mcft.
1	Total quantity of water drawn at head of canal	62,399	5,391.27	52,950	4,574.88
2	Average daily drawn at head of canal	455.47	39.35	434.62	3,750
3	Total quantity of water drawn at head of distributaries.	41,722.01	3,604.78	32,308.53	2,791.46
4	Average daily drawn at head of distributaries	305	26.35	265	22.88
5	Total Quantity of water used by local irrigation at the head of Distributaries (Discharge at head of Dy. (—) Discharge used by MSFC (—) Discharge utilised by non-irrigation purposes (—) discharge let down to Shetphal Tank.	37,168.87	3,211.39	26,219.65	2,285.37
6	Quantity of water let down through the escapes.	Nil	Nil	Nil	Nil
7	Total quantity of water passed to Shetphal tank.	411	35.51	Nil	Nil
8	Total quantity of water utilised by M.S.F.C.	2,810.37	242.82	3,103.88	268.18
9	Total quantity of water used for non-irrigation purpose.	1,331.77	115.06	2,985.00	257.91
10	Total quantity of water lost in transit (Discharge at Canal head (—) Discharge at Distributaries (+) Discharge let down to Shetphal Tank (+) Discharge let down to scouring sluices.	20,676.99	1,786.49	20,641.47	1,783.42
11	Percentage of losses on item No. 3 above	..	49.56	..	63.88
12	Percentage of losses on item No. 1 above	..	33.14	..	38.98
13	Average losses on canal per day	..	13.00	..	14.62

(Sd.)
Sub-Divisional Officer.

STATEMENT No. 2

Pune Irrigation Division, Pune

Statement showing Quantity of Water utilised by different agencies directly from canal and through Distributaries and the quantity of water let down to Shetphal Tank

Serial No.	Particulars	Rabi season (15-10-1978 to 28-3-1979)=137 days		Hot Weather Season (1-1-1979 to 30-5-1979)=122 days	
		Day cusecs	Mcft.	Day cusecs	Mcft.
1	Quantity let down at head of Canal	62,399	5,591.27	52,950	4,574.88
2	Quantity let down at head of Distributary	39,933.17	3,450.25	29,638.81	2,560.79
3	Quantity let down at Shetphal Tank	411	35.51	Nil	Nil
4	Quantity let down through scouring sluices	Nil	Nil	Nil	Nil
5	Quantity let down for non-agriculture purpose directly from canal and will be considered as quantity drawn at Dy. head while considering losses—				
	(1) Someshwar S. S. Kharkhana.	91.40	7.90	45.12	3.90
	(2) Baramati Water Supply	417.00	36.03	563.55	48.72
	(3) Industries Pimple	2.45	0.21	Nil	Nil
	(4) Someshwar S. S. Kharkhana.	132.42	11.44	36.11	3.13
	Total	643.27	35.58	645.15	55.75
6	Quantity drawn at Dy. head for N.A. purposes but not accounted at Dy. head originally deemed to be added to the discharge Distributary head for accounting losses at Dy. head considering losses in the Dy.—				
	(1) Southern Rly. Nion	128.28	11.08	114.02	9.85
	(2) Malegaon S. S. Kharkhana	141.29	12.21	68.80	5.95
	Total	269.57	23.29	182.82	15.80
7	Quantity drawn at Dy. head for N.A. purposes which is not to be added for considering losses at Dy. head but to be deducted for considering duties of irrigation area inclusive of 10 per cent losses in Dy. W. % L.T.D.	418.93	36.19	450.28	38.90
8	Total effective quantity achieved for N.A. purposes (Col. 5 + 6 + 7 + 9).	1,331.77	115.06	2,985.00	257.91
9	Quantity achieved for canal lifts directly from canal.	465	40.17	135.00	11.66
10	Quantity achieved for Non-Irrigation purposes at various places along canal due to scarcity of water.	Nil	Nil	1,706.75	147.46
11	Quantity achieved at Dy. head for consideration of transit losses (2+3+4+5+6+9+10).	41,722.01	3,804.78	32,308.53	2,791.46
12	Effective transit losses achieved at (Col. 1-11)	20,676.99	1,786.49	20,641.47	1,783.42
13	Effective quantity utilised at Dy. head for irrigation purpose, increase of volume i.e., Col. 2-7 + 10.	39,979.24	3,454.21	29,323.53	2,533.55
14	Quantity utilised by MSFC., Shivapur	2,810.37	242.82	3,103.88	268.18
15	Effective quantity utilised by Dy. head for local irrigation (13-14).	37,168.87	3,211.80	26,219.65	2,265.37
16	Percentage of losses in Col. 11 above	..	49.56	..	65.88
17	Percentage of losses in item 1 above	..	33.14	..	38.98
18	Losses on canal per day	..	13.00	..	14.62

(Sd.)
Sub-Divisional Officer.

STATEMENT
Pune Irrigation
Completion Irrigation Programme of

Serial No.	Rotation period		Quantity drawn at head of canal	Quantity drawn at Dy. Head in day cusecs			Total
	From	To		Nira	Pandhara	Baramati	
2	2	3	4	5	6	7	8
<i>Rabi Season</i>							
1	15-10-1978	25-10-1978	47	..	221.25	52.50	273.75
2	26-10-1978	15-11-1978	5,768	142.00	1,590.50	1,541.21	3,273.71
3	16-11-1978	6-12-78	13,869	384.50	3,592.50	3,952.49	7,909.49
4	7-12-1978	27-12-1978	14,199	350.50	3,753.75	4,982.03	9,086.28
5	28-12-1978	17-1-1979	14,158	404.00	4,031.50	4,771.33	9,206.83
6	18-1-1979	7-2-1979	6,932	269.00	2,732.00	2,222.00	5,223.16
7	8-2-1979	8-2-1979	7,428	255.50	2,805.00	1,899.45	4,259.95
Total			62,399	1,785.50	18,726.50	19,421.17	39,933.17
<i>Hot Weather</i>							
1	1-3-1979	16-3-1979	7,044	201.50	2,033.25	1,972.27	4,207.02
2	13-3-1979	3-4-1979	8,145	228.75	2,090.75	2,219.92	4,539.42
3	4-4-1979	19-4-1979	8,754	220.00	2,102.75	2,150.68	4,473.45
4	20-4-1979	5-5-1979	7,876	21.075	20,80.50	2,595.74	48,961.99
5	6-5-1979	21-5-1979	9,077	228.00	2,137.25	2,952.77	5,318.02
6	22-5-1979	8-6-1979	8,277	176.75	1,950.25	2,487.54	4,614.54
7	9-6-1979	30-6-1979	3,777	761.75	5.68.00	954.64	1,599.89
Total			52,950	1,342.50	12,962.75	15,333.56	29,638.81

No. 3

Division, Pune

Nira Left Bank Canal for the year 1978-79

Discharge let down to Shetphal Tasurgwadi Virgule Tanks 9	Discharge let down to scouring sluices 10	Discharge utilised by M.S.F.C. 11	Discharge utilised to N.A.			Total 15
			Nira 12	Pandhara 13	Baramati 14	
(Day cusecs)	(Day cusecs)	(Day cusecs)				
(16-10-1978 to 28-2-1979)						
42		4.68				
369		535.00				
—		356.41				
....		257.26				
....		578.62				
....		576.04				
....		502.36				
411	Nil	2,810.37	219.68	141.29	970.80	1,351.77
1-3-1979 to 30-6-1979)						
....		475.31				
....		435.14				
....		189.93				
....		766.73				
....		542.66				
....		321.35				
....		372.76				
Nil	Nil	3,103.88	585.83	495.49	18,903.68	2,985.00

Sd.
Sub-Divisional officer.

STATEMENT

Completion Irrigation Programme of

Serial No.	Rotation Period		Quantity drawn at head of Canal in daycusecs	Discharge drawn above S.W.F. Mile No. 42	
	From	To		Nira	Pandhara
1	2	3	4	5	6
1	15th October 1978	.. 25th October 1978 ..	47	....	221.25
2	26th October 1978	.. 15th November 1978	5,766	142.00	1,535.30
3	16th November 1978	.. 6th December 1978 ..	13,869	364.50	34,55.50
4	7th December 1978	.. 27th December 1979	14,199	350.80	3,613.75
5	28th December 1978	.. 17th January 1978 ..	14,158	404.00	3,868.50
6	18th January 1979	.. 7th February 1979 ..	6,932	269.00	2,663.00
7	8th February 1979	.. 28th February 1979 ..	7,428	255.50	2,682.00
Total ..			62,399	1,785.50	18,039.50
1	1st March 1979	.. 16th March 1979 ..	7,044	201.50	1,945.75
2	17th March 1979	.. 3rd April 1979 ..	8,145	228.75	1,991.75
3	4th April 1979	.. 19th April 1979 ..	8,754	220.00	2,009.75
4	20th April 1979	.. 5th May 1979 ..	7,876	210.75	1,983.50
5	6th May 1979	.. 21st May 1979 ..	9,077	228.00	2,035.25
6	22nd May 1979	.. 8th June 1979 ..	8,277	176.75	18,70.25
7	7th June 1979	.. 30th June 1979 ..	5,777	76.75	540.50
Total ..			52,950	1,342.50	12,377.75

No. 4

the Nira Left Bank Canal for the year 1978-79.

Total discharge drawn above SWF mile No. 42	A.V. quantity on SWF in mile	Discharge drawn below SWF in mile No. 42		Total discharge below SWF mile No. 42
		Pandhara	Baramati	
7	8	9	10	11
Rabi season (15-10-1978 to 28-3-1979)				
221.25	78	.....	52.59	52.50
1,677.50	2,797	55.00	1,541.21	1,596.21
3,820.00	6,576	137.00	3,952.49	4,089.40
3,964.25	7,527	140.00	/ 4,982.03	5,122.03
4,272.50	7,203	163.00	4,771.33	4,934.33
2,932.00	2,891	69.00	2,222.16	2,291.16
2,957.50	2,985	123.00	1,899.45	2,022.45
19,825.00	30,037	687.00	19,421.17	20,108.17
Hot Wether (1-5-1979 to 30-6-1980)				
2,148.25	3,253	86.50	1,972.27	2,058.77
2,220.50	3,965	99.00	2,219.92	2,318.92
2,229.75	4,184	93.00	2,150.68	2,243.68
2,194.25	3,752	97.00	2,595.74	2,692.74
2,263.25	4,597	102.00	2,952.77	3,054.77
2,047.00	4,230	80.00	2,487.54	2,567.54
617.25	2,061	27.50	954.64	982.14
13,720.25	26,042	585.00	15,333.56	15,918.36

Sd.
Sub-Divisional Officer.

