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Government of Maharashtra
Irrigation and Power Department

Jayakwadi Project Stage II

(Irrigation Scheme)

October 1973

• Report • Es
and
• Drawings

GENERAL INDEX

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C. W. & P. C. Proforma	(i)
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FOREWORD

In the year 1964, Jayakwadi Project Report was submitted to Central Water and Power Commission and Planning Commission. This Project report envisaged :-

- a) A dam near Paithan in Aurangabad District of Maharashtra State on Godavari river.
- b) Paithan Left Bank Canal to irrigate 1,41,637 Ha - (3,50,000 acres) in Aurangabad and Parbhani Districts.
- c) Paithan Right Bank Canal to irrigate 41,682 Ha (1,03,000 acres) in Aurangabad, Ahmednagar and Bhir Districts.
- d) A dam near Majalgaon in Bhir District of Maharashtra State on Sindphana river.
- e) Majalgaon Right Bank Canal to irrigate 93,885 Ha (2,32,000 acres) in Bhir, Parbhani and Nanded Districts.

Central Water and Power Commission scrutinised the report and suggested that the Paithan Dam with its Left Bank Canal only should be taken up as Jayakwadi Project Stage-I and the remaining components of the Project should be covered by a separate report as Jayakwadi Project Stage-II.

Accordingly Stage-I of the Project was cleared by Planning Commission under their letter No.III-2 (23)/64-I. & P.Dated 3-2-1965.

On clearance, the work of Stage-I was taken up immediately and is now in full swing. The earthen dam is completed and Masonry dam (without gates) will be ready by June 1974 when irrigation potential of about 16,000 Ha will also have been created. The

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installation of gates will be completed by June 1976 and entire canal and distribution system is programmed to be completed by 1979-80.

The Paithan dam will impound a live storage of 1965.90 Mm^3 , out of which 750 Mm^3 , (26.5 T.M.C.) net is meant for utilisation on Paithan Right Bank Canal and Majalgaon Right Bank Canal.

During the unprecedented drought of 1972-73 experienced in Maharashtra, the work of Paithan Right Bank Canal was started as scarcity work and nearly Rs.125.00 lakhs have been spent so far on this work. The work is still in progress.

In view of the facts that the entire water potential required under the Paithan Right Bank Canal will have been impounded at Paithan in 1976, it is imperative that the Paithan Right Bank Canal should be completed on priority so that area of 41,682 Ha in Aurangabad, Ahmednagar and Bhir Districts can be brought under irrigation before the end of the Fifth Five Year Plan. This will help us not only to achieve the badly needed irrigation facility in the above mentioned districts, but will also ensure that the expenditure already incurred on Paithan Right Bank Canal does not become infructuous. Simultaneously a start will also have to be made on the construction of Majalgaon dam and Majalgaon Right Bank Canal, so that an area of 93,885 Ha from Bhir, Parbhani and Nanded Districts (commanded by Majalgaon Right Bank Canal) can be brought under irrigation by about 1980-81.

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Jayakwadi Project Circle, Aurangabad is a fully established organisation and can immediately take up the works of Stage-II. Jayakwadi Canal Circle, Aurangabad can also be gradually entrusted with the work of Majalgaon Right Bank Canal as the work of Paithan Left Bank Canal will go on diminishing year after year. Thus the entire trained and established organisation of Jayakwadi Project Stage-I can be switched over for the construction of Stage-II.

It is with the above back-ground that this report on Jayakwadi Project Stage-II is being submitted to Central Water and Power Commission and Planning Commission for immediate clearance thereto. An early clearance will ensure continued employment for the technical and non-technical, skilled and un-skilled personnel now employed on Jayakwadi Project Stage-I and will also enable the State to create the much needed irrigation potential of the order of 1,35,567 Ha in the Marathwada region of the State which has been badly hit during the three successive drought years of 1970-71, 1971-72 and 1972-73.

S.S.APTE
Chief Engineer (Irrigation) &
Jt. Secretary Irrigation & Power Dept.
Maharashtra.

IRRIGATION AND POWER PROJECTS
LIST OF ITEMS AND REFERENCES

State : Maharashtra
 Name of Project : Jayakwadi Project Stage II
 Category of Project : Major Irrigation Project.
 Estimated Cost : Rs.7825.00 Lakhs.

