Canal Irrigation in Maharashtra: Present Status

Canal Irrigation in Maharashtra is mostly provided by Large Scale Public Sector Irrigation Projects (LSPSIP). Present status of Canal Irrigation from LSPSIP in the State can be studied from the Irrigation Status Reports (ISR) published annually by Water Resources Department (WRD), Government of Maharashtra (GOM). Report of Maharashtra Water & Irrigation Commission (MWIC), 1999 also helps in understanding the irrigation scenario in the State. This article presents data regarding availability of water for irrigation & its actual use. Next, it gives statistics regarding number of completed & on-going projects and expenditure for the same. The article then discusses important issues like Ultimate Irrigation Potential (UIP), Created Irrigation Potential (CIP) & Actual Irrigated Area (AIA). The article concludes that the picture of present status of canal irrigation in Maharashtra is neither complete nor clear; data & information given in Irrigation Status Reports being incomplete & unreliable. It suggests that LSPSIP may be brought under microscope to understand the ground situation & take corrective measures. Streamlining & disciplining LSPSIP is necessary, warranted & urgently called for.

Introduction

Present status of Canal Irrigation from LSPSIP in the State can be studied from the Irrigation Status Reports (ISR) published annually (in September) by Water Resources Department (WRD), Government of Maharashtra (GOM). This article refers to five ISRs. These 5 reports present data of 14 years i.e. from 1997-98 to 2010-11. Report of Maharashtra Water & Irrigation Commission (MWIC), 1999 has also been referred to understand the irrigation scenario in Maharashtra. In order to study the Canal irrigation in Maharashtra one needs to understand the logic of LSPSIP. Constraints of LSPSIP virtually define, shape & in fact, limit the performance of canal irrigation.

Large Scale Public Sector Irrigation Projects

LSPSIP in Maharashtra are Water-Infrastructure-Systems [WIS] which provide water not only for irrigation but even for non-irrigation purposes. These systems are highly complex Public Distribution Systems [PDS] comprising of several Techno-Socio-Economic-Legal [TSEL] processes expected (but not designed) to simultaneously achieve multiple & at times, even competitive / conflicting objectives. Existing WIS in Maharashtra are up stream controlled, manually operated, mostly open channel systems without water-control-situation [functioning control gates, cross regulators, measuring devices]. Implementation of Water Laws is virtually absent. Present performance of WIS is obviously an outcome of its original nature, system constraints & inherent characteristics. For example, the Overall Project Efficiency (OPE) assumed in the design of WIS normally ranges between 41 to 48% only! It is needless to say that the actual OPE is hardly 20 to 25% because of host of reasons. Any discussion on performance of canal irrigation in Maharashtra should not, therefore, ignore such real life system constraints. It would not be correct to expect something for which the system is not designed.

Availability of Water

Annual average availability of surface water in Maharashtra is 163.82 BCM (Billion Cubic Meters). Water allowed to use is, however, 125.936 BCM. This restriction is due to sharing of water of inter-state rivers. The storage capacity created through large[2] completed projects is 33.385 BCM. The so called gap between "Allowed to use" & "Storage capacity created" is due to non-availability of data in respect of (i) capacity created through local sector projects & (ii) capacity that could be created through on-going projects.

The current estimates of availability of surface water are as per present assumptions in hydrology & available science & technology. These estimates may further improve if better data are available regarding rainfall & river gauging.

Number of projects, created potential & investment

Table-2 presents information about completed & on-going state level as well as local sector projects. Total 47.37 L. ha potential has reportedly been created up to June 2010 through state level completed projects spending Rs. 48500 Cr. Similarly, 14.20 L. ha potential has been created through 65199 local sector completed projects. About 750 state level projects are still under construction & it is estimated that around Rs.75000 Cr. would be their balance cost. From Table-2, it is clear that ISRs are silent about the following:

1) Break up of project category-wise created potential of completed local sector projects

2) Potential that could be created through on-going projects

3) Break up of project category-wise investment in state sector projects

4) Investment in completed local sector projects

5) Lift irrigation schemes & storage tanks

In absence of above information the picture of irrigation status is neither complete nor clear. Considering the fact that WRD's annual budget is around Rs. 7500 Cr, the million dollar question is how & when the on-going projects, whose balance cost is Rs.75366 Cr, will be completed. If one considers the "well-set" pattern of time & cost overrun, habit of changing the scope of projects at will & ever increasing opposition to irrigation projects, one feels that these projects would perhaps never be completed.

