

## *Indicators of Performance of Irrigation Projects*

### **11.0 GENERAL**

So far much have been discussed about the efficiency and productivity of irrigation projects, efficient operation of reservoir, canals, water courses, warabandi, methods of irrigation, crop water requirement, irrigation scheduling etc. But **what is the use of it unless and until it becomes an extensive field practice?** Almost all engineers and agricultural officers, feel that all of it is theoretical or of academic interest or for any degree course and do not feel it of much use in the field. If it is so what is use of such theory? In fact this should not be taken so and is actually meant for the benefit of irrigated agriculture, increase the crop yields, decrease water consumption and solve many other problems. Again this is not easily possible, unless and until our attitude changes to monitor the projects and WUA on regular basis, evaluated and reported. Some past experiences of huge efforts made for improvement are narrated below.

### **11.1 PAST EFFORTS AND EXPERIENCES**

#### **11.1.1 Establishment of command area development authority (CADA)**

In the year 1972, soon after realizing, the low performance and short comings of irrigation projects huge programs under one common authority of irrigation and agriculture (CADA) with very high responsibilities and functions of water management of command area development (CAD) were established. In the laws enacted for Command area Development, most states provided for village

level committees consisting of water users and villages. Thousands of committees were formed but hardly anyone survived. They were given many responsibilities, but not the authority or the resources to enforce decisions. Huge money was spent in lining of canals, construction and lining of water courses. Though it achieved something, still the overall performance remained low and some places became the forum of blame on each other, see figure 1.6 b to 1.6 d. The authority could not hold officials of DOA and WRD accountable. The performance evaluation and realistic limitations could not become their objective. These are still functioning without achieving much of their objectives.

#### **11.1.2 Establishment of IMTI / WALMI**

From the year 1982, it was realized that joint inter disciplinary training of agriculture and WRD and that of the farmers is required. So IMTI and WALMIs were established. Training was imparted to individual line department, as well as jointly / collectively to agriculture and irrigation departments and also to farmers. Various methods of trainings such as class room, field visits, Diagnostic analysis in the field, workshops and seminars, video cassettes, small films and many other approaches were adopted.

Huge money was spent and is still being spent in training. The concept of farmer's involvement, "Diagnostic analysis" came in some practice in the training institutes. Many of the concepts discussed in the previous Chapters were taught in isolation,