STATEMENT No. 5

Pune Irrigation Division, Pune

Completion Irrigation Programme of Nira Left Bank Canal for the year 1978-79—Rabi Season

Statement showing cropwise ares irrigated (15-10-78 to 28-2-79)—137 days

Serial No.	Particulars	Sanctioned Block area in acres	Area in standing in Acres	Conversion factor	Area reduced to cane basis	Remarks
						(daycusecs)
1	Sugarcane Block—	12,427.16				
	(1) $\frac{1}{2}$ Basis cane		31,06.34	100%	3,106.85	(1) Quantity utilised for local irrigation. 37,168.87
	(2) Average overlap		2,270.10	100%	2,270.25	(2) Quantity utilised by M.S.F.C. 2,810.37
	(3) Cane on Form No. 7		16.20	100%	16.20	(3) Quantity for non-irrigation purposes. 1,331.77
						(4) Quantity let down to Shetphal tank. 411.00
2	Fruit Block	302.37	302.37	67%	202.96	
3	Garden Block	74.20	24.25	67%	26.50	(5) Quantity let down through scouring sluice. Nil.
4	Vegetable in—					
	(1) Cane Block		31.20	67%	25.63	(6) Quantity lost in Transit .. 20,676.99
	(2) Two seasonal block		5.00			
	(3) Three seasonal block		1.30			
			38.10			Total .. 62,399.00
5	High Yielding varieties of Wheat and Khapla—					
	(1) Cane Block		4,289.25	67%	7,688.06	(1) Percentage of loss at Dy. Head—
	(2) Two seasonal Block		5,161.11			$\frac{20676.99}{41722.01} \times 100 = 49.56$
	(3) Three seasonal Block		500.20			(2) Percentage of losses at Canal Head—
	(4) Form No. VII		1,543.13			$\frac{20676.99}{62399} \times 100 = 33.14$
			11,474.29			

6 Hybrid Commercial—

(1) Cane Block	..	..	327.05
(2) Two seasonal Block	..	..	578.00
(3) Three seasonal block	..	..	90.38
(4) Form No. VII	..	..	110.00
			<u>1,106.03</u>

53%

586.22

(1) Duty at Canal Head—

$$\frac{22634.67 \times 137}{59793} = 51.86$$

7 Rabi seasonals—

(1) Cane Block	..	..	12,327.16	2,422.02
(2) Two Seasonal Block	..	..	14159.11	8415.00
(3) Three seasonal Block	..	..	2,449.14	225.10
(4) Form No. VII	..	..		5,091.07
(5) Garden Block	..	..	74.20	47.35
(6) Canal Lift	..	..		549.06
				<u>16,748.20</u>

33%

5,527.00

(2) Duty at Dist. Head—

$$\frac{22634.67}{39979.24} = 77.56$$

8 Area booked on Panchnamas—

(1) Cane	..	..	930.03
(2) Bhusar	..	..	3,769.03
			<u>4,699.06</u>

1/6

1,155.06

35%

1,243.79

9 Add Areas irrigated by M.S.F.C. As per statement No. 6 attached).

Total

1,795.90

22,634.67

(Signed)
Sub-Divisional Officer.

STATEMENT No. 6

Pune Irrigation Division, Pune

Completion Irrigation Programme of M.S.F.C. for the year 1978-79

Period (15-10-78 to 28-2-79) 137 days

Serial No.	Name of Crop ^s	Sanctioned area in acres	Area standing in acres	Conversion factor	Area reduced to cane basis
1	Granted area	.. 14,70.00			
1.	Area standing	.. ....	11,02.20	100 %	1,102.50
2.	Average overlap	.. ....	639.25	100 %	639.62
2	Rabi seasonals:—				
1.	High yielding Wheat	.. ....	60.20	67 %	40.53
2.	Hybrid Jawar	.. ....	25.00	53 %	13.25
Total ..					1,795.90

1. Quantity of water utilised .. = 2,810.37 day cusecs
2. Areas irrigated in ares on cane basis .. = 1,795.90
3. Days = 137
4. Duty = $\frac{1795.90 \times 137}{2810.37}$.. = 87.54

(Sd.)

Sub-Divisional Officer.

STATEMENT NO. 7

Pune Irrigation Division, Pune

Completion Irrigation Programme of Nira Left Bank Canal for the year 1978-79—Hot weather season (1-3-79 to 30-6-79)—122 days

Statement showing Cropwise Areas irrigated

Serial No.	Particulars	Sanctioned Block in Areas	Area standing in Acres	Conversion factor	Area reduced to cane basis	Remarks	
							Day cusecs
1	Sugarcane Block ..	12,427.16					
	(1) $\frac{1}{4}$ Basis cane ..	....	3,106.34	100%	3,106.05	(1) Quantity utilised by Local Irrigators ..	26,219.65
	(2) Average overlap ..	....	54.00	100%	54.00	(2) Quantity utilised by M.S.F.C. ..	3,103.88
	(3) Cane on form No. III ..	....	13.20	100%	13.50	(3) Quantity utilised for Non-irrigation purposes.	1,278.25
2	Fruit Block ..	302.37	302.37	67%	202.96	(4) Quantity let down to Shetphal Tank ..	Nil.
3	Garden Block ..	74.20	24.25	67%	16.50	(5) Quantity let down through scouring sluices.	Nil
4	Vegetables standing in H.W. season ..	....	38.10	$\frac{67\%}{4}$	6.41	(6) Additional quantity of water released through canal for domestic purposes at various places on canal due to scarcity of water.	1,706.75
5	Post-seasonal watering to wheat ..	....	866.35	1/7	123.84	(7) Quantity lost in Transit ..	20,641.47

STATEMENT No. 7—contd.

Serial No.	Particulars	Sanctioned Block area in Acres	Area standing in Acres	Conversion factor	Area reduced to cane basis	Remarks
6	Hot Weather seasonals from 1-3-1979 —					
	(1) In cane Block ..	12,427.16	1,710.10	100%	7,786.20	(1) Percentage of losses at Dy. head $\frac{20641.47}{30594.78} \times 100 = 63.88\%$ (2) Percentage of losses at Canal head $\frac{20641.47}{52950} \times 100 = 38.98\%$
	(2) In Two seasonal Block ..	14,159.11	1,633.00			
	(3) In three seasonal Block ..	2,449.14	816.18			
	(4) In Garden Block ..	74.20	24.30			
	(5) On Form No. VII ..	....	3,226.30			
	(6) On Canal lift ..	....	375.00			
	Total ..		7,786.20			
7	Area Booked on Panchanama purely unauthorised—					
	(1) Cane 651.10 } (2) Bhusar 2054.04 }	2,705.14	1/7	386.48	(1) Duty at Canal head $\frac{12958.74}{48058} \times 122 = 32.90$	86
8	Add areas irrigated by M.S.F.C. (as per statement attached).			1,262.00	(2) Duty at Dy. Head $\frac{12958 \times 74}{29323.53} \times 122 = 53.91$	
	Total ..			12,958.74		

(Sd.)
Sub-Divisional Officer.

STATEMENT No. 8

Pune Irrigation Division, Pune

Completion Irrigation Programme of M.S.F.C. for the year 1978-79

(Period : 1-3-79 to 30-6-79=122 days)

Serial No.	Name of Crop	Sanctioned area in acres	Area standing in acres	Conversion factor	Area reduced to to cane basis
1	Guarnateed area	.. 1,170.00	....	....	....
	(i) Area standing	.. ....	1,102.20	100%	1,102.50
	(ii) Average overlap	.. ....	134.20	100%	134.50
2	Hot Weather Seasonals—				
	Cotton	.. ....	25.00	100%	25.00
Total					1,262.00

1. Quantity of water at head .. = 3,103.86 day cusecs
2. Aear irrigated in cane basis in acres = 1,262.00
3. Days .. = 122
4. Duty = $\frac{1262 \times 122}{3103.88}$.. = 49.60

Sd.
Sub-Divisional Officer.

STATEMENT

Pune Irrigation

Completion Irrigation Programme Composite Statement showing the areas irrigated on the year 1973-74

Serial No.	Particulars	Rabi Season					
		1973-74	1974-75	1975-76	1976-77	1977-78	1978-79
1	Areas Irrigated in terms of cane Acres.	25,994	26,393	23,380.30	25,466.15	23,033.08	22,634.67
2	Discharge drawn at Canal head daycusecs.	63,549	63,678	62,153	73,216	64,731	62,399
3	Discharge utilised at Dy. Head daycusecs.	40,867	44,237.31	40,835.45	50,273.54	43,068	39,979.24
4	Duty at Canal Head	48.17	48.32	42.47	48.55	49.96	51.86
5	Duty at Dy. Head ..	73.89	81.74	64.12	69.40	73.27	77.56
6	Losses in Transit day cusecs.	22,117.85	18,873.85	20,560.64	21,994.51	20,590.25	20,676.99
7	Percentage losses at Canal Head.	34.80	29.64	33.35	30.04	31.81	33.14
8	Percentage losses at Dy. Head.	55.38	42.13	50.05	42.94	46.65	49.56

No. 9

Division, Pune

Cane basis discharge utilised, duty at canal and Dy Head and Losses in Transit for to 1978-79

Hot Weather Season					
1973-74	1974-75	1975-76	1976-77	1977-78	1978-79
9,809	9,702.30	8,747.15	7,027.15	10,415.22	12,950.74
45,174	45,660	49,016	36,053	48,537	52,950
26,508.67	26,798.54	24,700.37	18,357.57	26,375.40	29,325.53
27.45	26.75	25.93	28.53	31.19	32.90
45.12	45.88	43.20	46.70	48.18	53.91
17,700.48	18,566.67	19,594.78	14,032.01	16,891.14	20,641.47
39.18	40.66	39.98	38.92	34.80	38.98
64.43	68.53	66.60	63.84	53.38	63.88

Sd.
Sub-Divisional Officer.

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APPENDIX VI

The Irrigation Development Corporation of Maharashtra Ltd.*Synopsis of Lift Irrigation Scheme at Chatori, Taluka Niphad, District Nashik***Typical Calculations***Salient features of the Lift Irrigation Scheme at Chatori, District Nashik*

1. Source of supply (Name of river/nala)	..	Godavari River.	
2. Total Estimated Cost	.. ..	Rs. 16.75 lakhs.	
3. Gross Command Area	.. ..	435 Hectares	
4. Area proposed for Irrigation	.. ..	348 Hectares.	
5. Cost per Hectare of Irrigable Area	.. ..	Rs. 4,813.	
6. B. C. Ratio	.. ..	4.30	
7. Static Head	.. ..	30.01 m.	
8. Total H. P. required	.. ..	200	
9. Commercial Water Rates per Acre—inch—			
(a) Cash Crops	.. ..	Rs. 6.95	} (Page 110)
(b) Food and Fodder Crops	.. ..	„ 4.65	

Brief particulars of the Lift Irrigation Scheme at Chatori, District Nashik

(1) Location of the Scheme—

(i) Village	..	..	..	Chatori
(ii) Taluka	..	..	..	Niphad
(iii) District	..	..	..	Nashik.