I. - HYDROLOGICAL AND GENERAL :-

- | | |
|---|---|
| i) Have hydrological and meteorological data been collected showing the following information ? | Mes. |
| a) A map showing sub-Divns. of catchment by tributaries water sheds, rain-gauge and temperature reading station, gauge and discharge sites, contour's isohyets. | Plate No.1. |
| b) Monthly and annual rainfall and temperature data for the catchment. | Chapter - II
Para - 1.1 |
| c) Average, maximum and minimum rainfall and temperature. | Chapter - II
Para - 1.1 |
| d) Gauge and discharge data of tributaries and main river. | Chapter - II
Para - 1.1 |
| e) Hydrographs of the river | Chapter - IV
Para - 3.2. |
| f) Maximum Historical flood with hydrograph and designed maximum flood and its frequency. | Designed Max.
9600 Cumecs.
Observed Max.
flood 3600 Cumecs
(1971) |
| g) Maximum, minimum and average annual run off. | Para - 1.1 |
| h) Suitability of water for irrigation, drinking etc. and treatment contemplated where required. | Suitable. |
| i) Silt data showing maximum and average silt intensities. | Not observed. |

- j) Erosion data and soil conservation measures if any. Nil
- k) Sub-water data in the command area showing depth of water table and its seasonal variation. Chapter - II
Para - 7.0

SEISMIC DATA

- Has basinwise development of the river been considered and the following information furnished. Yes.
- a) A map showing the overall proposals for valley development. Attached in Stage I report.
- b) Alternative proposals, discussions their merits and demerits. Attached in Stage I report.
- c) Extent to which any existing projects will be assisted or affected. Attached in Stage I report.
- 3) Has reservoir data been collected completely and following information furnished ? Yes.
- a) Reservoir topography area and capacity curves. Chapter - IV
Para - 2.00
Appendix- 3.4
- b) Probable rate of silting in the reservoir, and the life of the reservoir, comparison with silting of existing reservoirs. Chapter - III
Para - 2.0
- c) Live storage, the No. of years in which the reservoir completely fills, average annual utilisation, evaporation losses, extra storage provided for carry over from year to year if any.
- d) Working table for the reservoir. Chapter - III
Para - 2.0
- e) Flood absorption and routing. Chapter - IV
Para - 3.2

(III)

- | | |
|---|---------------------------------|
| f) Back water and tail water curves with bank levels. | Chapter - IV
Para - 3.2 |
| g) Fetch of reservoir, direction and velocity of winds and free board. | Chapter - IV
Para - 3.3 |
| h) Malaria control of reservoir. | Provision made in the estimate. |
| i) Area to be submerged and its classification, acquisition and compensation for land and properties. | Chapter - VII
Para - 1.0 |
| j) Programme of resettlement of population displaced from the reservoir area. | Chapter - VII
Para - 2.0 |

II - HEAD WORKS (DAM OR WEIR)

- | | |
|--|----------------------------|
| 1. Have the following aspects been discussed and shown on a map ? | Yes. |
| a) Dam site and consideration leading to its preference over other sites. | Chapter - IV
Para - 1.0 |
| b) Borrow areas and Quarries. | Chapter - IV
Para - 7.0 |
| c) Colonies, work shops and offices. | Chapter - IX
Para - 3.0 |
| 2. Has a detailed survey map of the dam sites been prepared (Scale 50 ft. to 100 ft.) showing the following ? | Yes. |
| a) All the natural features e.g. out crops of rocks springs etc. . | Plate No.3 |
| b) Dam and appurtenant works. | Plate No.5 |
| c) Site for construction plant e.g. crushing and concreting plants. Construction power plant on pressed air station etc. | -- |

