

## CHAPTER 3

### PROGRESS OF TULSHI PROJECT

#### 3.1 PROJECT SITE

In Kolhapur district, Radhanagari project is only one major project. It is a hydro-electric project and water releases from the storage is based for the electric power generation, so that a small portion of water is available for irrigation. In this area, Bhogawati, Panchaganga and Tulshi are the main rivers. From these rivers, some portion of water was lifted for irrigation, but it was not enough due to seasonal flow of the rivers. In Radhanagari taluka, most of the farmers formerly used private pumps for irrigating their lands in Tulshi valley. However, available irrigation in Tulshi valley was inadequate for agricultural use because of lean flow of water in the river, especially during the post-monsoon days. This had an adverse effect on the cropping pattern in the region as also on the crop productivity. The river valley had the agro-climatic potentialities for a changeover to better quality crops and multiple cropping, if perennial water supply was available. A positive change in the cropping pattern would help in improving the economic environment of the region. This viewpoint had a strong bearing on the government's decision to undertake the project.

The river Tulshi originates from the secondary ridge of the eastern stage of the western Ghats of the Sahyadri near

village Dhangarwadi in Radhanagari taluka of Kolhapur district at an altitude of 990 metres above mean sea level. After a total run of 35.4 kms., it merges into Bhogawati river near village Beed in Karvir taluka of Kolhapur district. The lower reach of the river was very suitable for storing water. On account of flat bed slopes, it had made lift irrigation possible. But because of lack of perennial flow of water, available reservoir was temporary. Hence, cultivators could not get adequate volume of water to sustain evergrowing cultivation of sugarcane, especially during summer. This site of the river was found suitable for the project. Importantly, in between the villages Burambali and Kanchanwadi, for a length of about 11.26 kms., no regular rock was exposed in the river bed. Therefore, a site near Burambali village was selected for the dam across the river Tulshi.

The Tulshi Project Report was submitted to the Investigation Circle, Pune. The Investigation Sub-division surveyed five alternative sites at various locations; they were: (1) up-stream of Dhamod, (2) between Dhamod and Ladewadi, (3) between Ladewadi and Kote, (4) at Chande and, (5) at Ghungurwadi. Initially, the Project was contemplated to envelope the command areas of Tulshi valley as well as Bhogawati valley with irrigation potential by flow irrigation to the tune of 6,555 hectares. But later on, the scheme was modified. Detailed submergence survey was taken for the first three sites. It was finally decided to irrigate the command area by lift rather than flow irrigation because lift irrigation was popular in the

region and secondly, because the project would save completely the construction and maintenance cost of canals. Detailed surveys of the three sites ultimately led to the selection of site number 1, up-stream of village Dhamod.

**Table 3.1**  
Salient features of Tulshi Irrigation Project

Sr. No.	Items	Details with metric units
1.	2.	3.
1	Scope of the Scheme	A lift irrigation project with storage on Tulshi river near Burambali, irrigating of land in Tulshi valley only.
2	(A) Source	Tulshi river, a tributary of Panchaganga in Krishna basin.
	(B) <u>Location:</u>	
	i) State	Maharashtra
	ii) Region	Western Maharashtra
	iii) District	Kolhapur
	iv) Taluka	Radhanagari
	v) Latitude	16°-31'-15"
	vi) Longitude	74°-1'
3	Upstream Utilization	About 0.5 M.Cu.m.
4	Yield and utilization on the project	104.36 M.cu.m. 73.26 M.cu.m.
	i) Catchment area above dam	34.92 sq.km.
	ii) Average annual runoff	132.24 M.cu.m. (4669 M.cu.ft.)
	iii) 75% dependable runoff	104.34 M.cu.m. (3685 M.cu.ft.)
	iv) Gross annual utilization	73.26 M.cu.m. (2587 M.cu.ft.)
	v) Percentage of average annual utilization to average runoff	55% of average yield