(2) Source of Supply (River/nala) Godavari River.

(3) Area under command—

(i) Gross Area	..	..	..	433 Hectares
(ii) Proposed for Irrigation	..	..	..	348 „ (860 acres)
(iii) Cropped Area	..	..	..	627 „

(4) Proposed Crop Pattern—

Season 1	Crop 2			Percentage 3	Area in Hectares 4
Kharif—					
Sugarcane	..	..	..	10	34.8
Bajra	..	..	..	60	208.8
Onion	..	..	..	11	34.8
Rice	..	..	..	10	34.8
Groundnut	..	..	..	10	34.8
				100	348.0
Rabi—					
Sugarcane	..	..	..	10	34.8
Onion	..	..	..	10	34.8
Hy. Maize	..	..	..	10	34.8
Hy. Jawar	..	..	..	20	69.6
Wheat	..	..	..	30	104.4
				80	278.40
Hot Weather—					
Sugarcane	..	..	..	10	34.8
Hy. Maize	..	..	..	10	34.8
				20	69.60

Total cropped area	..	..	..	627 Hectares
Percentage to Irrigable Area.	..	..	..	180

(5) Discharge required (as per Table 1 annexed)—

(i) Kharif	..	..	..	..	10.21 cusecs.
(ii) Rabi	..	..	..	..	8.69 cusecs
(iii) Hot Weather	..	..	..	..	4.18 cusecs

(6) Discharge adopted for design (for details please refer Table 1 annexed).

Stage I	Stage II	Stage III
Litres/sec	Litres/sec	Litres/sec

(7) Important Levels: (Stage-I)—

(i) River Bed Levels	..	..	..	R.L.	87.00
(ii) Low water level in river/jack well/sump well	..	..	..	R.L.	91.00
(iii) Normal H.F.L.	..	..	..	R.L.	100.00
(iv) Maximum H.F.L.	..	..	..	R.L.	101.00
(v) F.S.L. in Delivery Chamber	..	..	..	R.L.	121.00

(8) Operational Head (Stage-I)—

(i) Static head (v-ii of 7)	..	..	..	30.00 m
(ii) Frictional and other losses	..	..	..	5.00 m
(iii) Gross Head	..	..	..	35.00 m.

(9) Horse Power Requirement (Stage I)—

.. 187 H.P.

(10) Pumping Units provided (Stage I)—

(a) Working Units	..	..	..	2 Nos.
Type (V. T./C. F./Sub.)	..	..	..	V.T.
H.P.	..	..	..	200
Discharge/Unit	..	..	..	9450 min.
(b) Stand by Units	..	..	..	One
Type	..	..	..	V.T.
H. P.	..	..	..	100
Discharge/Unit	..	..	..	9450 min.

(11) Rising Main (Stage I)—

Type (R. C. C./P.S./M.S./C.I.)—

Internal Diameter .. 600 mm

Class

C.I. Prestressed P-1 P-2

150m 765m 465m 1035m

Length

(12) Estimated cost	(Rs.)
(i) Civil Works	3,15,705
(ii) Pipe Lines	7,00,700
(iii) Mechanical and Electrical Works	3,69,400
Total Works Portion	13,85,805
Establishment Tools and Plant charges at 21.70 per cent excluding land acq.	2,88,980
Gross (including E. T. P. charges) (Please see Annexure I enclosed for abstract of estimate)	16,74,785

(13) Cost per Hectare—	
(a) Of Irrigable Area	4,813
(b) Of Cropped Area	2,071

(14) Commercial Water Rates: (For details please see Annexure II enclosed)

Season	Crop	Rate/Hectare Rs.
(a) Kharif Seasonals	(i)	
	(ii)	
	(iii)	
(b) Rabi Seasonals	(i)	
	(ii)	(Please see page No. 110)
	(iii)	
(c) Hot weather seasonals	(i)	
	(ii)	
	(iii)	
(d) Two Seasonals	(i)	
	(ii)	
	(iii)	
(e) Perennials	(i)	
	(ii)	

(15) Benefit Cost Ratio ..	4.50
(For details please see Annexure III enclosed).	

ANNEXURE I

General Abstract of Estimate

Lift Irrigation Scheme at Chatovi, Taluka Niphad, District Nashik.

Sub-estimate	Amount
	Rs.
I. <i>Civil portion:</i>	
(i) Intake chamber ..	18,900
(ii) Jackwell	
(iii) Pump House (All Stages) }	1,34,475
(iv) Delivery Chamber (All stages) ..	4,180
(v) Distribution System ..	1,04,050
(vi) Land Acquisition ..	54,000
(vii) All other Items such as survey, approach road, etc. ..	.....
Total I ..	3,15,705
II. <i>Pipe Lines:</i>	
(i) Intake Pipe ..	22,230
(ii) Rising Main ..	6,78,470
Total II ..	7,00,700
III. <i>Mechanical and Electrical Portion:</i>	
Supply and erection of pumping machinery including valves, starters, switchboard etc. and delivery pipes upto manifold (all stages) including cable connections in the pump-house, earthing etc.	3,69,400
Total III ..	3,69,400
IV. <i>E. T. P. Charges:</i>	
Establishment and Tools and Plant charges at 12.85% of I+II+III (excluding Land Acquisition).	
Total IV ..	2,88,980
Grand Total (I+II+III+IV)	16,74,785

ANNEXURE II

Calculations for Commercial Water Rates

(Reference: Appendix V of Note on Preparation of Lift Irrigation Schemes)

	Stage I	Stage II	Stage III
(1) <i>Gross Head for Pumping:</i>			
Static Head ..	30.00 m		
Frictional and other losses ..	5.00 m		
Gross Head ..	35.00 m		
(2) <i>Horse Power Requirement:</i>			
$=QH/76$ (Q in Litres/sec. H in			
$10.21 \times 29 \times 35/76 \times 0.8$ 170			
Add 10% for altitude and temperature variation etc.	17.00		
	1879m.		
Total H. P. required ..	200		
(3) <i>Pumping Units Provided:</i>			
(i) Working Units: (a) Type ..	V.T.		
(b) Nos. ..	2 (of 100 HP)		
(c) H. P. ..	200		
(ii) Stand-by Units: (a) Type ..	V.T.		
(b) Nos. ..	1		
(c) H.P. ..	100		
(4) <i>Water requirement in Hectare-cm and Working Hours in each season:</i> (Please refer Table 1 for details)			
(i) Hectare Centimeters ..	Acre inch		
Khariff ..	8,858		
Rabi ..	14,706		
Hot Weather ..	7,224		
Total for the Year ..	30,788		
(ii) Number of working hours:			
(Hectare-cm $\times$ 27.78 divided by design discharge in Litres/sec.)			
Kharif ..	Hours		
Rabi ..	Hours		
Hot weather ..	Hours		

	Stage I	Stage II	Stage III
(iii) Working hours per month during each season:			
Kharif (2 months pumping) ..	/month	/month	/month
Rabi (5 months pumping) ..	/month	/month	/month
Hot weather (4 months pumping) ..	/month	/month	/month

(A) Electrical Charges : (As per M. S. E. B. Tariff effective from)

	Stage I	Stage II	Stage III
H.P. of working Units			

$$KW = \frac{HP \times 0.746}{0.9}$$

$$KVA = \frac{HP \times 0.746}{0.85}$$

No. of Units (KWH) consumed :

(i) Kharif (KW × Hours/month)	Units/month
Total for Kharif	Units for 2 months
(ii) Rabi (KW × Hours/month)	Units/month
Total for Rabi	Units for 5 months
(iii) Hot Weather (KW × Hours/month)	Units/month
Total for Hot Weather	Units for 4 months
(iv) Total for the Year	Units

(a) Demand charges :

At Rs. /KWH/month	Rs. Per year
-------------------	--------------

(b) Energy charges :

Kharif

Rabi

Hot Weather

Total .. /Year

(c) *Electrical Duty:*

At Rs.	per 5 units	Rs.	per year
(d) Meter Rent at Rs.	per month	Rs.	per year
Total Electrical charges:		Rs.	per year.
(a) + (b) + (c) + (d)			
∴ Electrical charges per Hectare-cm		Rs.	per year.

(B) *Maintenance of Civil and Mechanical Works*

Works portion (excluding E.T.P. charges)

Cost of Scheme:

Civil portion (Civil + pipe line) .. Rs. 10,16,405 per year

Mechanical and Electrical portion .. Rs. 3,69,400

(i) Maintenance of Civil Works at 1.5% of cost (Works portion) Rs. 15,246 per year

(ii) Maintenance of Mechanical and Electrical Works at 3% of Cost (Works Portion). Rs. 11,082 per year

Total Maintenance Cost (i) + (ii) .. Rs. 26,328 per year

Annual Cost of Maintenance per Hectare-cm/Acre-inch .. Rs. 0.80 per year

$$\frac{36328}{30785}$$

Electric charges:

4A. Total HP = 200 (Without standby)

Total energy charges = $200 \times 125 = 25,000$
 Rate/Acre inch .. 25000

$$\text{Rate/Acre inch} = \frac{25000}{30785} = 0.81$$

(C) *Supervisory Staff:*

Annual cost of supervisory staff (including operating staff and administrative staff) upto Sub-divisional level, works out to Rs. 52.5 per hectare of irrigable area. Adding 10% for establishment at higher level, cost of supervisory staff is Rs. 57.75 per year per hectare of area irrigated.

Area Irrigated .. 866 Acres (348 ha.)

∴ Cost of supervisory staff at Rs. 57.75 per hectare .. Rs. 20,097

Annual cost of Supervisory staff per $\frac{20097}{30788}$ Acre/inch Rs. 0.65 per year

(D) Description Charges:

(i) Civil works life 50 Years Capital cost	..	Rs.	3,15,705
.. Annual Depreciation at 2%	..	Rs.	6,314 per year
(ii) Pipe Lines life 33.33 years capital cost	..	Rs.	7,00,700
.. Annual Depreciation at 3 %	..	Rs.	21,021 per year
(iii) Machinery life 20 years Capital cost	..	Rs.	3,89,400
.. Annual Depreciation at 5%	..	Rs.	18,470 per year
Total Annual Depreciation Charges	..	Rs.	45,805 per yaer

Depreciation charges per $\frac{45805}{30788}$ Acre-inch Rs. 1.42 per year

(E) Interest on Capital:

Average rate 5.75	5.75% per year
Amount of interest at % on the Rs. 16,74,785	.. Rs. 98,300 per year
Total cost of the Scheme	.. Rs. 3.13 per year

Interest Charges per Acre-inch $\frac{96300}{30788}$ Acre-inch

Total Annual Cost per Acre-inch of Water supplied

			For Cash crops	For Food and Fodder crops
			Rs.	Rs.
(A) Electrical charges	..	..	0.18	0.81
(B) Maintenance of Works	..	..	0.86	0.86
(C) Supervisory Staff	..	..	0.65	0.65
(D) Depreciation charges	..	..	1.49	0.75
(E) Interest on Capital	..	..	3.13	1.57
Total	..	..	6.94	4.64
Say	..	..	695	4.65

Commercial Water Rates:

Crop	Acre/inch per Acre	Cost per Acre/inch	Commercial Water rate per Acre
		Rs.	Rs.
(i) Rice	 16	4.65	74.40
(ii) Bajra	 9	4.65	41.85
(iii) Onion (Kharif)	 12	6.95	83.40
(iv) Onion (Rabi)	 18	6.95	125.10
(v) Groundnut	 9	6.95	02.55
(vi) Hy. Maize	 21+30	4.65	237.15
(vii) Hy. Jawar	 18	4.65	83.70
(viii) Wheat	 18	4.65	83.70
(ix) Sugarcane	 169	0.95	750.60

ANNEXURE III

Calculations for Benefit Cost Ratio

$$\text{Benefit Cost Ratio} = \frac{A}{B} \text{ where}$$

A : Net annual benefits due to introduction of irrigation.