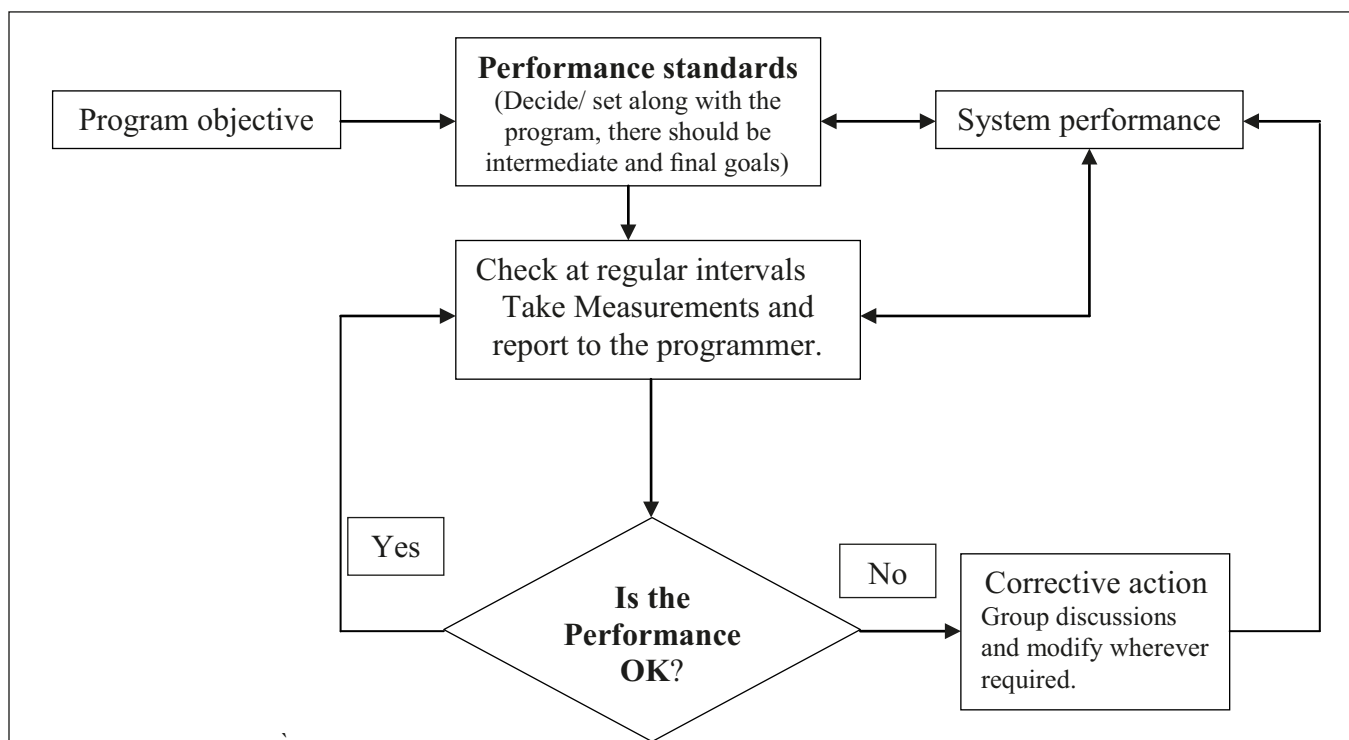
but the officers on return to the fields, felt that it cannot be used in the fields. They ignored their individual as well as joint responsibilities of improving the actual farm/ the field (see Chapter 3 and 6) and continued their work in their water tight departments with isolated schemes (also see paragraph 10.7.4) and much of the expected efficiency and objectives could not be achieved. But its impact is that only importance of PIM could be realized and not much could be achieved in the field. Still they prefer to work in their water tight departments, **blame each other** (see figure 1.6) and try their best to ignore the performance evaluation, answerability and accountability.

### 11.1.3 Enactment of PIM acts and formation of WUAs

From the year 1988, more importance of farmer involvement in irrigation management started being

felt. Attempts were made to establish WUAs and some were established, but could not perform well (many reasons) and soon became defunct. Actual breakthrough came from the year 1997 with the enactment of legislations for involvement of farmers (see Chapter 10). Still up to the year 2015 the monitoring, guidance, help and performance evaluation could not become the objective of either department.

The success of any program depends upon the qualitative measurement of performance as shown in figure 11.1, which is self explanatory. Standards of performance expected or required must be very clearly stated while initiating any program which may be new or modification for improvement. In an irrigation project these can be easily measured as discussed in tables 11.1 to 11.8.



**Figure 11.1 Monitoring and Measurement of performance of program objective**

*Notes to figure 11.1*

1. Senior and top authorities are not simply to monitor plan expenditure or physical progress in terms of numbers and feel satisfied (also see paragraph 10.7.4) . They must measure and monitor the aims of the program and take remedial measures for short comings.
2. In irrigated agriculture, water required and applied can be easily accounted. Similarly research centers must report with respect to water.
3. Now no lacunas should be tolerated for low irrigation potential utilization or poor irrigation efficiency or low production per ha. They are answerable and accountable for huge investment in this direction.

## 11.2 IMPORTANCE OF PERFORMANCE EVALUATION

The importance of carrying out Performance Evaluation started recognition at national level like, Public Accounts Committee, Planning commission, State Water Resources / Irrigation Ministers' Conference etc. (see paragraph from 2.11 to 2.16).

- The Indian National Water policy (1987) recommended undertaking the evaluation studies of water resources projects periodically on human settlements, occupations, economic aspects etc.
- The Working Group on Major & medium Irrigation projects for IX Plan (year 1997-2002), recommended implementation of the plan on “malady-remedy” basis and inter-alia observed that regular evaluation of project performance at 5 years interval. It also recommended that Performance Evaluation of Irrigation Projects be carried out before formulating Modernization Schemes.
- The National Commission for Integrated Water Resources Development Plan (NCIWRDP, 1999) and the World Bank in India Irrigation Sector Review Report (1998) also emphasized it. But nothing much was done.