1.	2.	3.
5	<u>Dam and Reservoir</u>	
i)	Gross capacity of reservoir of F.R.L. 616.91	98.29 M.cu.m.
ii)	capacity of dead storage at M.D.D.L. at R:L 591.31	6.37 M.cu.m.
iii)	Capacity of live storage	91.92 M.cu.m.
iv)	Max.water level A.H.F.L.	616.92 M.
v)	Carryover 22 days	5.15 M.cu.m.
vi)	Evaporation losses Fair weather	7.78 M.cu.m.
vii)	Area under annual submergence F.R.L.R. L. 616.91	353 hectares
viii)	Type of dam	Earthen dam with ogee shape masonry weir on left bank saddle
ix)	Max. height of dam	48.63 M.
x)	<u>Total quantity</u>	
	(A) Earth work	2.406 M.cu.m.
	(B) Concrete	0.010 M.cu.m.
	(C) Masonry	0.100 M.cu.m.
xi)	(a) Length of dam	1512 M.
	(b) Length of W.W.	198 M.
xii)	Free board	2.49 metres.
xiii)	<u>Waste Weir</u>	
	(a) Type	Ogee shape masonry
	(b) Design flood as per Inglis	640 cu.m./sec.
	(c) Depth over crest R.L. 611.60	8.40 metres

1.	2.	3.
xiv) <u>Outlet</u>		
(a) Location sill R.L.	At middle, two piers of	
589.79	waste weir	
(b) Type	R.C.C. conduit	
(c) Full supply discharge		
required	2.7 cu.m./sec.	
<u>Command Area</u>		
(a) Gross command area	<b>3,462 hectares</b>	
	4,757 hectares*	
(b) Area under existing		
wells and M.I.works,		
if any	36.01 hectares	
(c) Irrigable area	<b>2,800 hectares</b>	
	4,720 hectares*	

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Note: \*Indicates revised figures.

Source: Tulshi Project Report, May 1973.

### 3.2 CONSTRUCTION OF THE PROJECT

The work of Tulshi irrigation project was started in the year 1965 and practically completed in the year 1978. The main features of the project are as follows:

- (1) Dam: Total length of the dam is 1,512 metres, which includes 1,314 metres length of earthen dam and 198 metres length of masonry portion with spillway (waste weir). The height of the earthen dam in the deepest river bed is 48.63 metres. The top width of earthen dam is 6.0 metres, upstream slopes 2.5:1 upto R.L. 609, 3:1 upto R.L. 598, 3.5:1 upto 589 and 4:1 upto ground level.

The down-stream slopes are 2:1 upto R.L. 609, 2.5:1 upto R.L. 598, 3:1 upto R.L. 589 and 3.5:1 upto ground level. The width of berms is 12 metres on upstream side and 6 metres on down-stream side.

- (2) **Waste weir:** The central controlled-gated masonry spillway is provided. The length of masonry portion including key portion is 198 metres and provided with 3 radial gates of 12 metres x 5.5 metres, which are electrically operated.
- (3) **Kolhapur-type weirs:** Seven Kolhapur-type weirs are constructed at: (i) Dhamod, (ii) Kote, (iii) Ghungurwadi, (iv) Kanchanwadi, (v) Bhatanwadi, (vi) Bachani, and (vii) Are. Additional three Kolhapur-type weirs are proposed to be constructed at: (a) Chande, (b) Beed, and (c) Rukadi. Of these, the Rukadi weir has been completed recently and the remaining two, Chande and Beed, are under construction.

### 3.3 COMMAND AREA

The command area means the area benefited by the Project. The total gross command area in Tulshi valley is 23 metres lift on both the banks of the river. The command area covers portions of Radhanagari and Karvir talukas. Details of the command area are given in Table 3.2

Table 3.2 indicates that the total gross command on both banks of the river is 3,421 hectares. Average percentage of culturable area to the gross commanded area is

**Table 3.2**  
Gross command area of Tulshi Project

Sr. No.	Taluka	Gross Command Area (in hectares)	% of culturable to gross area	Culturable area in hectares	% of irrigable area to culturable area	Irrigable area in hectares
1.	Radha-nagari	526	92.5	492	90	445
2.	Karvir	2,895	90.0	2,612	90	2,355
	<b>Total</b>	<b>3,421</b>	<b>90.5</b>	<b>3,104</b>	<b>90</b>	<b>2,800</b>

Source: Tulshi Project Report, May 1973.