Actual Water Use Actual water use in the year 2010-11 is presented in Table-3. Out of total reported water use, 57.84 % water has been used for irrigation & 22% for non-irrigation; evaporation being 20.16 %.

Water use as reported in ISR is silent about water use in Local Sector projects.

Significant percentage of "other use" in Non-Irrigation could be a matter of serious concern. Other use means use which is not planned for in water budget & officially not recognized as a separate category. Releases of water in river under pressure for political and or cultural/ religious purposes are generally reported as "other use".

In absence of scientific, actual & reliable measurement of water, credibility of everything reported under water use is questionable to say the least. Though the water theft is rampant & unauthorized use of water is an unfortunate reality, it is not reported at all in the ISRs. (On this background, Water Audit & Bench Marking of irrigation projects in Maharashtra is a separate & serious subject which deserves special & immediate attention.)

Table 2: Number of projects, created potential & Investment

Projects	Numbers	Created Potential	Investment
1.State Sector (completed) June 2010		(L. ha)	(Rs. Cr.)
Major	86	26.32	N.A.
Medium	258	8.46	N.A.
Minor	3108	12.59	N.A.
Total	3452	47.37	48500 (Mar 2010)
2.State Sector (on-going)			
Major	78	N.A.	N.A.
Medium	128	N.A.	N.A.
Minor	543	N.A.	N.A.
Total	749	N.A.	75366 (balance cost on April 2011)
3.Local Sector (completed)			
Percolation Tanks	23460	N.A.	N.A.
K.T. weirs	12283	N.A.	N.A.
Village tanks & underground bunds	26409	N.A.	N.A.
Diversion weirs	540	N.A.	N.A.
Minor tanks	2507	N.A.	N.A.
Total	65199	14.20	N.A.

Ultimate Irrigation Potential

Ultimate Irrigation Potential (UIP) as predicted (Table-4) by Maharashtra Water & Irrigation Commission (MWIC) is 126 L. ha (85 L. ha from surface water & 41 L. ha from ground water). Assumptions made by MWIC for arriving at its estimate of UIP are presented in Table-5.

Though assumptions made by MWIC, prima facie, appear to be scientific & reasonable, following points deserve consideration:

1) Water for irrigation is being increasingly diverted for non-irrigation purposes & hence, significantly less volume of water would be actually available for irrigation.

2) Basin / sub-basin wise planning of irrigation, as suggested by MWIC, have not been implemented so far in the State. Chances of its implementation appear to be nil in near future.

3) Since supply side solutions are being promoted by WRD & so called irrigation experts, demand side management has not been taken seriously by all concerned. Hence, modern methods of irrigation are not being adopted.

4) Water saved through efficient / modern methods & reuse may not bring additional area under irrigation. It may increase number of rotations & or it may promote perennial crops in the same area for the same individuals; equitable distribution of water is not on the agenda of WRD. It does not implement its own Water Laws.

5) There is hardly any coordination between various departments related to water. Every department has its own method of reporting water use & area irrigated. Logic demands that format for reporting potential created & actual area irrigated should match to the format of recommendations of MWIC regarding UIP (i.e.Table-4). However, such a format does not exist. And, therefore, it is practically impossible to draw any scientific conclusion regarding UIP, CIP & AIA together.

Created Irrigation Potential (CIP) Theoretically speaking, Irrigation Potential is said to be CREATED only when the project is complete. MWIC in its report (Vol.-1, para 5.7, `Completing incomplete projects') has defined "Completed Project". As per that definition completing a project means following:

1) Actual handing over of the project from construction organization to management organization as per the technical circulars of WRD, GOM

2) Verification of design carrying capacity of canals & distribution network by actual flow measurement and issuing formal certificate regarding the same.