## 11.3 PERFORMANCE EVALUATION STUDIES

Finally, Performance Evaluation studies of many projects in India had been carried out and are continuing by Ministry of Water Resources, CWC and CBIP in some states through consultants (see paragraph 2.12). But this is very costly approach and not feasible every year. These reports have many eye opening remarks and substantial improvements are being carried out on that basis. Still may not have sufficient details for want of adequate data of the past, are too late and frequently not possible due to high cost. Also the field officers may not get the reports and may not exert till huge pressure from top. Therefore data collection is required on regular basis or reports are required from the concerned field officers on seasonal basis

or annual basis for improvement immediately or in the next crop season.

There is tremendous potential for increasing agricultural productivity and economic growth in India / in world through better managed irrigation, see figure 1.1 and 1.2.

Some of the major challenges to India's irrigation sector include:

- Steady decline in the management and performance of all government- and community-managed surface and ground water irrigation systems
- Regulating groundwater overdraft and quality deterioration and Reducing power subsidies in groundwater irrigation
- Increasing the sustain ability of ground water irrigated agriculture

## 11.4 FUTURE OF PERFORMANCE EVALUATION

And now under the banner of irrigation management transfer both departments (agriculture and irrigation) are trying their best to avoid the monitoring of WUA and performance evaluation and wish to enjoy the fruits of their own organizations. Let us see how long it continues or a break though will come.

Looking to the importance of performance evaluation, to ensure success of WUA through regular monitoring, formats for collection of timely data and analysis has been proposed throughout the text of this book and it has been proposed that the Government through technical support group (TSG, see paragraph 10.9), monitor the WUA regularly and help / guide them.

Therefore for easiness, quick reference and monitoring by top administrators, indicators of performance are summarized in this Chapter from the discussions from chapter 1 to 10.

## 11.5 INDICATORS OF PERFORMANCE

*Indicator is a parameter/ data or value that point outs the level of performance. It is just like efficiency (see Chapter 2). These are qualitatively quantifiable, measurable and comparable data*

*sheets to know the performance of water deliveries to WUA and by WUA to all its members. Therefore these are performance / output oriented, accountable and answerable. Similarly performance evaluations of WUAs are required (also see paragraph 3.1). Many times indicators are multipurpose to indicate multiple performances. For that multiple data sheets are required. Also see paragraph from 2.10 to 2.16 in chapter 2.*

There cannot be same indicators for all purposes. These are different for different organisation / purposes.

The indicators of performance of a WUA can be divided into following four parts along with the responsibility of monitoring as indicated.

- i. General / overall performance - It relates to the general aspects of functioning of WUA as listed in table 11.1 (responsibility of DOA).
- ii. Water delivery and channel maintenance- as discussed in Table 11.2 to 11.6 (responsibility of WRD).
- iii. Agricultural performance in table 11.7 (responsibility of DOA).
- iv. Physical and financial performance in table 11.8, jointly.

These are further discussed below:

### **11.5.1 General / overall Performance assessment of WUA**

The proposed format is given in table 11.1. It can be

easily filled by the AAO of the DOA. He has a very good support of Ag. Supervisors (see figure 10.4). The Monitor must make notes in the format itself or attach sheets and give marks. Finally a grading from A++ to D can be given as under:

- i. A++ means very good/ excellent- above 80%
- ii. A+ means good- between 70 to 80%
- iii. B+ means above satisfactory and not good- between 60 to 70%. This WUA can easily improve with little support.
- iv. B means above satisfactory and not good- between 50 to 60%. This WUA can easily improve with little support.
- v. C means satisfactory- between 50 to 60%. Some persuasion is continuously required to improve.
- vi. D means below satisfactory level -less than 50%. Huge efforts are required to improve.

The marking system can also be decided by Dy. Director Ag.

DLTSG (see table 10.10 and 10.2) should make out a further grading on this basis for the district. Good WUA must be rewarded. This assessment should start after 1 year of start of capacity building. It should be filled annually or six monthly or crop season wise. For minor schemes, it may be annual or crop season wise. For medium and major projects it should be both six monthly and annually.

**Table 11.1 –General / overall Performance assessment of WUA**  
(Rating of Parameters including lift schemes) – To be filled by the AAO of DOA, initially every six months and then annually as the case may be.