90.5 (3,104 hectares) and the irrigable area is 90 percent of the culturable area (2,800 hectares). Due to additional Kolhapur-type weirs, the total command area increased from 2,800 hectares to 4,720 hectares. Under the command area, 22 villages are covered. Table 3.3 shows the village-wise population, land use and actual irrigation done in the year 1987-88 as per the records of the Irrigation Department, Kolhapur. In the command area, the population was 23,903 in 1961; it increased to 36,433 in 1981, registering an increase of 52.46 percent in two decades. The total physical area of these 22 villages is 10,137 hectares and the distribution of land use in 1981 was as follows:

(A)	Area under forest	:	231.15 hectares
(B)	Area under irrigation	:	1,637.93 hectares
(C)	Unirrigated area	:	5,113.97 hectares
(D)	Culturable Waste	:	2,262.55 hectares
(E)	Non-culturable area	:	868.23 hectares

Table 3.3

Village-wise details of land use pattern in  
the common area of Tulshi Project

Sr. No.	Village	Taluka	Area in Hectares	Land Use (1981)				
				Forest	Irrigated	Un- Irrigated	Culturable Waste	Non- Culturable
1	Dhamod	R'nagari	1,300	-	48.00	1063.00	116.00	73.00
2	Chande	R'nagari	765	-	15.00	372.00	334.00	44.00
3	Ghungurwadi	Karvir	244	-	9.74	159.26	62.67	12.02
4	Malsawade	Karvir	527	-	45.50	145.75	290.75	45.12
5	Kanchanwadi	Karvir	252	-	60.15	13.50	50.15	128.25
6	Sonali	Karvir	263	-	60.35	115.75	65.10	21.55
7	Paterkarwadi	Karvir	80	-	50.25	20.15	5.15	4.14
8	Bhatanwadi	Karvir	89	-	52.60	25.15	4.15	7.25
9	Bachani	Karvir	486	-	140.20	306.40	-	39.10
10	Are	Karvir	270	-	137.30	90.37	25.14	10.34
11	Kote	R'nagari	1,078	-	8.00	416.00	603.00	51.00
12	Manjarwadi	Karvir	251	-	12.47	125.41	100.06	12.85
13	Ghanwade	Karvir	48	-	33.66	224.98	192.23	30.20
14	Arale	Karvir	451	-	43.40	232.22	152.50	22.62
15	Garjan	Karvir	191	-	25.17	103.73	48.68	13.11
16	Chopadi	Karvir	229	-	35.72	130.10	22.93	39.94
17	Mandhare	Karvir	249	-	29.07	147.43	40.20	18.56
18	Savarde	Karvir	294	-	69.50	131.02	66.97	26.23
19	Sadoli (D)	Karvir	317	-	67.40	178.95	40.42	29.86
20	Hirawade	Karvir	201	-	122.05	63.00	-	16.20
21	Shiroli (D)	Karvir	828	-	237.00	523.00	-	67.59
22	K. Beed	Karvir	1,291	231.15	335.40	526.80	42.45	155.30
<b>Total</b>			<b>10,137</b>	<b>231.15</b>	<b>1,637.93</b>	<b>5,113.97</b>	<b>2,262.55</b>	<b>868.23</b>

Sources: 1. Reports of Irrigation Department at Kolhapur,  
2. District Census Handbook of Kolhapur District, 1981.



Normally, rainfall in the command area is 2,286 mm. at dam site near Burambali and 1,270 mm. at the end of the command area near the confluence of Tulshi with Bhogawati river. The lands in the command are from medium to deep, well drained and fertile. In the command zones, both kharif and rabi crops are grown.

### 3.4 AREA SUBMERGED AND THE PROBLEM OF REHABILITATION

The total area under submergence in the first stage of the Tulshi Project, i.e. crest R.L. 611.60 is 554 hectares and in the second stage, after erection of gates, 664 hectares upto F.R.L. Under submergence, area covered by 328 houses from villages Burambali, Kelashi, Talegaon and Aptal having population of 1,694, are affected. These affected persons belonged to the agricultural class. The area under submergence is hilly with deep slopes. It is unculturable waste land. The affected villages lost their lands and houses. Hence, provisions for their rehabilitation on higher elevations and compensation for their lands have been made in the project estimate. Economic condition of the affected families was not satisfactory, as many of them were landless and those having some land, had most of it either uncultivated or cultivated under heavy strain. These families have been shifted in new Gaothans in the area of villages Dhamod, Bachani and Kagal. Many of the persons from the affected area willingly shifted in the catchmen area above the submergence, as they were conversant with the

products from the forest area. The affected families were paid their land cost through Land Acquisition Officer, out of the project funds. In addition, they were given compensatory land from 1 to 10 acres in the vicinity from the 'Mulkipad' (Government land) and by acquiring surplus land from the beneficiaries. Persons from the project-affected families were taken in the services of the Irrigation Department on the posts for which they were qualified. The Maharashtra Government provided many other facilities to the project-affected families, such as loans for housing, agricultural development works and development of small-scale industries. Besides, the Government also provided 5 percent reservation in the government services other than the Irrigation Department and for the purpose, a special employment section was opened in the office of the District Collector.