3. Have a geological investigation been made and a report showing the following submitted ? Geological report is awaited.
- a) A brief account of regional geology, major rock types, effects of faulting etc. description of other structural features and their relation to possible leakage grouting proposals. Geological report is awaited.
- b) Laboratory tests of samples of foundation material and their interpretation. -
- c) Levels of ground water table and direction of flow and discussion of percolation tests. -
- d) Reference to any special condition affecting the preliminary design. -
4. Have the following maps been included ? Yes.
- a) Combined topographical and geological map. -
- b) Map showing bed rock contours. Plate No.3 (i)
- c) Logs of drill holes, tests, pits, exploratory tunnels etc. Plate No.3(ii)
- d) Maps, profiles and section showing results of geophysical work and any other special method. Plate No.3 (i)
- e) Ground and aerial photographs if available. No
5. Have investigations of construction material been made and report showing the following attached. Yes.
- a) Various types of embankment materials e.g. pervious, semi-pervious and impervious with quantities in various borrow areas. Chapter - IV
Para - 7.2

(7)

- | | |
|--|----------------------------|
| b) Stone for rip-rap rock fill. | Chapter - IV
Para - 7.2 |
| c) Material for stone masonry and concrete comprising rubble fine and coarse aggregates with quantities and physical properties. | Chapter - IV
Para - 7.2 |
| d) Source of supply of cement. | Chapter - IV
Para - 7.2 |
| e) Laborator tests performed on items 'a' to 'd'. | -- |
| f) Haul roads and transport of construction materials. | Chapter - IV
Para - 8.0 |
| g) Plans of borrow areas and quarries with bore or trial pits data. | - |
| 6. Have the main structures and appurtenants work i.e. dam, spillway power dam, outlet, cofferdam, etc. been designed and the following appended ? | Yes |
| a) General plan upstream and down stream elevation showing natural ground level, and final excavated levels. | Plate No.3(i) & 4 |
| b) Foundation treatment and drainage. | -do- |
| c) Spillway and outlets with energy dissipation arrangements. | Plate No.5,6 & 7. |
| d) Maximum section of overflow non overflow and earth dam. | Plate No.4 to 7 |
| e) Gallaries and openings. | -do- |
| f) Gates, hoists and other central equipment. | -do- |
| g) Diversion works during construction etc. | - |
| h) Design calculations with list of assumptions made and factors of safety adopted together with justification for the types of structures. | Appendix - 4.2 |

III - IRRIGATION :-

- | | |
|--|---------------------------------|
| 1) Have the following investigations been made and report prepared ? | Yes. |
| i) Existing irrigation facilities indicating gross area, cultivable command area, irrigated area and extent of water utilised. | Chapter - II
Para - 4.0 |
| ii) Proposed facilities indicating gross area, culturable command area, and area proposed for irrigation. | Chapter - II
Para - 4.0 |
| b) Soil Survey and pattern of crops indicating existing and proposed areas under various crops. | Chapter - II
Para - 7.0 |
| c) Monthly water requirements of crops based upon the proposed crops pattern. | Chapter - III
Para - 1.0 |
| d) Existing and proposed duties, deltas and intensity of irrigation. | -do- |
| e) Existing and proposed water rates and land revenue rates. | Chapter - X
Para - 3.0 |
| f) Investigation of construction material. | Chapter - IV
Para |
| g) Land Acquisition and compensation for properties. | Chapter - VII ;
Para - 1.0 |
| h) Malaria control, stream sanitation, population control and health services. | Provision made in the estimate. |
| 3) Have the canals, branches and structures on them been designed and report and drawings prepared for the following. | Yes. |

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- | | |
|--|--|
| a) Remodelling the existing irrigation system if any. | Nil |
| b) Capacity factor, free board and other assumption. | Chapter - V
Para - 2.0 & 2.4 |
| c) Longitudinal sections and cross sections of canals and branches. | Plate No.8 to 18 |
| d) Cross drainage works, bridges regulators etc. | Chapter - V
Para - 3.0 |
| i) Sections and cross sections of main structures and typical drawings for others. | -- |
| e) Method of calculation of discharge of cross drainage works. | Chapter - V
Para - 3.5 |
| f) Distribution system including minor and outlets. | Chapter - VIII
Para - 2.01 |
| g) Field channel and agency for their excavation. | Field channels will be constructed by Cultivators under supervision of Agriculture Department. |
| h) Regulation arrangements of offtake channels. | -- |

IV - POWER DEVELOPMENT :-

- | | |
|---|---|
| i) Have investigation been made and the following details furnished. | No power is expected from the project. |
| a) Present position of power supply in the region system, load factor etc. | Power supply is available from the Grid of Maharashtra State. |
| b) Extent of firm power available from the scheme (working tables and the basis of estimation of firm power should be supplied) and extent of secondary power if any. | Does not arise. |