S. No.	Indicators (Parameters)	Remarks/comments of the Monitor	Marks / grading
1.	List of office bearers and mobile numbers (attach sheet)		
2.	Forming of all subcommittee and their effective functioning. Number of subcommittee required and in existence every month. Number of meetings required and held.		
3.	Office facilities available – adequacy, record up keeping etc. (see paragraph 11.5.1.3)		

S. No.	Indicators (Parameters)	Remarks/comments of the Monitor	Marks / grading
4.	Maintenance of record –see list of records to be maintained at the end of this table. Quality of records being maintained e.g register of membership, minutes of meetings, accounts and water recording registers etc.1or 2 marks should be assigned to each register, see paragraph 11.5.1.2. Remarks and marking can be done in that table.		
5.	Status of maintenance of assets (properties) in the jurisdiction of WUA		
5.1	<p>Financial Sustainability- Aids and generation of own revenue- types of revenue</p> <p><i>Irrigation charges realized in the year</i></p> <p><b>Income from the properties and assets attached to the irrigation system</b></p> <ul style="list-style-type: none"> <li><i>i. Allotment of reservoir bed and cultivation with charges,</i></li> <li><i>ii. sale of pebbles, coarse sand, clay etc. coming in the bed in monsoon</i></li> <li><i>iii. Fines on defaulters,</i></li> <li><i>iv. Sale of goods such as grass, Fruits of trees along canals and dams, rest houses</i></li> <li><i>v. Sale of water to industries</i></li> <li><i>vi. Allotment water for drinking</i></li> <li><i>vii. Income from other assets like govt. inspection huts on dam, fruit gardens/ rest houses etc.</i></li> </ul> <p><i>Arranging seeds, Fertilizers etc.</i></p> <p><i>Member ship fee (individual or groups)</i></p> <p><i>Aids- central and state Govt.</i></p> <p><i>Others (under various schemes of central and state)</i></p> <p><i>Any other revenue</i></p>		
5.2	<p><b>Costs of establishments</b></p> <p><i>Payments for</i></p> <p><i>Office expenses-Rent, electricity and water charges</i></p> <p><i>Salary to staff</i></p> <p><i>Holding of meetings-executive and general body</i></p> <p><i>Stationary and printing</i></p> <p><i>Telephones and communications</i></p> <p><i>Irrigation charges paid to the government</i></p> <p><i>Maintenance of inspection huts on dam, fruit gardens/ rest houses etc.</i></p> <p><i>Any others</i></p>		
6.	Annual auditing of accounts from Chartered accountant		
6.1	Annual social auditing if necessary		



<b>S. No.</b>	<b>Indicators (Parameters)</b>	<b>Remarks/comments of the Monitor</b>	<b>Marks / grading</b>
7.	Participation in decision making Number of farmers attending meetings / Number of farmers aware of decisions taken in committee meetings		
8.	Liaison with government departments e.g.: irrigation, electricity, agriculture, cooperatives		
9.	Farmers participation in operation and maintenance		
10.	Maintenance and Amount spent on repairs- Number of farmers contributing in cash and kind Number of days the system was interrupted owing to technical faults. Number of farmers paying water and other charges on time		
11.	(For lift scheme) Number of times servicing/greasing of pump is done		
12.	(For lift scheme) Number of times the mechanic is called for repair of the system		
13.	(For lift scheme) Number of days system was interrupted owing to problems in electricity (supply & fault)		
	Reserve fund, Overdue bank loans, Timely payment of electricity bills – office, pumps motors etc.		
14.	Access to information- Number of members who are aware of rules and regulation		
15.	Access to opportunity- Number of member farmers to total farmers in the command		
16.	Economic sustainability- Payback period of the scheme Cost benefit analysis (technology costs in relation to increased benefits Agriculture input and output ratio Increase in employment Decrease in migration		
17.	Food security- Increase in availability of food Increase in availability of milk		
18.	Reliability of water availability -Number of farmers receiving water on their turn / due time. Number of farmers received water according to their given needs; also see tables 3.9 and 11.4 and 11.5.		