### 3.5 STAGES OF PROGRESS

The Tulshi irrigation project was administratively approved by the Government of Maharashtra under Government Resolution No.MIP/6365/47079-IP dated the 28th May 1965 and was later on, revised under Government Resolution, IP Department No.MIP-6365/47079-I(2) dated the 10th May 1973. The initial cost of the project was Rs.199.70 lakhs as per estimate approved by the Government in 1968, but it has increased to Rs.650.36 lakhs in 1973 and again to Rs.949.19 lakhs in 1988.

The work of Tulshi irrigation project was started in the year 1965 and practically completed in the year 1978. The project was considered for irrigation of 2,800 hectares and drinking water supply to Kolhapur city.

The project is principally divided into two parts; one is the main dam or storage dam and the other is construction of weirs on down-stream of the storage dam. The work of the main dam was started in the year 1970. The construction of dam is divided in the following components:

- (1) Earthen portion of main dam,
- (2) Earthen bunds in saddle portion,
- (3) Masonry portion in the river portion.

The masonry work is again divided in the following parts:

- (A) Non-overflow section (pillars and key wall),
- (B) Overflow section,
- (C) Irrigation outlet,
- (D) Energy dissipation arrangement.
- (E) Mechanical components:-
  - (a) Radial gates,
  - (b) Service and emergency gate,
  - (c) Hoisting arrangement.

The construction work of these various components is complete.

### Kolhapur-type weirs

Initially, before the commencement of the project, one weir at Koge in the command area already existed. Six weirs were under project provision. Construction of weirs was started and completed before the construction of the main dam. After completion of these weirs, additional three Kolhapur-type weirs, namely, Rukadi,, Beed and Chande, were in progress and one of them, namely, Rukadi, is functioning presently. Due to completion of these additional three weirs and modification of cropping pattern, the command area under the project has been enhanced from 2,800 hectares to 4,720 hectares. Table 3.4 gives the details of the Kolhapur-type weirs, which formed part of the Tulshi project.

**Table 3.4**  
Kolhapur-type weirs under Tulshi project

Sr. No.	Name of the K.T. weir	Cost (Rs. in lakhs)	Storage Capacity (in M. cu.m.)	Irrigation Potential in hectares	Year of Completion
1	Dhamod	4.27	0.0396		1977
2	Kote	2.11	0.0821		1978
3	Chande	19.72	-		Under construction
4	Ghungurwadi	1.83	0.336	4,720	1970
5	Kanchanwadi	2.61	0.374		1968
6	Bhatanwadi	2.03	0.488		1969
7	Bachani	2.06	0.377		1967
8	Are	1.77	0.424		1970
9	Beed	17.54	-		Under construction
10	Rukadi	30.00	-		May 1989

Sources: 1. Reports of Irrigation Department at Kolhapur  
2. The Tulshi Irrigation Project Report.

### 3.6 REQUIREMENT OF WATER AND WATER UTILISATION

Under the Tulshi irrigation project, water is made available through the lift irrigation system and not through the canal system. At Burambali, an earthen dam has been constructed. Its length is 1,512 metres and height 48.63 metres. At Burambali site, 67.96 M.cu.m. water is stored. Further, Kolhapur-type weirs are constructed at suitable places within a span of 24 miles from the dam site to the point of confluence of river Tulshi with river Bhogawati. Water is released from the main dam in the Kolhapur-type weirs and farmers on both the banks of the river lift water according to their requirement by installing their pumps. This is the water planning of the project.

#### Total available yield (quantities of water at the dam site):

The total annual runoff at the dam site is 132 M.cu.m. (4,669 m.cu.ft.) and 75 percent dependable yield (runoff) is 104 M.cu.m. (3,684 M.cu.ft.). After considering the post-monsoon flow of 290 M.cu.ft., storage in weirs of 89 M.cu.ft. and regeneration flow of 220 M.cu.ft., total available yield in the valley is 4,213 M.cu.ft. Out of this yield, the water supply in the valley (considered utilization for water supply) is 1,500 M.cu.ft. and losses in the valley are considered to be 295 M.cu.ft. Therefore, the net yield available for actual irrigation is 2,418 M.cu.ft. Relevant details in this context are presented in Table 3.5

**Table 3.5**  
Requirement of water for water supply

(A) Total available yield		
1	75% dependable	3,685 M.cu.ft.
2	Post-monsoon	219 M.cu.ft.
3	Storage in downstream weirs	89 M.cu.ft.
4	10% regeneration	220 M.cu.ft.
<b>Total</b>		<b>4,213 M.cu.ft.</b>
(B) Utilization		
1	Water supply	1,500 M.cu.ft.
2	Losses	295 M.cu.ft.
<b>Total</b>		<b>1,795 M.cu.ft.</b>

Source: Tulshi Irrigation Project Report.