B : Net annual costs.

(A) Net annual benefits due to introduction of irrigation = Net annual benefits after irrigation *minus* Net annual benefits before irrigation.

(i) Net annual benefits after irrigation (as per Director of Agriculture's letter No. 1 CR/BC Ratio/I, dated 1st April 1974 or latest norms published by Agri/Deptt.)

Serial No.	Crop	Area (hectares)	Net benefit per hectare Rs.	Total net benefit (Rs. thousands)
1	Rice	34.83	1,785.00	62,172
2	Bajra	209	971.25	2,02,991
3	Onion (Kharif)	34.83	1,537.00	53,533
4	Onion (Rabi)	34.83	2,817.75	97,968
5	Groundnut	34.85	1,167.50	40,664
6	Hy. Maize	69.66	1,112.50	77,497
7	Hy. Jawar	69.66	1,476.50	1,02,853
8	Wheat	104.49	1,485.00	1,55,168
9	Sugarcane	34.85	4,612.50	1,60,653
		626.91		
Say 627 Ha. Total (i)			9,53,499	

(ii) Net Annual Benefit before Irrigation: (Based on the existing crop pattern of the area).

Serial No.	Crop	Percentage	Area (hectares)	Net benefit per hectare	Total net benefits (Rs. thousands)
1	Value of existing irrigation produce at the rate of Rs. 39.39 Acre (As per				
2	Circular from I. P. I. Circle, Pune).				
3	$\therefore 860 \text{ Ac.} \times 39.39 = 33,875.$				
4	(As proposed by the Superintending Engineer).				
5					
6					
7					
8					
9					
10					
Total (ii)				33,875	

$\therefore$ Net annual benefit due to introduction of irrigation = (i) — (ii) 95,499 — 33,875
Rs. = Rs. 0,19,824. thousand

(B) Annual Cost—(Thousand rupees)

Electrical charges	..	..	..	25,000
Maintenance charges	..	..	..	26,328
Supervisory staff	..	..	..	20,097
Depreciation charges	..	..	..	45,805
Interest on capital	..	..	..	26,300
Total				2,13,530

$$\therefore \text{Benefit Cost Ratio} = (A)/(B) = \frac{9,19,624}{2,13,530} = 4.30$$

TABLE I

Discharge requirement in each season and Hectare-Centimeters for each crop for Stage-I

Sr. No.	Name of Crop	Area in hectares	AI/DC Hectares Litres/sec	Interval of irrigation days	Hectare-cm for each crop			
					Discharge Litres/sec.	No. of waterings	cm depth	Total Hectare Cm
					Col. 3 Col. 4 × Col. 5			(7 × 8 × 3)
1	2	3	4	5	6	7	8	9
<i>Khariif</i>								
1	Rice ..	86	60		1.43	4	4	1,376
2	Bajra ..	516	100		5.16	3	3	4,644
3	Onion ..	86	75		1.32	4	3	1,032
4	Groundnut ..	86	88		0.98	3	3	774
5	Sugarcane ..	86%	65		1.32	4	3	1,032
			Total ..		10.21			8,858
<i>Rabi</i>								
1	Onion ..	86	65		1.32	6	3	1,548
2	Hy. Maize ..	86	80		1.06	7	3	1,800
3	Hy. Jowar ..	172	180		915	6	3	3,096
5	Wheat ..	268	100		2.58	6	3	4,644
5	Sugarcane ..	86	55		2.58	12	3.5	3,612
			Total ..		6.60			14,706
<i>Hot Weather</i>								
1	Hy. Maize ..	86	50		1.72	10	3	2,580
2	Sugarcane ..	86	50		2.46%	12	4.5	4,644
			Total ..		4.19			7,224
Total Hectare-cm for the year ..								30,788

Note.—AI/DC is on the basis of pumping for 16 hours every day.

TABLE III

Discharge requirement in each season and Hectare-centimeters for each crop for Stage III

Sr. No.	Name of Crop	Area in hectares	AI/DC Hectares Litres/sec	Interval of Irrigation days	Discharge Litres/sec.	Hectare-cm. for each crop		
						No. of waterings	cm depth	Total Hectare-cm (7 × 8 × 3)
1	2	3	4	5	6	7	8	9
<i>Kharif</i>								
1	Sugarcane	..	10	10				
2	Hy. Bajra	..	60	10				
3	Onion	..	10	10				
4	Rice ..	..	10	10				
5	Groundnut	..	10					
Total ..			100	40				
<i>Rabi</i>								
1	Sugarcane	..	10	10				
2	Onion ..	..	10	20				
3	Hy. Maize	..	10					
4	Hy. Jawar	..	20					
5	Wheat ..	..	30	40				
Total ..			80	70				
<i>Hot Weather</i>								
1	Sugarcane	..	10	10				
2	Hy. Maize	..	10	20				
3	Onion ..	..						
Total ..			20	30				
Total Hectare-cm. for the year.								

Note.—AI/DC is on the basis of pumping for 16 hours every day.

APPENDIX VII

Different application forms are used as stated below for the various types of Crops

WESTERN MAHARASHTRA

- | | | |
|--------------------|----|--|
| 1. Form No. I | .. | .. Two seasonal Blocks. |
| 2. Form No. IA | .. | .. New Two seasonal Blocks. |
| 3. Form No. I-B | .. | .. Rabi Blocks. |
| 4. Form No. II | .. | .. Sugarcane Blocks. |
| 5. Form No. IV | .. | .. Fruit Block. |
| 6. Form No. V | .. | .. Garden Block. |
| 7. Form No. V-A | .. | .. Garden and seasonal Block. |
| 8. Form No. VI | .. | .. Additional water for Overlap/Post/seasonal/
pre-seasonal watering. |
| 9. Form No. VII | .. | .. Seasonal Crops. |
| 10. Form No. VII-A | .. | .. Demand of water on Pazar, nallas and
streams. |
| 11. Form No. I-K | .. | .. Three seasonal Block. |
| 12. Form No. V-B | .. | .. Garden Blocks (1/5, 1/3, 1/3). |

VIDARBHA REGION

- | | | |
|------------------|----|---|
| 1. Form A or A-1 | .. | .. Irrigation Agreements for fixed years. |
| 2. Form B .. | .. | .. Supplementary agreements. |
| 3. Form C | .. | .. Declaration of findings. |
| 4. Form G | .. | .. Water application. |

APPENDIX VIII

Current Water Rates for the Flow Irrigation Schemes in Maharashtra

Serial No.	Name of the Crop or Season				Water rates Rs./ha.
1	2				3
1	Sugarcane and Banana	..	..	..	750
2	Other Perennial	..	..	..	500
3	Kharif seasonal	..	..	..	50
4	Rabi seasonal	..	..	..	75
5	H. W. Seasonal	..	..	..	150
6	Hy. Commercial:—				
	(a) Kharif	..	..	..	50
	(b) Rabi	..	..	..	75
7	Hy. Seed and Foundation crops:—				
	(a) Kharif	..	..	..	100
	(b) Rabi	..	..	..	150
8	H. W. Cotton	..	..	..	400
9	H. W. Groundnut	..	..	..	300
10	Pre-seasonal	..	..	..	30
11	Post seasonals for Kharif crops in Rabi season	..	..	..	20
12	Post seasonals for Rabi crops after 1st March	..	..	..	25

*Statement showing Water Rates for Lift Irrigation Schemes (Up to 100 ft.)
under Irrigation Development Corporation of Maharashtra Limited.*

Serial No.	Season/Crops	Water Rates from 15th October 1978 for		
		First Year	Second Year	Third Year and thereafter
		Rs./ha.	Rs./ha.	Rs./ha.
1	2	3	4	5
(A) Two Seasonals—				
1	Tur	25	50	80
2	Turmeric	36	72	110
3	Chillies	36	72	110
4	L.S. Cotton and Groundnuts (H.W. & Kharif)	65	130	200
(B) Perennials—				
1	Sugarcane	200	400	600
2	Banana	200	400	600
3	Other Perennials	140	280	415
4	Single water rate for excess sugarcane and banana	6	12	20
(C) Kharif Crops—				
1	Sai (Dhan)	20	40	60
2	Cereals and Fodder Crops	16	32	50
3	Other Cash crops	24	48	70
(D) Rabi Crops—				
1	Wheat	30	60	90
2	Other Cereals and Fodder Crops	20	40	60
3	Other cash crops	45	90	140
(E) Hot Weather Crops—				
1	H. W. Cereals	40	80	120
2	Hy. Jowar	40	80	120
3	Cash Crops	65	130	200
4	Summer Paddy	50	100	150
(F) Vegetables—				
1	Kharif	30	60	90
2	Rabi	45	90	140
3	Hot Weather	65	130	200
(G) Pre-seasonal and Post-seasonals (each watering)—				
1	Cereal crops	5	10	15
2	Cash crops	7	14	22

**Statement showing Water Rates for Lift Irrigation Schemes (above 100 ft.) under the
Irrigation Development Corporation of Maharashtra Limited, Pune.**

Serial No.	Season/Crops	Water Rates from 15th October 1978 for		
		First Year	Second Year	Third Year and thereafter
		Rs./ha.	Rs./ha.	Rs./ha.
1	2	3	4	5
(A) Two Seasonals—				
1	Tur	27	54	82
2	Turmeric	24	76	114
3	Chillies	38	76	114
4	L. S. Cotton and Groundnuts (H.W. & Kharif)	80	160	240
(B) Perennials—				
1	Sugarcane	242	484	725
2	Banana	242	484	725
3	Other Perennials	166	336	505
4	Single Water Rate for excess Sugarcane and Banana	8	16	25
(C) Kharif Crops—				
1	Sal (Dhan)	29	58	88
2	Cereals and Fodder Crops	17	34	50
3	Other Cash Crops	23	46	70
(D) Rabi Crops—				
1	Wheat	37	74	110
2	Other Cereals and Fodder Crops	22	44	66
3	Other Cash crops	47	94	140
(E) Hot Weather Crops—				
1	H. W. Cereals	80	160	240
2	Summer Paddy	92	184	276
(F) Vegetables—				
1	Kharif	31	62	92
2	Rabi	47	94	140
3	Hot Weather	80	160	240
(G) Pre-seasonal and Post-seasonals (each watering)—				
1	Cereal crops	5	10	16
2	Cash Crops	7	14	22