S. No.	Indicators (Parameters)	Remarks/comments of the Monitor	Marks / grading
19.	Efficiency and system performance Duty of water at the source- tank /weir/ well Percentage of area actually irrigated to total CCA (area irrigated with 1 watering, 2 watering and so on, can be prepared from Shudkar). A schematic representation can be shown as in figure 11.2. Number of farmers using water efficient techniques Number of farmers completing weeding operations in field channels Leakages in pipeline Types of crops grown and their water requirement , a separate table is required		
20.	Linkages of institutional infrastructure for the improved production (see figure 10.3).		
21.	Receipt of feedback information (see figure 10.4)		
22.	Performance from tables 11.2 to 11.8		

#### 11.5.1.2 List of records and inventory to be maintained by WUA

Almost all PIM acts/ laws and their rules mention the list of records to be maintained. It also gives their formats for recording. The rules 2002 under the PIM act of GOR gives 21 formats. These may be little different in different states. It may not have all the items required for an efficient WUA. Therefore for simplicity, better reliability and adequate transparency, an updated list of records to be maintained is given below:

1. An up-to-date copy of PIM Act
2. Map of the area of operation of the framer's organization along with map of the structures and distributary networks prepared in consultation with the Water Resources Department. This is known as Shajra map.
3. Summary of the canal net work of the project, see table 3.5
4. Canal wise list of outlets, see table 3.6
5. List of users with details of land holding- this is known as village Khasra,
6. Outlet wise list of farmers, see table 3.8
7. Assets and liabilities- this Statement may change every year- Initially it must be obtained from

*WRD. Trees along canals are also assets. These may be fruit or forest trees. Fruits are to be auctioned every year. Normally a separate register of trees along canals is maintained. Counting is carried out once every year.*

8. Book of meetings and Minutes
9. Stock register
10. Register of penalties (also known as tawans (Urdu word) in some states)
11. Cash book - Books of account showing receipt and payments
12. Books of account of all purchases and sales of goods by the Framers' organization and Bill register
13. Receipt books and its register
14. Cheque issue register
15. Gauge recording registers for reservoir and canals, see table 4.7, 4.8, 11.4 and 11.5.
16. Ground water table monitoring register, see table 8.9 and 8.10
17. Irrigation recording register (This is Sudhakar) and preparation of figure 11.2
18. Khatoni register

19. *Water Charges (bill) and its register*
20. *Register of agriculture extension trainings*
21. *Register of measurement books, level field books, work orders and the like*
22. *Copies of audit reports and enquiry reports*
23. *Inspections/monitoring register*
24. *All such other accounts, records and documents as may be prescribed from time to time.*

Almost all the above records were maintained by the revenue staff (called in Rajasthan as Ziladar, Girdawar and Patwari of the Sub divisional office) of WRD. They were strict instructions to check them and were actually checked and also examined by the EE and reported in annual performance reports of officers. From the above list, it may be clear that without the help of a good clerk, WUA may not be able to do all the jobs required for efficient operation, maintenance and management of irrigation projects. There is huge work in medium and major projects and therefore Water master has been proposed in Chapter 10 and table 10.5). The above items can be put in a tabular form and grading / marking can be done in that.

**Also all the forms must be printed and supplied to WUA as per earlier system by government.** Necessary funds from the subsidies should be permitted. Therefore it must be considered at the earliest. Many may argue that now in the computer era when a large section of the society is planning paperless offices, there is no need of such huge

records. Well computers do not remove the necessity of records. Only thing they do is record is maintained in the computer and analysis is made easy. Still observations are to be collected at site and recorded at site, without any office table etc. and use of Computers is still very far off.

In case if one is really interested in improvement of irrigation projects, then there is no escape from maintaining all records and scrutinizing. The interest of Govt. and all funding agencies is to improve the efficiency, productivity of irrigation projects than that in the past, than where is an escape from above monitoring. How anyone know higher performance without any analysis and reporting?