From Table 3.5, water requirement for the modified cropping pattern for 1,000 acres is worked out at 204.30 M.cu.ft. Therefore, area irrigable from the available yield is estimated at 11,835 acres or 4,720 hectares. The season-wise utilization and storage of water is shown in Tables 3.6 and 3.7.

**Table 3.6**  
Season-wise Water Utilisation of Tulshi Project  
(in M.cu.ft.) (Irrigable area: 4,270 hectares)

Sr. No.	Item	Kharif	Rabi	Hot Weather	TOTAL
1	Irrigation	195 (23.96)	1,095 (64.53)	1,120 (66.12)	2,410 (57.31)
2	Water supply	501 (61.55)	506 (29.82)	493 (29.10)	1,500 (36.67)
3	Evaporation	118 (14.48)	96 (5.66)	81 (14.78)	295 (7.03)
<b>Total</b>		<b>814 (100.00)</b>	<b>1,697 (100.00)</b>	<b>1,694 (100.00)</b>	<b>4,205 (100.00)</b>

Note: Figures in parentheses are percentage of total.

Source: Report of Tulshi Irrigation Project.

Since the entire terrain of the project is within the stroke of the monsoon, it is but natural that relatively less water will be utilised for kharif crops. Therefore, during this part of the year, larger portion of water (61.55 percent) is utilised for supply of drinking water. Water for crops is utilised to mop up the deficiency on account of inadequate and untimely rains - utilisation of water for crops in the post-monsoon season is significant. On the whole, 57.31 percent of the available water goes for crop sustenance and nearly one-third for drinking water. Losses by evaporation are limited to 7 percent only.

Year-to-year rainfall, storage of water and its aggregate utilisation are shown in Table 3.7.

From Table 3.7, it is seen that during 1978 to 1990, the dam could be fully stored only twice, that is, 1980-81 and 1983-84. However, the quantum of water utilisation was maximum (110.49 M.cu.m. and 112.41 percent) in 1983-84. The following year 1984-85, stood second best. Overall average utilisation of water during 11 years between 1978-79 and 1988-89 was 82.75 percent. Not bad a performance indeed. Perhaps the utilisation of water has been affected greatly by the sharp fluctuations in annual rainfall in the tract and consequent variations in the amount of water stored. Percentage utilisation of water has moved in consonance of increase or decrease in rainfall with reference to the previous year. With higher rainfall than that in the last year, utilisation percentage has increased and vice-

**Table 3.7**  
Year-wise storage and water utilisation of Tulshi Project

Year	Rainfall (mm)	Max.level in lake	Min.level in lake	Storage in M.cu.m	% of storage	Inflow (M.cu.m.)	Utilisation (M.cu.m.)	% of Utilisation
1978-79	2,912.00	616.52	599.18	96.41	98.03	55.90	75.71	77.03
1979-80	2,142.00	616.26	589.80	94.98	96.63	72.42	69.83	71.04
1980-81	2,326.40	616.90	594.00	98.29	100.00	91.38	95.87	97.54
1981-82	2,022.80	614.77	591.00	87.50	89.02	92.22	81.16	82.57
1982-83	1,660.00	614.75	591.00	87.50	89.02	66.00	69.23	70.43
1983-84	2,351.60	616.90	590.00	98.29	100.00	111.31	116.49	112.41
1984-85	1711.80	614.91	591.48	88.19	89.72	102.62	96.00	107.80
1985-86	1,389.00	611.22	592.62	70.91	72.14	66.43	71.00	64.51
1986-87	1,460.60	612.21	593.91	75.36	76.67	63.48	76.00	77.32
1987-88	1,119.00	609.23	565.50	62.38	63.46	49.35	63.00	64.09
1988-89	1,550.00	613.91	592.15	83.32	84.76	74.49	84.00	85.46
1989-90	1,371.40	613.71	591.84	82.36	83.79	74.17	84.00	85.46
<b>Total</b>	<b>1,834.70</b>	<b>614.27</b>	<b>590.20</b>	<b>85.45</b>	<b>86.93</b>	<b>75.81</b>	<b>81.35</b>	<b>82.77</b>

Source: Record of Kolhapur Irrigation Division, Kolhapur.



versa. This is mainly for the reason that a part of the available water has necessarily to be spared for drinking purpose. This demand is almost steady; rather, it will be increasing through years because of increasing demand from the civil population. Water for agriculture then becomes a residual supply. Hence, the observed tendency in water utilisation from year to year.