Water Rates for Lift Irrigation from 1st January 1981

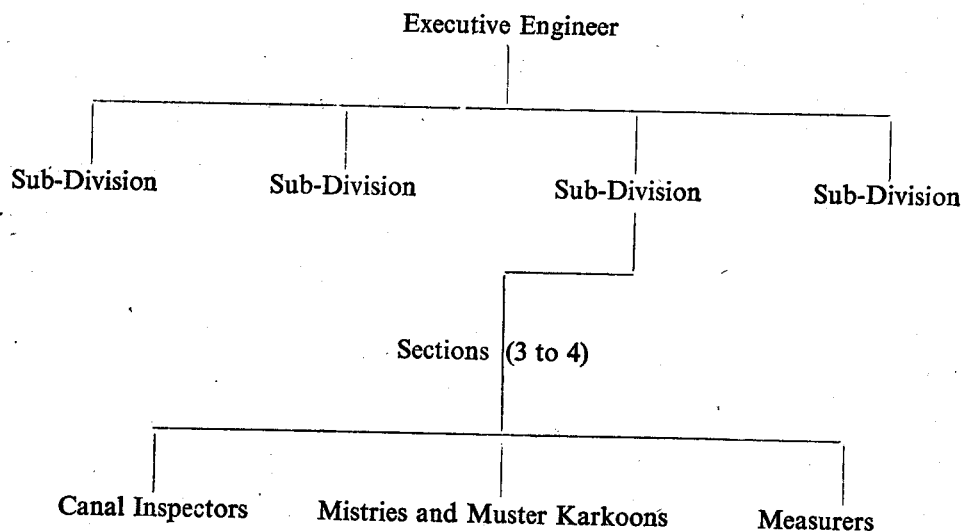
Serial No.	Type of Lift Irrigation	Water Rates					New Rates
		Sugar-cane Banana	Other Pere- nnials	Kharif seas- onals	Rabi seas- onals	H.W. seas- onals	
		Rs./ha.	Rs./ha.	Rs./ha.	Rs./ha.	Rs./ha.	
1	2	3	4	5	6	7	8
1	Lift Irrigation on Canals	At per Flow Irrigation Rates on Canals.					
2	Lift Irrigation on Reservoirs	At 50 per cent of Flow Irrigation Rates on Canals.					
3	Lift Irrigation in between Dam and diversion weir.	At 50 per cent of Flow Irrigation Rates on Canals.					
4	Lift Irrigation on Pond of Bandharas.	250	175	25	37.50	75	At 50 per cent of flow irrigation. Rates as per BKS-1479/3181-(I)-IMG (I), dated the 24-2-1980.
5	Lift Irrigation on diversion weirs and in the command of Canals.	187.50	125	12.50	20	37.50	
6	Lift Irrigation on Pond of Bandharas and where there is no dam.	187.50	125	12.50	20	37.50	
7	Lift Irrigation on diversion weir on nallas and rivers.	62.50	40	Exempted.	12.50	12.50	

Notes.—(1) There are no separate rates for Two seasonals. The rates for these will be charged as per the prevailing rates in a particular season in which these crops are irrigated.
 (2) Where on particular project the water supply is not assured the rates for perennials and other perennials will be charged at $\frac{1}{2}$ of those for assured water supply.

APPENDIX IX

Field Organisation

Generally under a Management Circle, there are 4 to 5 Divisions of Irrigation Management each covering a hectarage of 40 to 60 thousands of mixed irrigation. Under every Division there are generally 3 to 4 Management Sub-Divisions, each Sub-Division dealing with 10,000 to 12,000 hectares of mixed irrigation. Field Organisation of a Maintenance Division is given below:



APPENDIX IX—contd.

Norms of Establishment for Irrigation Management Section

The following are the norms :—

1. Category (A) .. One or more irrigation Projects irrigating an area of about 3,200 ha. to 4,000 ha. (8,000 to 10,000 acres) of lands.
2. Category (B) .. One or more irrigation Projects which irrigate an area of about 2,000 ha. to 3,200 ha. (5,000 to 8,000 acres) of lands.
3. Category (C) .. Three or more irrigation Projects which irrigate an area upto 2,000 ha. (5,000 acres) of lands.

APPENDIX IX—contd.

Establishment for the Sections(1) *Category (A):—*

1. Sectional Officer ..	..	..	1	No.
2. Sectional Karkoon ..	..	..	1	No.
3. Maistry and Muster Karkoon ..	..	..	2	Nos.
4. Canal Inspector ..	..	..	4	Nos.
5. Daftar Karkoon ..	..	..	1	No. for each 2,500 ha. (6,250 acres).
6. Measurer ..	..	..	3	Nos.
7. Gauge Karkoon ..	..	..	1	No.
8. Messenger ..	..	..	1	No.
9. Patkari ..	..	..	2	Nos.
10. Chowkidar ..	..	..	2	Nos.
11. Canal Chowkidar ..	..	..	2	Nos.
12. Canal Tapali ..	..	..	2	Nos.

Total for (A) .. 22 Nos.

(2) *Category (B):—*

1. Sectional Officer ..	..	..	1	No.
2. Sectional Karkoon ..	..	..	1	No.
3. Muster Karkoon ..	..	..	1	No.
4. Canal Inspector ..	..	..	3	Nos.
5. Measurer ..	..	..	3	Nos.
6. Patkari ..	..	..	3	Nos.
7. Chowkidar for each Project ..	..	..	As per requirement.	
8. Attendant ..	..	..	1	No.

Total for (B) .. 13 + Chowkidar

(3) *Category (C):—*

1. Sectional Officer ..	..	..	1	No.
2. Sectional Karkoon ..	..	..	1	No.
3. Attendant for S.O. ..	..	..	1	No.
4. Muster Karkoon ..	..	..	1	No.
5. Canal Inspector ..	..	..	2	Nos.
6. Messurer ..	..	..	2	Nos.
7. Patkari ..	..	..	2	Nos.
8. Chowkidar (for each Project) ..	..	..	As per requirement.	

Total for (C) .. 10 + Chowkidar.

(Ref. Government, I. and P. Department, No. EDC/1360/35453-I(5), dated 15th January 1968).

TB 4650—10a

APPENDIX X

मोठ्या कालव्यावर कालवे सल्लागार
समित्या स्थापन करण्याबाबत—

महाराष्ट्र शासन
पाटबंधारे विभाग

शासन निर्णय क्रमांक सीएमई १०८१/(१९०२) व्यवस्था-३, दिनांक १७ मार्च १९८२

- पहावे : (१) शासन निर्णय, सार्वजनिक बांधकाम विभाग, क्रमांक ३६४७/८६-२, दिनांक ३० मे १९४७.
(२) शासन निर्णय, सार्वजनिक बांधकाम विभाग, क्रमांक ३६४७/३६-२, दिनांक १७ मे १९५१.
(३) शासन निर्णय, पाटबंधारे व वीज विभाग, क्रमांक सीएमई २९६८/११०३१९/पा (४), दिनांक २१ सप्टेंबर १९६८.
(४) शासन निर्णय, पाटबंधारे विभाग, क्रमांक सीएमई १०८०/६३३२/(१६१९)/व्यवस्था-३, दिनांक ९ जानेवारी १९८१.
(५) शासन निर्णय, क्रमांक सीएमई १०८०/ १४३६८/(१६५३), व्यवस्था-३, दिनांक १९ जून १९८१.

शासन निर्णय, सार्वजनिक बांधकाम विभाग, क्रमांक ३६४७/८६-२, दिनांक ३० मे १९४७ अन्वये खालील मुख्य कालवे पद्धतीवर कालवे सल्लागार समित्या स्थापन करण्याबाबत आदेश देण्यात आले होते :—

- (१) निरा कालवा, (२) प्रवरा कालवा, (३) गोदावरी कालवा, (४) मुळा कालवा,
(५) गिरणा कालवा, (६) विसापूर कालवा, (७) हातमती व खारी कालवा, (८) गोकक कालवा.

शासन निर्णय.—स्थानिक अधिकाऱ्यांच्या शिफारशीनुसार शासन आता कालवे सल्लागार समिती नेमणुकीबाबत खालीलप्रमाणे आदेश देत आहे. कालवे सल्लागार समित्यांचे आता दोन स्वतंत्र प्रकार रहातील :—

(१) कार्यकारी अभियंता यांचे पातळीवरील कालवे सल्लागार समिती ही फक्त १०,००० हेक्टरपेक्षा जास्त समादेश क्षेत्र असणाऱ्या मोठ्या कालव्यासाठी असेल.

(२) दहा हजार हेक्टरहून लहान समादेश क्षेत्र असलेल्या कालव्यासाठी उप विभाग समित्या नेमण्यासाठी ९ जानेवारी १९८१ ला अगोदारच आदेश देण्यात आले आहेत.

मोठ्या कालव्याबाबत विभागीय पातळीवरील कालवे सल्लागार समितीची नेमणूक करण्याबाबतचेच प्रस्ताव शासनाकडे मान्यतेसाठी सादर करावेत आणि अन्य उपविभागीय पातळीवर कालवे सल्लागार समित्या नेमणुकीबाबत अधिकार मुख्य अभियंत्यांना देण्याबाबत प्रस्ताव शासनाचे विचाराधीन असून त्याबाबत वेगळा निर्णय स्वतंत्रपणे लौकरच देण्यात येत आहे. लघु पाटबंधारे समादेश क्षेत्रासाठी (१०००) हेक्टरचे आत कालवे सल्लागार समित्या विशेष उपयुक्त ठरतील असे दिसत नाही. तेथे पाणी पंचायत समित्या आहेत, त्याच कालवे सल्लागार समित्या होतील. अशा पाणी पंचायत समित्या नेमावयाची कार्यवाही शासन निर्णय, दिनांक ३० मे १९४७, परिच्छेद क्रमांक ४ अन्वये प्रशासकीय अधिकारी या नात्याने अधीक्षक अभियंत्यावर राहिल.

कालवे सल्लागार समितीबाबत वेळोवेळी प्रसृत झालेल्या शासकीय आदेशाच्या प्रती माहितीसाठी सोबत जोडल्या आहेत. सन १९८२-८३ हे पाणी वर्ष सुरू होण्यापूर्वी वरील समित्या अस्तित्वात असणे उपयुक्त ठरेल. त्या दृष्टीने सत्वर कार्यवाही हाती घ्यावी.