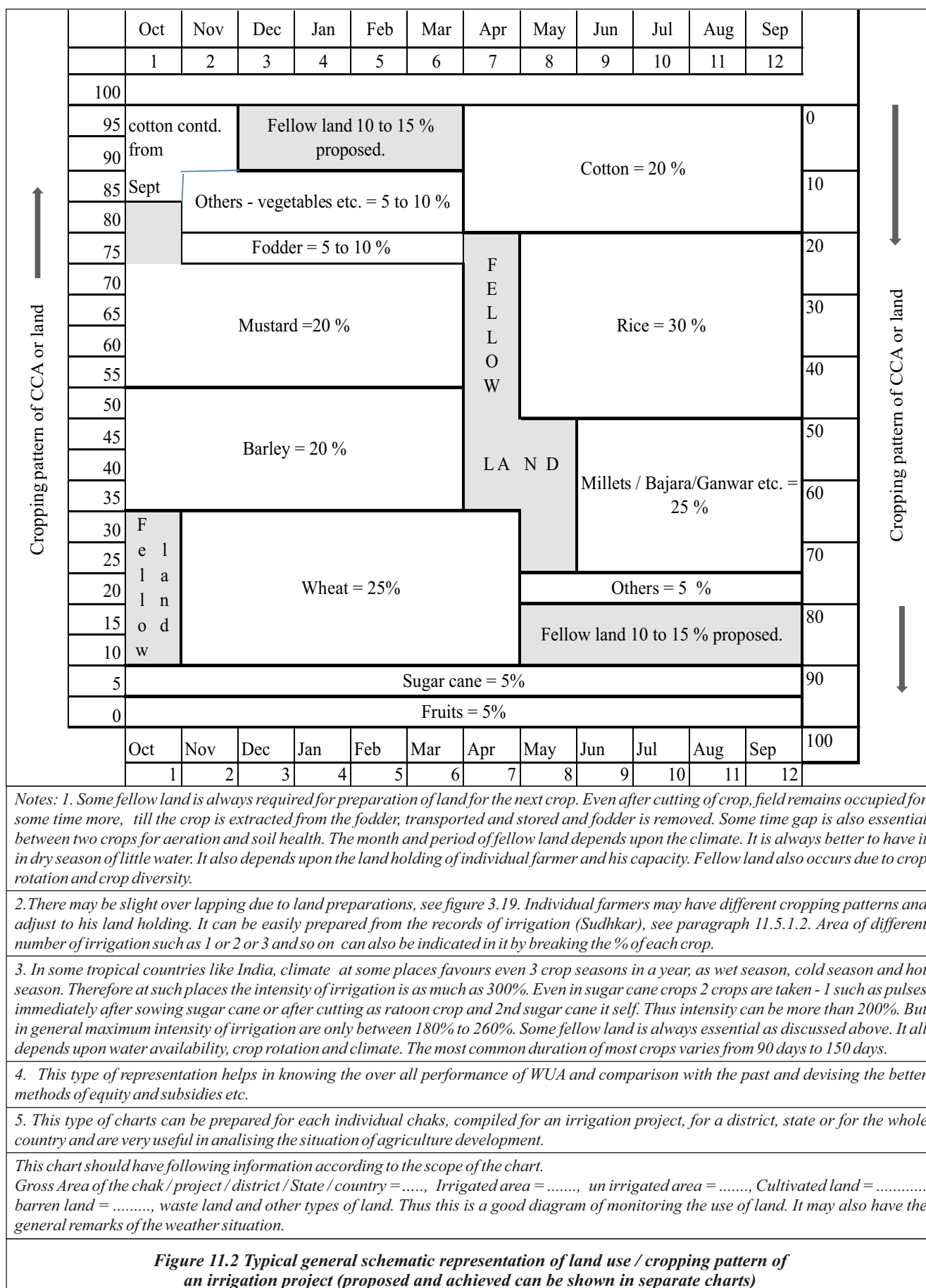
Therefore all the above records must be checked by the Chairman of TSG of WUA and grade them by giving marks. Further officers of DL TSG must ensure the same. The entire responsibility is that of DOA and WRD (ID).

#### **11.5.1.3 Office facilities and equipments required in a WUA**

For an effective functioning of WUA, following office facilities as listed below are required. The office may be in the central village of the command. On many projects there are inspection huts/ rest houses on the dam and along the canals. Now WUA has to take care and maintain them. If possible these can be used for WUA office. The general body and other meetings can be in any public place. Alternatively till new accommodation is constructed, it may be a rented space.