3) Completion of Techno-Socio-Economic-Legal (TSEL) processes for proper O & M of the project.

4) Formal acceptance of Project Completion Report by WRD, GOM

5) Formal issuance of notification by WRD, GOM to declare that project is complete & then official handing over of project to the State/Nation.

MWIC further says that a project is said to be complete if it achieves the objectives assumed in its design. In short, what matters is completion of processes & thereby achieving results & not mere

Table 3 : Actual water use in 2010-11 (Mcum)

Description	Water use	Remarks
Design storage of completed projects	33385	
Actual Live Storage as on 15th Oct 2010	27309	
Evaporation	5383	20.16 %
Non-Irrigation	5876	22.00 %
Irrigation	15447	57.84 %
Total	26706	100 %
Break-up of Non-Irrigation water use		
Drinking	3260	56%
Industrial	656	11%
Other uses	1960	33%
Total Non-Irrigation	5876	100%

Table 4: Ultimate Irrigation Potential (L Ha.)		
Sr.No	**Description**	**Potential**
A	**SURFACE WATER**	
1	From the use of reservoir water	56
2	From the use of rain water infiltrated in the command areas	08
3	From the reuse of water given for non-irrigation	03
4	From the use of water saved by adopting modern methods of irrigation like drip, sprinkler, etc	05
5	From the use of canal water percolated in wells in the command areas	08
6	From the use of water saved in the command areas by adopting efficient methods of irrigation	05
	Total A	85
B	**GROUND WATER**	
1	From the areas where water conservation works have been carried out	24
2	From areas where water conservation works are not possible	09
3	From the use of saved water from areas outside the command areas by adopting modern methods of irrigation	07
4	From the use of water saved in the areas outside the command areas by adopting efficient methods of surface irrigation	01
	Total B	41
	Total A & B	126
	Assuming 90% intensity of irrigation, UIP in terms of CCA	140

Table 5: Assumptions made by MWIC to arrive at UIP		
Sr.No.	**Description**	**Details**
1	Water available for irrigation	1,12,568 Mcum
2	Sub basins 1 to 19 (excluding 8 & 9)	
	*For seasonal crops in Kharif & Rabi seasons	Water Requirement (cum/ha)
	-Flow Irrigation	4000 - 5770
	-Modern Irrigation	2400
3	Sub basins 8, 9 & 20 to 25	
	*For perennial crops	Water Requirement (cum/ha)
	-Flow irrigation	11000 -13500
	-Modern Irrigation	6000
4	Irrigation Methods (proportion)	Flow (75%), Modern (25%)
5	Overall project efficiency	42.5%

Table 6: Annual Increase in Design Storage & Central Irrigation Potential (CIP)				
Year	**Design Storage**	**CIP-Major & Medium Projects**	**CIP- Minor Projects**	**CIP-Total**
1998-99	1184	1,66,000	22,000	1,88,000
1999-00	4	33,000	51,000	84,000
2000-01	32	1,48,000	58,000	2,06,000
2001-02	1314	43,000	20,000	63,000
2002-03	653	26,000	17,000	43,000
2003-04	125	25,000	26,000	51,000
2004-05	49	45,000	5,000	50,000
2005-06	221	67,000	23,000	90,000
2006-07	421	53,000	76,000	1,29,000
2007-08	632	1,24,000	75,000	1,99,000
2008-09	2918	1,04,000	51,000	1,55,000
2009-10	140	1,17,000	31,000	1,48,000
2010-11	174	61,000	42,000	1,03,000

completion of construction! If this definition of completed project is to be adhered to then there is hardly any irrigation project in Maharashtra which is complete in the truest sense of the term.

It is an unfortunate fact that in most of the projects, irrigation potential is declared as CREATED even if the canals & distribution network and works related to command development are incomplete. Political expediency overtakes engineering principles. Instead of creation of potential, "creation of statistics" becomes more important. Annual increase in Design Storage & Created Potential for last 13 years is presented inTable-6 which is based on five ISRs mentioned earlier. [Pl. also see Graphs 1 & 2]

Table-6 & Graphs 1 (Year-wise storage developed) & 2 (year-wise increase in potential) reveal following:

1) There is no apparent correlation between annual increase in design storage & CIP

2) Annual increase in design storage & CIP is not uniform over the period. It varies drastically.