कालवे सल्लागार समितीची मुदत नियुक्त केलेल्या तारखेपासून ५ वर्षे किंवा शासन ठरविल त्याप्रमाणे राहिल.

महाराष्ट्राचे राज्यपाल यांचे आदेशानुसार व नावाने,

(सही) रा. कृ. इनामदार,
शासनाचे उप सचिव.

प्रपत्र : शासन निर्णय, क्रमांक सीएमई १०८१ (१९०२) व्यवस्था-३, दिनांक ४ मार्च १९८२

१०,००० हेक्टर पेक्षा अधिक समादेश क्षेत्र असलेल्या विभागीय पातळीवरील कालवे सल्लागार समितीची रचना

अध्यक्ष : कार्यकारी अभियंता.

(अ) शासकीय सभासद :

- (१) योजना अधिकारी जिल्हा परिषद,
- (२) शेती विकास अधिकारी जिल्हा परिषद.

(ब) अशासकीय सभासद :

- (१) स्थानिक साखर कारखान्यांचा एक प्रतिनिधी ज्या मोठ्या कालव्यावर ऊस विकास पाणी पुरवठा करण्याची तरतूद नाही, त्या भागातील साखर कारखान्यांचे बाबत प्रतिनिधीस देण्याची आवश्यकता नाही.
- (२) स्थानिक बागायतदारांचे दोन प्रतिनिधी,
- (३) विधानसभा/विधान परिषद दोन स्थानिक सदस्य,
- (४) अधिसूचित जाती एक प्रतिनिधी,
- (५) अधिसूचित जमाती एक प्रतिनिधी,
- (६) अल्पसंख्या जमाती एक प्रतिनिधी;
- (७) आर्थिकदृष्ट्या दुर्बल वर्गाचा एक प्रतिनिधी.

वरील शासकीय सभासद नेमताना जर कालव्याचे समादेश क्षेत्र एका पेक्षा अधिक जिल्ह्यात विस्तुरले असल्यास संबंधित जिल्ह्यातील जिल्हा परिषदेचे शासकीय सभासद नेमावेत तसेच वरील अशासकीय सभासद क्रमांक (२), (४), (५), (६) व (७) यांना कालवे सल्लागार समितीवर सभासदत्व देताना ते संबंधित कालव्यावर लाभधारक असणे आवश्यक आहे याची कृपया नोंद घ्यावी.

संबंधित उपविभागीय अधिकारी बैठकीस हजर राहू शकतील पण ते कालवे सल्लागार समितीचे सभासद असणार नाही.

सचिव.—संबंधित कालव्यावरील एका उपअभियंत्याची कार्यकारी अभियंता, सचिव (सदस्य) म्हणून नेमणूक करतील.

निरनिराळ्या कालव्यावरील कालवे सल्लागार
समितीची रचना—

महाराष्ट्र शासन

पाटबंधारे विभाग

शासन निर्णय, क्रमांक सीएमई./१०८०/६३३२(१६१९)/व्यवस्था-३, दिनांक ९ जानेवारी १९८१

पहावे :—(१) शासन निर्णय, सार्वजनिक बांधकाम, क्रमांक ३६४७/३६-२, दिनांक १७ मे १९५१.

(२) शासन निर्णय, पाटबंधारे व वीज विभाग, क्रमांक सीएमई./२९६८/११०३१९-पा-४, दिनांक २१ सप्टेंबर १९६८.

शासन निर्णय.—स्थानिक अधिकाऱ्यांच्या शिफारशीनुसार शासन कालवे सल्लागार समितीच्या रचनेत खालील प्रमाणे बदल करित आहे.

कालवे सल्लागार समित्यांचे पुनर्व्यवस्थापन प्रस्ताव शासन निर्णय, क्रमांक सीएमई. २९६८/११०३१९-पा-४, दिनांक २१ सप्टेंबर १९६८ नुसार देण्यात आलेल्या आदेशानुसार करण्यात यावेत. परंतु सदर प्रस्ताव पाठविताना खाली उल्लेखिलेल्या बाबी लक्षात घेऊन ते शासनाकडे मंजुरीसाठी पाठविण्यात यावेत.

(१) शासन निर्णय, क्रमांक सीएमई. २९६८ च्या आदेशानुसार कालवे सल्लागार समितीवर अशासकीय सभासद म्हणून डेक्कन शुगर फॅक्टरीज असोसिएशनकडून नाम निर्देशित केलेल्या साखर कारखान्याचा एक प्रतिनिधी घेण्याबाबत आदेश देण्यात आलेले आहेत.

याबाबत असा निर्णय घेण्यात आलेला आहे की, ज्या भागातील बहुसंख्य मध्यम व लघु पाटबंधारे योजनांवर उस पिकास पाणीपुरवठा करण्याची तरतूद नाही, त्या भागातील साखर कारखान्यांचे प्रतिनिधीस कालवे सल्लागार समितीवर सभासदत्व देण्याची आवश्यकता नाही. ज्या भागातील मोठ्या अथवा मध्यम प्रकल्पावर उस पिकास पाणी पुरवठा करण्याची मंजुरी आहे व तेथे साखर कारखाना आहे त्या भागातील कालवे सल्लागार समितीवर साखर कारखान्याचा एक प्रतिनिधी घेण्यात यावा.

(२) शासन निर्णय, क्रमांक सीएमई. २९६८/११०३१९/पा-४, दिनांक २१ सप्टेंबर १९६८ नुसार कालवे सल्लागार समितीवर अशासकीय सभासद म्हणून स्थानिक बागाईतदारांचे दोन प्रतिनिधी नेमण्यात यावेत.

परंतु कालवे सल्लागार समिती नेमताना कार्यभार पाहून त्या त्या जिल्ह्यातील पूर्ण झालेल्या व नजिकच्या भविष्यात पूर्ण होणाऱ्या योजनांचे समूह करून अशा प्रत्येक समूहासाठी एक कालवे सल्लागार समिती नेमावी. प्रत्येक जिल्ह्यातील योजनांचे अशा प्रकारे समूह करून सामान्यपणे प्रत्येक उप विभागासाठी एक याप्रमाणे कालवे सल्लागार समित्या नेमण्यात याव्यात.

ह्या समितीतील प्रत्येक मध्यम प्रकल्पासाठी एक व अन्य लघु पाटबंधारे योजना मध्ये जवळपास येणाऱ्या योजनांसाठी मिळून एक अशाप्रकारे बागाईतदारांचे प्रतिनिधी घेण्यात यावेत.

कालवे सल्लागार समितीची रचना, कार्य व कार्यपद्धती याबाबत मार्गदर्शनासाठी शासन निर्णय, सार्वजनिक बांधकाम विभाग क्रमांक ३६४७/३६-२, दिनांक १७ मे १९५१ व पाटबंधारे व वीज विभाग, शासन निर्णय, क्रमांक सीएमई./२९६८/११०३१९/पा-४, दिनांक २१ सप्टेंबर १९६८ ची प्रत सोबत जोडली आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावे,

(सही) रा. कृ. इनामदार,
शासनाने उप सचिव

*Canal Advisory Committees Composition
of the—*

GOVERNMENT OF MAHARASHTRA

IRRIGATION AND POWER DEPARTMENT

Resolution No. CME 2968/110319-I(4), Bombay Castle (Bombay No. 1)

Date 21st September 1968

Read—(I) Government Resolution, No. 3647/36-II, dated the 17th May 1951.

(II) Government Resolution, No. CME 6063/53193-I(4), dated the 11th May, 1964.

RESOLUTION.— In modification of the rule made in the clause 5 of the Rules accompanying Government Resolution, Public works Department No. 3647/36-II, dated 17th May 1951 and in supercession of the orders issued regarding composition of the Canal Advisory Committees from time to time, Government is pleased to direct that the composition of Canal Advisory Committees, laid down in the clause (5) of the Rules accompanying the Government Resolution referred to above, should be as follows :—

Chairman:

Executive Engineer. *

Member :

- (1) Planning Officer of Zilla Parishad,
- (2) Parishad Agricultural Development Officer, Zilla Parishad,
- (3) One representative of the sugar Factories nominated by the Deccan sugar Factories Association,
- (4) Two local Irrigators for each Canal nominated by Government,
- (5) Two Local Members of Legislative Assembly; or

Members of the Legislative Council nominated by Government. The Sub-Divisional Officers concerned will be present at the meetings but will not be members of the Committee.

Secretary:

The Executive Engineers may select one of the Sub-Divisional Officers mentioned above as Secretary (Non-Member).

By order and in the name of the Governor of Maharashtra,

(Signed)-Y. B. KHARADE,

Under Secretary to Government of Maharashtra,
Irrigation and Power Department.

*Composition of Canal Advisory
Committee—*

GOVERNMENT OF MAHARASHTRA

IRRIGATION DEPARTMENT

Government Resolution No. CME-1080/14368(1653)IMC-3

Mantralaya, Bombay 400 032, dated the 19th June 1981.

Read.—(1) Government Resolution, Irrigation and Power Department, No. CME-2968/110319-I(4), dated 21st September 1968.

(2) Government Resolution, Irrigation Department, No. CME-1080/6332 (1619)/IPC-3, dated 9th January 1981.

Government has issued orders regarding the composition of Canal Advisory Committees in Government Resolution, Irrigation and power Department, No. CME-2968/110319-I(4), dated 21st September 1968, however, it is observed that in many cases the command of the canal system covers more than one District, Therefore, it is felt necessary to appoint the planning officers, Zilla parishad and Agriculture Development Officer Zilla Parishad of respective Districts within the command of the canal system of canal Advisory Committee for extending their Co-operation in proper utilisation of water.

RESOLUTION.—Government is now, therefore, pleased to direct in partial modification of orders issued in Government Resolution, No. CME-2968/110319-I(4), dated 21st September 1968, that when the command of the canal system covers more than one District the Planning Officers, Zilla Parishad and Agriculture Development Officers of Zilla Parishad of the concerned districts should be appointed on Canal Advisory Committee for extending their co-operation in proper utilisation of water.

By order and in the name of the Governor of Maharashtra,

(Signed) R. K. INAMDAR,

Deputy Secretary to the Government
of Maharashtra.

*Canal Advisory Committees and water
Panchayat Committee—*

Establishment of the—on the various
Canal System.

GOVERNMENT OF BOMBAY

PUBLIC WORKS DEPARTMENT

Resolution No. 3647/36-II

Bombay Castle (Bombay No. 1), 17th May, 1951

Read.—Government Resolution No. 3647/36-II, dated the 30th May, 1947.

Letter No. G. R. No. 49, dated the 17th February, 1949, from the Superintending Engineer, Karnataka Irrigation Circle.

Letter No. G. R. No. 49, dated the 20th June, 1949, from the Superintending Engineer, Southern Circle.

Letter No. P.F. 51/5017, dated the 7th June, 1950, from the Superintending Engineer, Deccan Irrigation Circle.