S. No.	Particulars	Minor projects	Medium/ major projects	Remarks
	Office accommodation @70 sq. ft /person	140 for 2 persons	200 sq. ft for 3 persons	In the departmental system all the facilities were available in AE / Zillader office, Patwaries were given iron box etc. at govt. cost.
	Toilet facility -1 female and 1 male	2	2	
	Office Tables, 2.5 x 3.5	2	3	
	Chairs (+2 for visitors)	6	9	
	Steel Almirah for record	2 to 4	3 to 5	
	Fans	1	2	
	Measuring tap 100 ft. 1/ WUA	2	2/WUA	
	Computer (optional) where water master is well acquainted with it	1	1 per WUA	In view of digital India it becomes essential
<i>As far as possible only Iron equipments must be procured and provided, as in the villages there is always a problem of rats.</i>				





### 11.5.2 Performance assessment of WUA for Water delivery and channel maintenance

Every WUA has to ensure proper maintenance of channel, running of canals and delivery of water to its members. To ensure that the WUA is properly functioning, a format of Operation, maintenance and management (O M& M) of Channels- Water delivery by WUA is given in table 11.2.

This format is to be filled jointly by the AAO, JE /AE of DOA and WRD. The Monitor must make notes in the format itself or attach sheets and give marks. Finally a grading from A++ to D can be

given as discussed in paragraph 11.5.1 above. The marking system can also be decided by the EE concerned.

DTSG (see table 10.10 and 10.12) should make out a further grading on this basis for the district. Good WUA must be rewarded. This assessment should start after 1 year of start of capacity building. It should be filled for every crop season wise for all types of projects. In the beginning it will be definitely low, but by practice it will improve. More over this approach will reduce heavy cost of economic survey.

**Table 11.2- List of works for Operation, maintenance and management (O M& M) of Channels- Water delivery by WUA and further to its members**  
(to be filled jointly by the AAO, JE / AE of WRD and representative of WUA, also see figure 10.2, 10.4 and further assessment by EE)

Item of performance / parameters / Indicators (Deliverables)	Methodology	Verification / Remarks / comments of the Monitor (separate sheets can be attached)	Marks / grading
1	2	3	4
<b>1. Prior to commencement of rainy season and irrigation season (also see table 10.5)</b>			
a. Clean the u/s and d/s of the body of dam, areas of spillway channels and all approaches. b. Watch and petrol the dam during day and night in the rainy season with torches and lanterns, liaison J E /AE of WRD and report every day c. Auction grass on the dam and canals, every 1.5 months after 1 <sup>st</sup> rains. (Generally 2 times are adequate. d. Identification of problems, bottlenecks and issues for rectification of canal system. e. Listing works as per priority f. Motivating WUA members to get weed-clearance & de- silting in/along his field as member's participation g. Engaging / fixing patrolling group for canal regulation- especially tail area cultivators to be involved h. Taking suggestions from farmers for O & M works	Joint Walk through survey with some measurement by works sub-committee and discussion with farmers.	Walk through carried out with sufficient details and assessment of required works. Estimates prepared, and O and M responsibility fixed.	

Item of performance / parameters / Indicators (Deliverables)	Methodology	Verification / Remarks / comments of the Monitor (separate sheets can be attached)	Marks / grading
1	2	3	4
<b>2. O &amp; M (see paragraph 10.11 and table 10.5)</b>			
a. Prepare and execute O&M works approved by Management Committee b. If O&M funds fall short contribution from WUA members be obtained in proportion to their land holding c. At least sufficient O&M fund may be kept reserve for repairs during running of canals d. To get technical assistance and funds from WRD for special repair, if any. e. Maintenance of drains –field, tertiary, secondary and main drains to the natural drain	Participatory discussion, execute works as per decisions and check by field visits.	Field visit, walk through survey to check adequate/ proper maintenance before irrigation season	
<b>3. Water budgeting, (see table 3.2 to 3.4 and irrigation policy in paragraph 3.8.5. to 3.10.2)</b>			
To get declared irrigation policy and water budget, see Chapter 3. To fix up irrigable area and cropping pattern after assessment of available water in the tank in accordance to the water budgeting.	Participatory discussions by the Management committee	Crop wise area to be irrigated and crop selection as per water budget.	
<b>4. Opening and closing of canal ( see paragraph 3. 9 to 3.15.2)</b>			
a. Fixing up the probable date of opening and closing of canal and to announce it in the command villages and present demand letter to WRD for medium and major projects. b. To get released the water in canal as per demand and distribute from tail end to head. Close in time. See Ch.3. C. Record and maintain registers	Participatory discussion and fixing responsibility.	Ensure timely opening and closing as approved, water reached up to tail end through gauges & reports from tail enders, see table 11.3 to 11.6	
<b>5. Equitable water distribution, (see paragraph 3. 17 to 3.18)</b>			
To fix up right of water of each member of WUA, according to the land holding, osrabandi / warabandi and ensure its implementation (see paragraph 3.17 to 3.18 and tables 11.3 to 11.6. Irrigation with type of crop and number of watering be recorded in Sudhkar.	Participatory discussion and Educating the farmer.	Has every farmer received water as per their due share, see table 3.9 & 11.4.	