### 3.8 COST OF THE PROJECT

The cost of the project was initially worked out to Rs.199.70 lakhs in 1965 before the construction of the dam and project work. But completion of the main dam (earthen dam, masonry portion) required the expenditure of Rs.650 lakhs upto 1973. After that, construction of additional Kolhapur-type weirs was taken up under this project to increase the command area from 2,800 hectares to 4,720 hectares. The final cost of the project is Rs.950 lakhs, break-up of the cost of various project activities is given in Table 3.8.

From Table 3.8, the sub-heads wise expenditure and their details are as follows:

- (1) The cost of the project works is 809.50 lakhs. By adding to it, the cost of establishment, office staff and labourers, total cost moved upto Rs.950 lakhs. The expenditure before starting of the dam and at the time of the construction of the dam, preliminary survey, soil survey, foundation, exploration, construction and material

survey exhausted Rs.6.50 lakhs under 'A' Preliminary.

- (2) Expenditure for land acquisition from submerged area as well as project area, dam site, Kolhapur-type weirs and rehabilitation of the affected persons was made under sub-head 'B' land (Rs.6.75 lakhs).
- (3) The expenditure on main dam, provided under 'C' works cost Rs.640 lakhs. Out of which the expenditure on earthen dam (portion) was Rs.280 lakhs, on the masonry portion was Rs.1.70 lakhs and on Kolhapur-type weirs Rs.1.50 lakhs. This expenditure includes the expenditure of additional Kolhapur-type weirs.
- (4) The cost of the construction of residential buildings and office buildings in Project Colony at dam site at Dhamod and at Kolhapur was Rs.34.0 lakhs.
- (5) The plantation had been taken at the down-stream side of the dam and the expenditure made for the purpose was Rs.0.50 lakhs.
- (6) The expenditure for the various items not coming under above sub-heads were grouped under 'Miscellaneous' (Rs.17.0 lakhs).
- (7) The expenditure on maintenance of machinery and buildings was Rs.23 lakhs.
- (8) The machinery taken by the Irrigation Department for the various works of the construction of the dam and colony required Rs.15.0 lakhs.
- (9) The various approach roads to dam and colony and internal roads in colony had been constructed under the

provision of 'communication' (Rs.9.0 lakhs).

One point is worth noting in this context. The entire project is designed to work with minimum possible cost. Importantly, the project has dispensed with the canal network and instead provided Kolhapur-type bunds at place for water storage. Consequently, substantial expenditure on construction and regular maintenance of the canals and loss of water through canal seepages is avoided. In a way, the river-bed itself has been treated as a canal.

### **3.8 MAINTENANCE OF THE PROJECT**

The maintenance of the project, namely, main dam, colony and Kolhapur-type weirs has been entrusted to one Sub-division and three sections. The headquarters of the Sub-division is at Radhanagari whereas maintenance sections are at Dhamod, Bhatanwadi and Koge. The work of these sections is to maintain the safety of the dam and the Kolhapur-type weirs. They take release of water from storage dam and store the water in various downstream Kolhapur-type weirs by plugging with wooden needles and black cotton soils. This forms temporary storage for lifting the water to fields for irrigation by private and co-operative lift irrigation schemes. The lift irrigation schemes are maintained privately or by co-operative societies. The expenditure of maintenance of the dam, colony and Kolhapur-type weirs is being made through the provision of maintenance grant of Irrigation Department. The maintenance

sections collect the data of crops taken in the command area by the farmers and finally, collect the irrigation charges from them through the co-operative societies.

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1. TULSHI DAM: EARTHEN PORTION.



2. TULSHI DAM : WASTE WEIR WITH GATES.



1000. KALASHEB KHARDEKAR LIBRARY  
SHIVAJI UNIVERSITY KOLHAPUR





### 3. KOLHAPUR TYPE WEIR AT DHAMOD.



### 4. COMMAND AREA OF TULSHI PROJECT - AN OVERVIEW.