3) The reported annual increase in both the parameters, in some of the years, is unbelievable. It is either too less or too large than normally expected.

4) Annual increase in `CIP –Minor Projects' is comparatively more than `CIP-Major & Medium Projects' in at least three years

5) Accuracy of reported statistics is doubtful in view of points 1 to 4 given above.

ISRs don't give any explanations about the discrepancies in data. ISRs unfortunately only `report' & don't analyze. The reporting is too mechanical & hence, appears to be only a formality to be completed- a sort of an annual ritual for WRD! That's all!!

CIP changes with time There is one more important aspect regarding CIP which further complicates the discussions on present status of Canal Irrigation. CIP of irrigation projects changes with time due to following reasons:

1) Reduction in yield due to up- stream abstractions

2) Encroachment of silt in the live storage of the reservoirs

3) Diversion of water from irrigation to non-irrigation

4) Increase in losses due to evaporation, seepage, leakage, etc

5) Conversion of irrigated land into Non-Agriculture(NA) land7) Diversion of water from seasonal crops requiring less water to perennial crops requiring more water.

It is necessary to periodically revise irrigation potential considering above facts & officially reduce & de-notify area under irrigation. However, this is never done for political reasons. Moreover, since M & R (Maintenance and Repair) grants are based on area, reduction in potential means reduction in M & R grants too! Obviously, no politician or officer would ever agree to revise the potential. More area & shortage of water is also an opportunity for corruption!

Actual Irrigated Area (AIA) Data of AIA for last 14 years is available in ISRs. That data is presented in Table-7 (Pl. See Graphs 3 & 4 also). Table-7 & Graphs 3 & 4 reveal following:

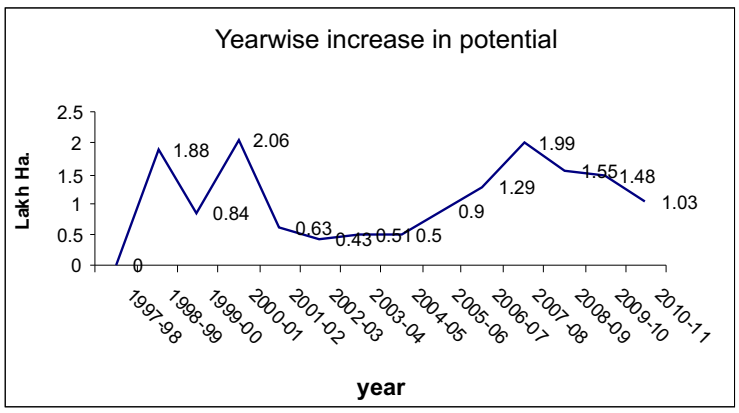
1) There is no apparent correlation between variation in live storage & area irrigated.

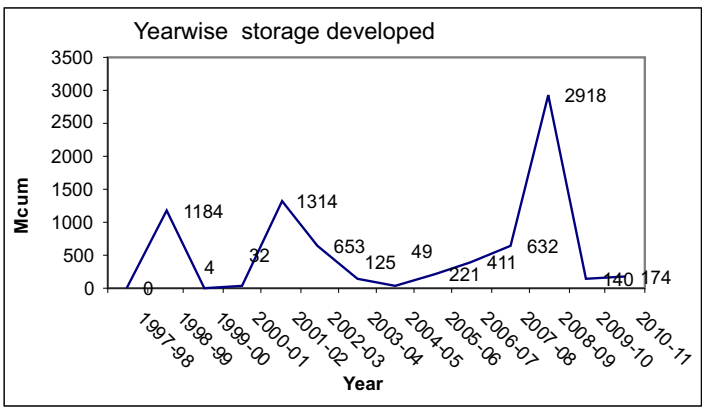
2) AIA is significantly less as compared to CIP & Total Cultivable Area.