RESOLUTION

On the recommendations of the local officers, Government is pleased to revise the constitution and Rules of Business of Canal Advisory Committees and Water Panchayat Committees. The accompanying revised rules will come into force hereafter.

By order of the Governor of Bombay.

(Sd.) V. W. GOTHOSKAR,
Deputy Secretary to Government.

CONSTITUTION AND RULES OF BUSINESS OF CANAL ADVISORY COMMITTEES

RULES

1. These Rules may be called "The Canal Advisory Committee" Rules, 1947.
2. In these rules,—
 - (a) "Canal Advisory Committee" shall mean the "Committee" Constituted in accordance with the rules.
 - (b) "Executive Engineer" shall mean the "Executive Engineer of the public Works Department Division" concerned or any other officer deputed by him in this regard by a general or special order.
 - (c) "Sub-Divisional Officer" shall mean the "Sub-Divisional Officer of the Public Works Department Sub-Division" concerned.
3. Subject to the approval of the Superintending Engineer the activities of a *Canal Advisory Committee* will extend over the entire area served by one (or more) specific irrigation system, provided that no Committee shall have to deal with more than one Executive Engineer.
4. The whole body of irrigators in the sphere of activities of each Committee will constitute a "Bagaitdar Sangh" and every irrigator will *inso facto* be a member of the Sangh as long as he holds a valid pass for irrigation on the irrigation system concerned.
5. The composition of the Canal Advisory Committee shall be as under:—

Chairman—

Executive Engineer,

Members—

 1. One representative of the Agricultural Department.
 2. One representative of the Revenue Department.
 3. One representative of the Sugar Factories.
 4. Two local irrigators for each canal nominated by Government.
 5. Two Local Members of Legislative Assembly or Members of Legislative Council nominated by Government.

The Sub-Divisional Officers concerned will be present at the meetings but will not be members of the Committee.

Secretary—

The Executive Engineer may select one of the Sub-Divisional Officers mentioned above as the Secretary (Non-members).
6. The non-official members will hold office for two years. The retiring members will, however, be eligible for renomination.

7. The functions of the committee will be strictly advisory and will generally cover the following items:—

(a) The exchange of views on the needs of irrigated crops as regards the quantity of water required, irrigation intervals, dates of plantation and harvest, etc.

(b) The collection and distribution amongst irrigators of information about new varieties of crops.

(c) Suggesting measures for improving the supply of seed and the prevention and eradication of crop pests and diseases.

(d) Submission to the Irrigation Department of information and requests in respect of (a) to (c) above.

(e) Maintenance of a continuous liaison with the water panchayats operating on the canals concerned.

(f) Receiving petitions, appeals, etc. of a general nature from Water panchayats and discussing the same.

(g) Holding Irrigators Conference in January every year when demonstrations, exhibitions and lectures by experts on irrigation, agriculture, co-operation etc., may be arranged.

(Note.—The Committee will have no authority to inquire into or interfere with the internal administration and working of the Irrigation Department or with questions of personnel and discipline; and if any question arises at any meeting as to the validity of a matter raised for discussion, the decision of the Chairmen will be final.).

8. The Chairman will ordinarily convene meetings of the Committee at least three times a year. The dates of the meetings should be so arranged that there is at least one meeting in each of the Kharif, rabi and hot weather seasons. The Chairman will be at liberty to request any persons, official or non-official, to attend any meeting of the Committee whenever their presence and advice appear to him to be desirable. The person or persons so invited will, however, have no right of voting.

9. Any subject relating to irrigation on the canals concerned may be brought up for discussion by any member of the Committee.

10. The agenda for each meeting shall be circulated to all members ten days before the date of such meeting and it will include all items received and approved by the Chairman up-to-date. Urgent business may, however, be taken for consideration at any meeting without notice, with the consent of the Chairman.

11. The Chairman will keep the Superintending Engineer informed from time to time regarding work done by the Committee.

12. Non-official members of the Committee will be eligible for travelling expenses under the rules in Appendix-XLII-A of the Bombay Civil Services Rules Manual as amended from time to time.

CONSTITUTION AND RULES OF BUSINESS OF A WATER PANCHAYAT COMMITTEE

RULES

1. These Rules may be called "the Water Panchayat Committee Rules, 1947".
2. In these rules,—
 - (a) "Panchayat Committee" shall mean the "Panchayat Committee" constituted in accordance with the following rules.
 - (b) "Group" means the "particular group of Irrigators" as defined in Rules No. 3.
 - (c) "Executive Engineer" shall mean the "Executive Engineer of the public works department division" concerned or any other officer deputed by him in this regard by a general or special order.
 - (d) "Sub-Divisional Officer" shall mean the "Sub-Divisional Officer of the Public Works Department Sub-Divisional" concerned.
3. *The sphere of activities of each Panchayat Committee shall ordinarily be equivalent to the beat of a canal inspector and the Executive Engineer shall have the power to fix its exact limits in each particular case. All the irrigators within this limit shall be collectively termed the "Group of Irrigators".*
4. Each panchayat shall consists of three to seven panchas, and the Executive Engineer shall have the power to fix the exact number in each case and also to nominate additional panchas to secure sufficient representation of small bagayatdars and also of bagayatdars at the tail on the panchayat committee.
5. At a meeting held in accordance with Rules 8 the group shall select candidates for being appointed as panchas and number to be elected, shall be double the number or vacancies to be filled. The names of all the elected candidates shall be arranged to discending order of number of votes secured by each and from the list so prepared, the first half shall be appointed as panchas.
6. Panchas* shall be appointed for a period of two years. About half the number of panchas shall be retire in rotation each year. Elections shall be held each year for the purpose of filling such vacancies. The retiring panchas will be held eligible to contest the new elections.

Explanation.—When a panchayatis newly established about half the number of panchas in the order of votes secured will be appointed for two years and the rest for only one year.
7. If any panch retires before the expiry of his term of office, the vacancy so caused shall be filled by appointing the next available elected candidate on the list prepared as laid down in Rule No. 5 above, when no such candidates are available, the required number will be elected in accordance with the provision of Rules Nos. 5 and 8.
8. For the purpose of holding the Elections of candidates for being appointed as panchas the Sub-Divisional Officer shall convene a meeting of the group with a notice of not less than seven days as regards date, time and place thereof. The elections shall be made by majority of votes of eligible bagaitdars in the group under

* Panch—Member of Panchayat Committee (Please see rule No. 9)

the supervision of the old Sarpanch or another President specially elected at the meeting. The President shall communicate to the sub-divisional officer within 3 days the results of such elections, failing which the sub-divisional officer shall assume that the elections were not held and shall then take such further action as would appear to him necessary.

9. Any bonafide irrigation who has had sanction of irrigation in the preceding year within the limits of the Group concerned shall be eligible to vote at the election meetings, provided he attends the meeting in person.

10. Any bona fide irrigation who has had sanction of irrigation in the preceding year within the limits of the group at the time of an election shall be eligible to contest for the seat of panch.

11. A panch shall cease to be a panch and vacate his seat in the panchayat if he fails to have any sanction of irrigation on the canal for a period of 12 months while water could have been made available to his land or if he takes water unauthorisedly to a crop not sanctioned under the Irrigation Rules. A panch who takes water unauthorisedly should not be eligible for re-election for a period of two years.

12. As soon as the annual elections of new panchas are declared, the old and new panchas together shall elect Sarpanch for the ensuing year.

13. The business year of the panchayat shall be reckoned from 15th February to 14th February. The election of panchas for the ensuing year shall be held in the second fortnight of January.

Please see rule No. 9.

14. As soon as a Panchayat is constituted, it shall be held responsible for carrying out the following duties:—

(a) To prepare Pali-Patraks.

(b) To estimate the quantity of water required in the ensuing rotation and inform the Sub-Divisional Officer about it, so as to make it convenient for the later to arrange for a suitable supply of water consistent with the interest and convenience of the Canal as

(c) To advise the irrigators as necessary and to ensure that water is not used without a valid pass, out of turn, unauthorised or extravagantly and to prevent waste of water.

(d) To hold panchanamas, etc., in accordance with rules against those who commit such offences as are mentioned in (c) above.

(e) To settle mutually the complaints arising in connection with items (a) to (d) above and to communicate to the Sub-Divisional Officer, in writing, their disposal together with the complainant's acceptance, of such disposal.

(f) To offer suggestions to the Sub-Divisional Officer regarding equitable and economic distribution of canal water.

(g) To disseminate among the irrigators information regarding the latest Government Orders and notifications concerning irrigation and agricultural matters.

15. The Sarpanch shall convene meetings of the panchayat at a suitable place and from time to time as may be necessary, provided that the interval between any two such meetings shall not exceed 3 months. Representatives of the Irrigation and Co-operative Departments shall be requested to attend these meetings though they shall not vote. The reports of the meeting shall be sent to the Sub-Divisional Officer in writing.

16. A Canal Inspector or Patkari appointed by the Executive Engineer shall continue to carry out all the duties mentioned in Rule 14 above, with the assistance of the panchayat, for so long as the letter is not considered by the Executive Engineer to be fully capable of undertaking these duties independently.

17. The panchayat shall be eligible after duly passing a resolution to that effect, to request the Executive Engineer to withdraw the canal inspector or the patkari and if such demand is not fulfilled within 6 months, to appeal to the Superintending Engineer (Circle), whose decision in the matter shall be final.

18. If at any time, it would appear to the Executive Engineer that the panchayat is not satisfactorily carrying out the duties entrusted to it as mentioned in Rule 14 above, the Executive Engineer shall have the right again to depute a Canal Inspector or a Patkari for assisting the panchayat, or to dissolve the panchayat all together and order fresh elections.

19. The panchayat shall arrange to collect from the irrigators, at rate not exceeding half an anna per rupee of the water rate payable by the irrigators funds necessary to meet its current or future expenditure. Any member who fails to contribute his share shall be disqualified and struck off the list member.

20. The panchayat shall be competent to appoint one or more paid servants for carrying out the clerical work in connection with the duties mentioned in Rule 14 above when it is functioning without the help of the Government Canal Inspector or Patkari. These servants will, however, not be entrusted with any administrative duties, which must be performed by the panchayat itself.

21. The accounts of the panchayat shall be maintained in a form approved by the Executive Engineer and shall be audited annually.

22. The funds of the panchayat shall be deposited in a bank approved by the Registrar of Co-operative Societies.

23. The panchayat can, after obtaining previous sanction of the Executive Engineer, also undertake the following functions in addition to these shown in Rule 14 above :—

(a) To disseminate by means of propaganda among the irrigator knowledge regarding the improved practice and methods of irriculture in accordance with the suggestions of the Canal Advisory Committee.

(b) To place in a collective form before the irrigation officers and Canal Advisory Committee the suggestions and complaints of irrigators in the Groups.