- c) Load survey, future peak and energy demands anticipated system load factor. Does not arise.
- d) The function which the proposed scheme would perform in relation to the other stations of existing grid, if any, and details indicating how the scheme has been designed to fit in the existing grid. Does not arise
- e) Proposed initial and ultimate installed capacities, number and the size of units, power factor, efficiency etc. Does not arise
- f) The map showing the general layout of the scheme including the dam, water conductor system, power house, step up station, and out going transmission lines. Does not arise
- g) General map showing the transmission system and the location of the present and future loads. Does not arise
- h) A note on the development of power in stages if any. Does not arise
- i) Present and proposed tariff rates comparison of similar rates in other states and reasons for differences. Does not arise.
- j) Proposed sources of coal fuel etc. Does not arise.
- i) Investigation of construction materials. Does not arise

V - OTHER BENEFITS :-

- | | | |
|----|--|----|
| 1) | Has the flood control aspect been investigated and the designs and drawing prepared and the following particulars indicated. | No |
| | a) Peak flood, moderated flood and optimum safe discharge in the flood plan. | - |
| | b) Areas affected by flood at present and areas which will get protection giving location and quantum. | - |
| | c) Special structure required for flood moderation e. g. | - |
| | d) i) Flood embankment | - |
| | ii) Regulation by barrage into various channels old and new. | - |
| | e) Betterment levy if any for the area protected from floods. | - |
| 2) | Has navigation been provided and the following indicated. | No |
| | a) Navigation reaches of river and canals, with depth of drafts and clearance under structures. | - |
| | b) Location and design of locks with data of foundation materials. | - |
| | c) Existing and proposed navigation traffic, both passenger and goods. | - |

(x)

- d) Existing and proposed tollage rate of registration fees of navigation.
- 3) Has fish culture recreation etc. been considered and if so, have following details been given ? No
- a) Present facilities and scope of the scheme. -
- b) Structures required e.g. fish ladder, gardens health and pleasure resorts. -

VI - CONSTRUCTION PROGRAMME :-

- 1) Has a construction programme been drawn up for the execution of the various components in the project with following details ? Yes.
- a) Machinery and equipment available together with proposed requirement. Chapter - VI
Para - 1.0
- b) The quantities of materials involved together with the daily out turn proposed for Major item like masonry, concrete of earth work. Chapter - VI
Para - 2.0
- c) Justification of the construction programme Chapter - IX
Para - 1.0
- d) Yearly requirements of construction staff, technical and non-technical and labour, skilled and unskilled. Chapter - IX
Para - 3.0
- e) Yearly requirements of cement, steel, coal and other essential materials. --

- 2) Have charts been furnished showing the construction programme and target diagrammatically for the various components of the Project.

VII - ESTIMATES AND ANALYSIS OF RATES :-

- 1) Have project estimates together with abstracts of quantities and costs for various components of the project been made and following details furnished.?
- a) Estimated cost of the various stages of the project. Chapter - VIII
- b) The year to which the rates in the estimate pertain. 1973-74.
- c) Allocated cost of irrigation power flood control, navigation and other heads of the Project. Purely irrigation project.
2. Have analysis of rates been made and the following details furnished ? Yes.
- a) Labour out turn for the various items.
- b) Materials required for unit quantities of items of work. These things are attended while preparing D.S.R.
- c) The correct schedule of rates in the area and rates proposed comparasion with rate obtained on analogous works.

VIII - FINANCIAL RETURNS AND BENEFITS :-

- 1) Has the financial aspect of project been discussed and the following details furnished ?
- Yes.
- a) The programme of expenditure on the various unit of the project in the foreign exchange and in rupee. Chapter - IX
Para - 1.1, 1.2, 1.3, 2.0
- b) The programme of development of irrigation, power, navigation etc. Chapter - X
Para - 1.0
- c) Gross revenue statement from the different functions with schedule of water rates, betterment fees, irrigation cess. Power rates and flood levels. Chapter - X
Para - 3.1
- d) Statement showing maintenance and the establishment costs and net revenue available. Chapter - X
Para - 3.2
- e) A note on the productivity of the project stating percentage return, capital cost, of irrigation per acre and of power per Killowatt. Chapter - X
Para - 5.0
- f) Financial resources available for construction of the project e.g. contribution by public load from centre etc. -
- 2) Have total direct and indirect benefits on the project been stated in respect of the following ?
- Yes.
- a) Irrigation Chapter IX
- b) Power -
- c) Flood control -
- d) Navigation -
- e) Employment Chapter VI
- f) Other facilities. -