- Average AIA (Canal + well) is 53.7% of CIP.
- Average AIA (only canal) is hardly 37.3%

Table 7 : Analysis of Area Irrigated (L Ha)

Sr No	Year	% Live Created Potential	Area storage available on 15 Oct (Mcum)	Area Irrigated (Canals)	Total Irrigated (Wells)	% of Total Area (Canals+ Wells)	% of Total Area Irrigated wrt Created Potential	% of Are Irrigated wrt Total cutivable Area (225.48 L.ha)	% of Area Irrigated Canal wrt Total Cultivable Area	Irrigated on Canal wrt Created Potential
1	1997-98	32.28	65	12.02	4.75	16.77	52.0	7.4	5.3	37.2
2	1998-99	34.16	87	12.25	4.71	16.96	49.6	7.5	5.4	35.9
3	1999-00	35.00	85	12.86	5.84	18.7	53.4	8.3	5.7	36.7
4	2000-01	37.06	71	12.98	4.66	17.64	47.6	7.8	5.8	35.0
5	2001-02	37.69	63	12.5	4.58	17.08	45.3	7.6	5.5	33.2
6	2002-03	38.12	66	13.18	5.24	18.42	48.3	8.2	5.8	34.6
7	2003-04	38.63	59	12.44	4.41	16.85	43.6	7.5	5.5	32.2
8	2004-05	39.13	63	12.59	4.4	16.99	43.4	7.5	5.6	32.2
9	2005-06	40.03	85	16.17	5.97	22.14	55.3	9.8	7.2	40.4
10	2006-07	41.32	92	18.35	8.46	26.81	64.9	11.9	8.1	44.4
11	2007-08	43.31	84	18.97	8.67	27.64	63.8	12.3	8.4	43.8
12	2008-09	44.86	75	18.25	9.07	27.32	60.9	12.1	8.1	40.7
13	2009-10	46.34	58	16.56	8.87	25.43	54.9	11.3	7.3	35.7
14	2010-11	47.37	82	18.41	11.14	29.55	62.4	13.1	8.2	38.9
	Minimum	32.28	58	12.02	4.4	16.77	43.4	7.4	5.3	32.2
	Maximum	47.37	92	18.97	11.14	29.55	64.9	13.1	8.4	44.4
	Average	39.7	74	14.82	6.48	21.31	53.2	9.4	6.6	37.2





of CIP.

• Average AIA (Canal + well) is 9.4% of Total Cultivable Area.

• Average AIA (only canal) is 6.4% of Total Cultivable Area.

(N.B. - WRD, GOM should take credit only for AIA by canal irrigation. Well irrigation is neither legally notified nor officially provided for in WRD's water budget. WRD does not supply water for well irrigation. Water tariff on well irrigation though provided for in Maharashtra Irrigation Act, 1976, has also been waived off.)

There are, of course, some valid reasons to explain why AIA is significantly less as compared to CIP & Total Cultivable Area:

1) Water from irrigation projects is mainly given to sugarcane which requires large volume of water. Out of total area under sugarcane in the State as much as 54% area on an average (period 2005-06 to 2010-11) is in the command of irrigation projects as per ISRs.

2) Average season wise AIA is as follows: Kharif (28.7%), Rabi (38.43%), H.W. (11.06%), Two seasonal (3.66%), Perennial (18.15%). Total AIA obviously gets reduced when AIA in HW & that under perennial crops increases.

3) Annual actual water use per ha in many irrigation projects is 1.5 to 4 times that of the norms officially accepted for Benchmarking; overall project efficiency being hardly 20-25%. (Reports on Benchmarking are available on WRD's web site).