(c) To collect the water applications of the irrigators and present them to the irrigation officers, after duly completing them, for facilitating their quick disposal.

Canal Advisory Committees and Water
Panchayat Committees—Establishment
of the—on the various Canal System.

Government of Bombay,
Public Works Department,
Resolution No. CME. 1058-T,
Sachivalaya, Bombay-1.

Read.—Government Resolution No. 3647/36-II, dated 9th March, 17th May 1951

Letter No. Gen/Irri/63856 dated the 15th November 1958 from the Superintending Engineer, Gujarath Irrigation Circle.

Resolution : On the recommendations of the local Officers, Government is pleased to direct that the duration of a canal Advisory Committee should be 3 years instead of 2 years as hitherto.

2. Government is also pleased to direct that the non-official members will hold office for a period of 3 years instead of 2 years. Necessary corrections should accordingly be carried out in item 6 of the Constitution and Rules of Business of the Canal Advisory Committee printed as an accompaniment to Government Resolution, Public Works Department No. 3647/36-II, dated the 17th May, 1951.

3. Government is further pleased to direct that 50 per cent of the representatives of local irrigation to be appointed to such committees should represent small irrigators.

By order and in the name of the Governor of Bombay,

(Signed) A. R. KAULGUD,
Officer on Special Deputy.

APPENDIX XI

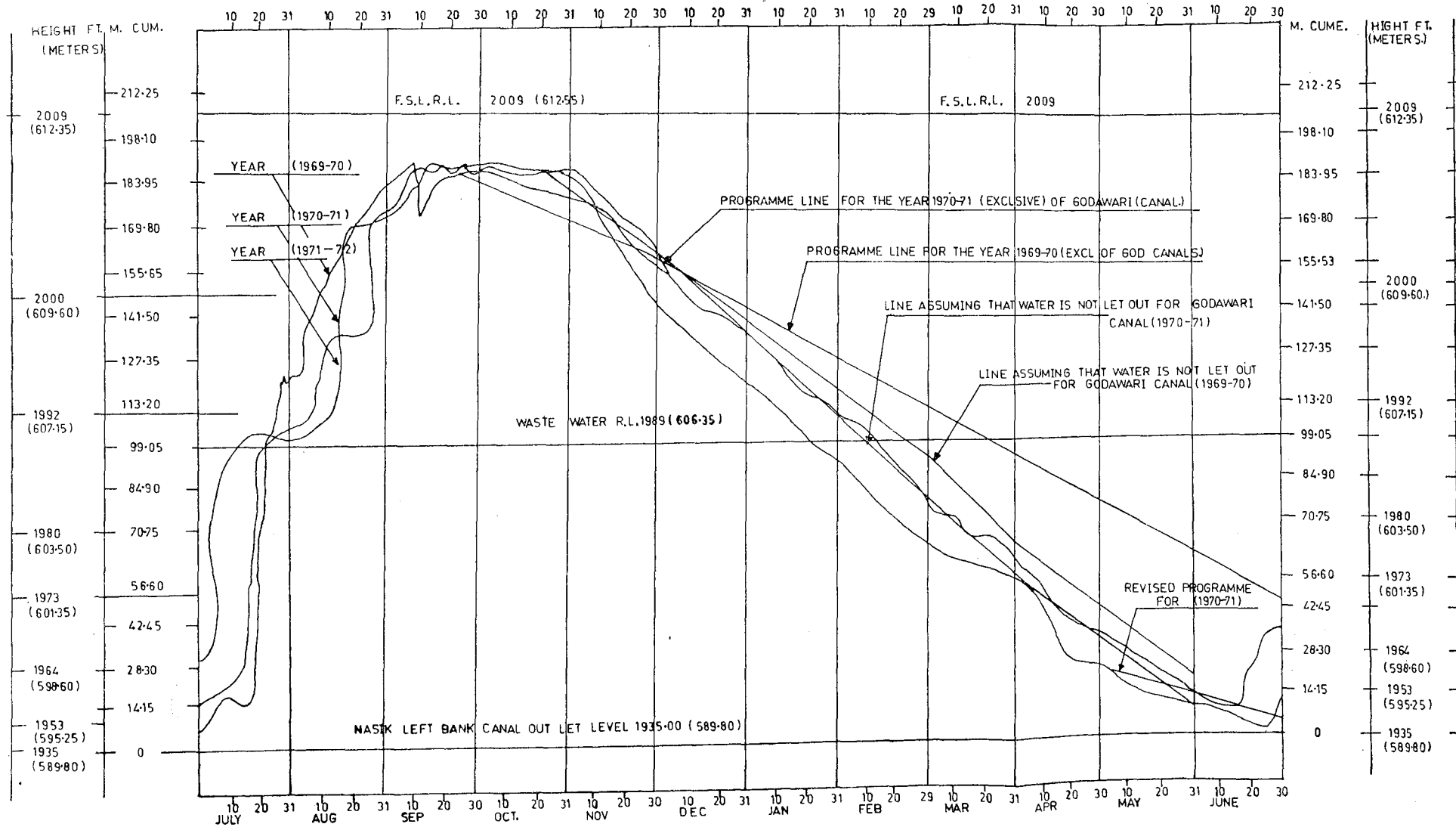
Factors of Conversion for units in this chapter

To convert A to B multiply A by P. To convert B to A multiply B by Q

Unit A		Factor P	Factor Q	Unit B
<i>Length—</i>				
Inches	... ..	2.54	0.3937	Centimetres
Feet	... ..	30.48	0.0328	Centimetres
Miles	... ..	1.609	0.62137	Kilometres
<i>Area—</i>				
Square feet	... ..	0.0929	10.764	Square metres
Acres	... ..	0.4047	2.471	Hectares
Hectares	... ..	10.000	0.0001	Square metres
<i>Volume—</i>				
Cubit feet	... ..	0.028317	35.3147	Cubic metres
Acre feet	... ..	43.560	0.000023	Cubic feet
Acre feet	... ..	0.12337	8.10735	Hectare metres
Million cubic feet	... ..	28.300	0.000035	Cubic metres
<i>Velocities—</i>				
Cubic metre per second	... ..	35.3145	0.028317	Cubic feet per second
"	... ..	1000	0.001	Litre per second
"	... ..	864000	0.00011574	Cubic metres per 24 hour
Cubic feet per second	... ..	86400	0.000011574	Cubic feet per 24 hour

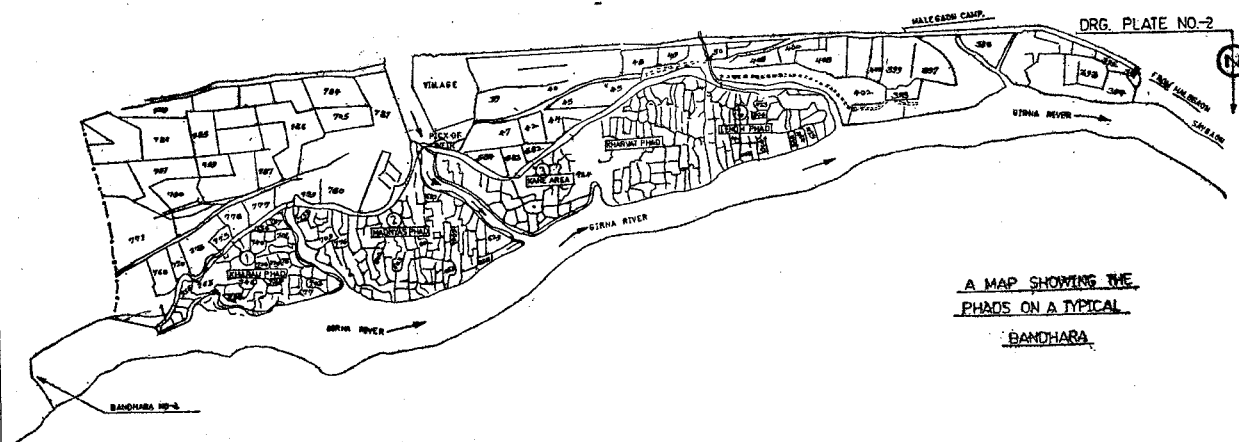
PROGRAMME
CHART AND TANK CHART OF GANGAPUR DAM.

DRG. PLATE. NO-1



DRG. PLATE No. 2

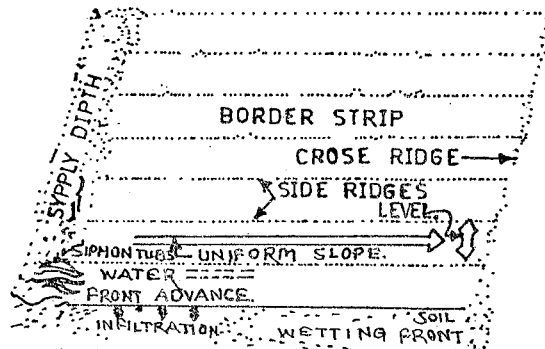
A MAP SHOWING THE PHADS ON A TYPICAL BANDHARA



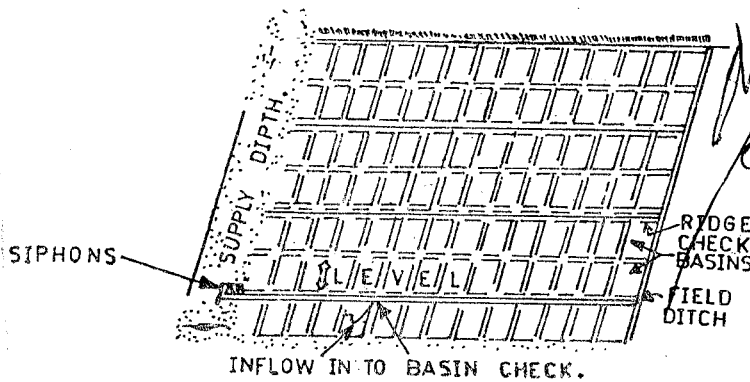
A MAP SHOWING THE
PHADS ON A TYPICAL
BANDHARA

DRG. PLATE NO-3

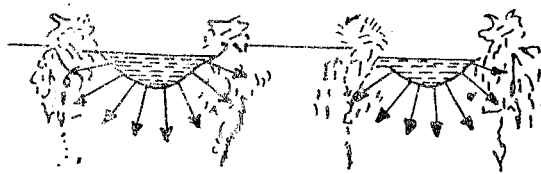
No. 2



IN SCHEMATIC SKETCH ILLUSTRATING THE LAYOUT
OF AN IMPOUNDING TYPE BORDER IRRIGATION SYSTEM.



SCHEMATIC SKETCH ILLUSTRATING TYPICAL.
LAYOUT OF CHECK BASIN METHOD OF IRRIGATION



SCHEMATIC SKETCH ILLUSTRATING FURROW IRRIGATION
FOR A VEGETABLE CROP WITH ONE FURROW FOR EACH
TWO ROWS OF THE CROP

13544