JAYAKWADI PROJECT STAGE-II

Salient Features

1. Scope of the Scheme An Irrigation Project with
Storage on Godavari river
@ Paithan and Sindphana
@ Majalgaon.
2. Source i) Godavari river.
ii) Sindphana river.
3. Yield and Utilisation
- i) Catchment area. i) Godavari
@ Paithan 21404 Sq.Kms.
ii) Sindphana
@ Majalgaon 3840 Sq.Kms.
- ii) a) Average annual yield. 3888.42 Mm³ *
(137.4 T.M.C.)*
- b) 75% dependable yield. 2832.83 Mm³ *
(100.1 T.M.C.)*
- c) Gross average annual utilisation. Stage - I 1647.06 Mm³
(58.2 T.M.C.)
- Stage - II 1185.77 Mm³
(41.9 T.M.C.)
- Total 2832.83 Mm³*
(100.1 T.M.C.)*
- d) Percentage of annual utilisation to average runoff. 72.8%

* Note :- The figures are for final stage.

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<u>4. Dam and reservoir.</u>	<u>Majalgaon Dam.</u>
i) Gross Storage.	444.45 Mm ³ (15.7 T.M.C)
ii) Dead Storage.	133.15 Mm ³ (4.7 T.M.C)
iii) Live Storage.	311.30 Mm ³ (11.0 T.M.C)
iv) Minimum Draw Down Level.	+ 426.11 (+ 1398.0 ft.)
v) Full Reservoir level.	+ 431.44 (+ 1415.5 ft.)
vi) Maximum Water Level.	+ 431.70
vii) Top of dam level	+ 435.00
viii) Area under submergence @ F.R.L.	7892 Ha
ix) No. of villages affected.	19 Nos. (2 Nos. deserted)
x) Maximum height of dam in the river bed.	30.5 M.
xi) Free Board.	3.40 M.
xii) Total quantity of earth work for the dam.	6914 Tm ³
xiii) Total quantity of	
Masonry:	210 Tm ³
Concrete:	43.40 Tm ³
xiv) Total length.	
(a) Earthen dam on left flank.	1002 M.
(b) Masonry Dam.	468 M.
(c) Earthen dam on right flank.	5550 M.
xv) Spillway.	
(a) Type	Ogee, with 28 gates (12 M x 5 M)
(b) Designed flood	9600 Cumecs.

(xv)

- (c) Depth over crest from the design flood. 5 M.
- (d) Length of spillway. 417 M. (including 27 piers : 3 M. thick)

xvi) Outlets

- a) Location. Right Flank @ Ch:172
- b) Type Details not worked out.
- c) Full supply discharge. 100 M³/Sec.
- d) R.L. of outlet sill. + 424.70

* Note:- Paithan reservoir is included in Stage-I.

5. <u>Canals.</u>	<u>Paithan Right Bank Canal.</u>	<u>Majalgaon Right Bank Canal</u>
1) Full supply discharge at head in Cumecs.	63.71	82.63
2) Length in Kms.	132.56	165
3) Section at head.		
a) Bed width at head in metres	9.14	8.50
b) Side slopes	1½:1	2:1
c) Full supply depth in metres.	3.87	4.00
d) Free Board in metres.	0.90	0.90
4) Description	Both the canals are lined and perennial.	