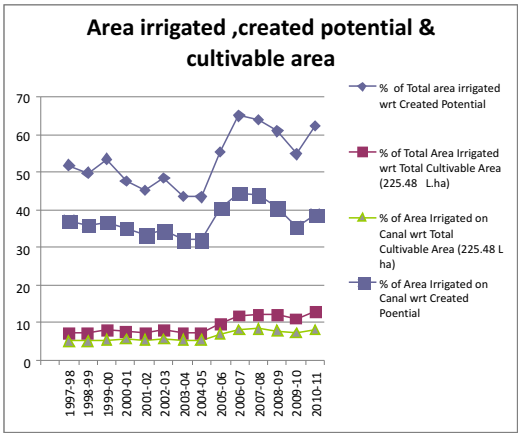
4) Lift irrigation from reservoirs, rivers & canals has been significantly increased. But most of it is generally not reported & brought on record.

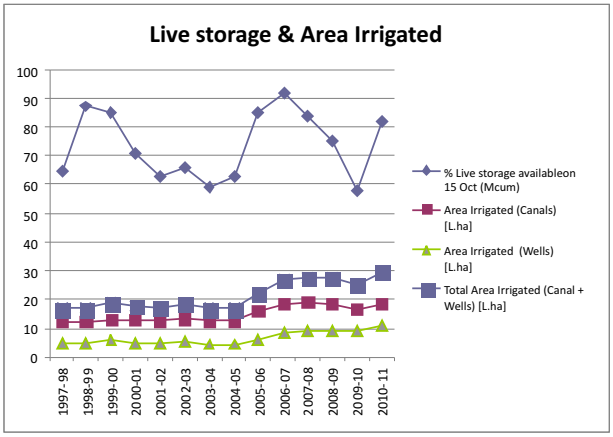
5) In order to avoid payment of water tariff many irrigators claim that they use water from their own wells & not the canal water. GOM has waived off water tariff on irrigation on wells in the command area.

6) Significant volume of water has been diverted from irrigation to non-irrigation.

7) Neither AIA nor water utilized is actually measured. WRD's records, therefore, are not at all reliable & scientific. Its credibility is doubtful

8) In absence of implementation of water laws there is hardly any control over water distribution & use. Theft of water & unauthorized irrigation is a rule rather than exception.





Conclusions

1) The picture of present status of canal irrigation in Maharashtra is neither complete nor clear; data & information given in Irrigation Status Reports being incomplete & unreliable.

2) There is scope to believe that projects reported as `completed' are, in fact, not complete in the truest sense of the term.

3) There is also scope to believe that potential said to be created is, in fact, not really 100% created in the truest sense of the term.

4) Revision of irrigation potential may reveal that actual irrigation potential is drastically different from that of declared potential.

5) Actual irrigated area would be significantly different than reported area if irrigation management in the State is streamlined & disciplined.

6) If data & information given in Irrigation Status Reports is to be "believed" then following is the status of canal irrigation in Maharashtra (2010-11):

a) Ultimate Irrigation Potential (Surface water): 85 L.ha (break up as State & local sector: N.A.)

b) Created Irrigation Potential (State sector): 47.37 L.ha

c) Actual Irrigated Area (Canal irrigation/state sector): 18.41 L.ha (i.e.39% of CIP)

d) Investment on completed (!) state sector projects: Rs. 48500 Cr

e) Balance cost of 749 on-going state sector projects: Rs. 75500 Cr(approx.)

[N.B.: Expenditure on M & R, special repairs, emergency maintenance, rehabilitation of systems & establishment is a separate issue which is not discussed here.]

7) Local sector irrigation appears to be the blind spot because its actual irrigated area & expenditure incurred on the same have not been reported in Irrigation Status Reports. Simply reporting created potential would not suffice.

Recommendation

LSPSIP may urgently be brought under microscope. Streamlining & disciplining LSPSIP is necessary, warranted & called for.

References:

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2. WRD,GOM, "Report of Maharashtra Water & Irrigation Commission", 1999

3. Pradeep Purandare, Articles in Marathi Weekly "Aadhunik Kisan", Aurangabad (Feb – July,2012)

4. Pradeep Purandare, Article in Marathi Daily "Loksatta" on Water Audit, 22 Mar 2012

Pradeep Purandare

References

1: Retired Associate Professor, WALMI, Aurangabad, Maharashtra, India, pradeeppurandare@gmail.com

2: Reliable figure of water storage capacity available from smaller projects is not available, though the figure is likely to be substantial.