6. Command area (Ha)

	<u>Paithan R.B. Canal.</u>	<u>Majalgaon R.B. Canal.</u>	<u>Total</u>
I) Gross command area.	59,892	1,31,520	1,91,412
II) Culturable command Area.	53,910	1,19,400	1,73,310
III) Net irrigable area.	41,682	93,885	1,35,567

7. Irrigable Command Area Talukawise (Ha)

<u>District.</u>	<u>Taluka.</u>	<u>Paithan R.B. Canal.</u>	<u>Majalgaon R.B. Canal.</u>	<u>Total</u>
Aurangabad.	Paithan	1732	-	1732
Ahmednagar.	Shevgaon	1690	-	1690
Bhir.	Gevrai	24060	-	24060
	Majalgaon	14200	28300	42500
Parbhani.	Gangakhed.	-	58385	58385
Nanded.	Kandhar.	-	7200	7200
Total		41682	93885	135567

8. Irrigation Crop Pattern (Ha)

<u>Sr. No.</u>	<u>Crops.</u>	<u>%</u>	<u>Paithan R.B. Canal.</u>	<u>Majalgaon R.B. Canal.</u>	<u>Total</u>
1.	Sugar cane.	3	1250	2718	4068
2.	Other perennials.	1½	625	1409	2034
3.	Paddy.	5	2085	4695	6780
4.	L.S.Cotton	37½	15635	35210	50845
5.	Rabi Seasonals	51	21225	47875	69130
6.	Hot Weather Seasonals.	2	832	1878	2710
Total			41682	93885	135567

Intensity of Irrigation - - - 77%
 (Ratio of cropped area to culturable area).

9. Normal Rain fall in the command.

<u>Months.</u>	<u>Rainfall (mms)</u>
June	139.70
July	165.10
August	139.70
September	190.70
October	45.72
November	22.86
December	7.62
January	5.08
February	5.08
March	5.08
April	12.70
May	15.24
	<hr/>
Total	754.58
	<hr/>

10. Soils in the command.

The percentages of the shallow soils, medium soils and deep soil area are as under :-

	<u>Paithan Right Bank Canal.</u>	<u>Majalgaon Right Bank Canal.</u>
Shallow soil area	18.88%	21.70%
Medium soil area	11.31%	23.40%
Deep soil area.	69.81%	54.90%

11. Existing Pattern of cultivation

	<u>Crop.</u>	<u>Percentage.</u>
1)	Rice.	0.74
2)	Wheat.	3.30
3)	Sugarcane.	0.21
4)	Kharif Jawar.	8.00
5)	Rabi Jawar.	24.80
6)	Bajra.	7.50
7)	Maize	0.44
8)	Gram.	3.32
9)	Other T.S. (Tobacco etc.)	0.01
10)	Ground Nut.	3.16
11)	Other oil seeds.	8.60
12)	Cotton.	21.45
13)	Pulses.	19.47

12. Details of duty and deltas at distributary head for the proposed irrigated crops.

Crop.	<u>Duty (Ha/Cumec)</u>			<u>Delta (mms)</u>			
	Khariif	Rabi	Hot Weather	Khariif	Rabi	Hot Weather	Total
1. Sugar cane.	1358	1000	714	77.72	106.68	145.80	330.20
2. Other peren- nials	2358	1500	1072	45.20	71.12	97.04	213.36
3. Paddy	1286	5716	-	82.04	18.79	-	100.83
4. L.S. cotton	5144	8574	2286	20.57	12.44	45.73	78.74
5. Rabi Seaso- nals	-	2858	-	-	38.10	-	38.10
6. Hot Weather Seaso- nals	-	-	1429	-	-	73.66	73.66

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13. Utilisation @ Canal head (Mm³)

	<u>Kharif</u>	<u>Rabi</u>	<u>Hot Weather</u>	<u>Total</u>
Paithan Right Bank Canal.	74.71 (2.64)	138.67 (4.90)	118.01 (4.17)	331.39 (11.71)
Majalgaon Right Bank Canal.	159.90 (5.65)	303.38 (10.72)	253.57 (9.96)	716.85 (25.33)
	-----	-----	-----	-----
Total:-	234.61 (8.29)	442.05 (15.62)	371.58 (13.13)	1048.24 (37.04)

14. Cost of the Scheme Rs. in lakhs

A) Direct charges.

1) Head Works	1825.00
2) Canals and distributaries.	5649.66
3) Other charges Establishment, ordinary T & P. etc.	710.20

Total:- 8184.86

Deduct receipts and recoveries: 371.15

7813.71

B) Indirect charges. 11.29

Total:- 7825.00

15. Cost per hectare of cropped area. .. Rs. 5772.

16. Benefit cost ratio .. K. 2.55

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