Item of performance / parameters / Indicators (Deliverables)	Methodology	Verification / Remarks / comments of the Monitor (separate sheets can be attached)	Marks / grading
1	2	3	4
<b>6. Optimum use of water (see Chapter 6 and tables from 10.3 to 10.7)</b>			
a. To obtain optimum yield from available water -To stop wastage of water b. To educate about minimum use of water for each crop c. To motivate cultivators to irrigate land in night hours also if necessary/ as per canal running schedule.	Adopting new techniques / appropriate methods of irrigation. Participatory discussion.	Wastage of water is reduced – no complaints for any wastage. Area and number of irrigation done, see table 11.8.	
<b>7. Water thefts and unauthorized watering, see irrigation policy in paragraph from 3.8 to 3.8.8 and other records in Ch.11.</b>			
<b>8. Planning, design and execution of OFD works see Chapter 6.</b>			
a. Construction of Water Courses-Drains-Land leveling and provide siphon tubes b. To give financial support to the cultivators, unskilled works of OFD, be got done through them in their land. c. To keep intensive watch over quality of OFD works d. To manage construction of OFD works such as not to affect irrigation.	Participatory discussion.	OFD works progressed well and quality maintained	
<b>9. Issue of water bill, Collection of money and deposition in bank account / WRD office and maintain accounts and Keeping records – see Chapter 10, 11 and paragraphs 11.5.1.2 and table 11.2.</b>			

**Table- 11.3 Activity, Responsibility and Indicators of performance of individual farms**

S.No.	Activity	Responsibility	Indicators
1	Measurement of gauges and time at the head of each farm whenever the water is running (as per form given in table no.11.6)	WUA and the farmer	Duration of water supply to each farm.
2.	Measurement of area and number of watering, as per prescribed forms and rules (see paragraph 11.5.1.2, Shudakar)	WUA and the farmer	Area and number of watering

**Table- 11.4 Activity, Responsibility and Indicators of performance of canal**

<b>S. No.</b>	<b>Activity</b>	<b>Responsibility</b>	<b>Performance Indicators</b>
<b>1.</b>	Declaration of canal operation schedule (depends upon individual canal system, to be developed by WUA and WRD, see Chapter 3).	WRD and WUA	<p>i. So that that each and every farmer know the exact date, time and period of running of the canal and</p> <p>ii. Match the actual date and time with the declared time through a bar chart.</p>
<b>2</b>	Measurement of daily discharges and gauges (water levels) at the head of each canal / at the head of each WUA during running days (as per form given in table no.4) (Discharge need not be measured; it can be worked out from daily gauge and canal discharge rating curve. If possible automatic gauge recorders should be installed at least at important locations. Gauge wells are normally constructed at every regulator)	WRD and WUA	<p>i. Ratio of Actual water level / Full supply level (Ratio of Actual Number of days for above and below water level/ Required Number of days) - Ratio of Actual discharge / capacity and design discharge of canal (Capacity is peak discharge, Design or required discharge very month to month)</p> <p>ii. Total volume of water supplied- fort nightly, monthly, Kharif and Rabi season wise and annual (it is derived simply by summation)</p> <p>iii. Ratio of Actual volume supplied / required volume or demanded volume - fort nightly, monthly, Kharif and Rabi season wise and annual (it is derived simply by summation)</p> <p>iv. Water supplied per unit of command area (<math>m^3 / s</math>) / ha, weekly, fort nightly, monthly, Kharif and Rabi season wise and annual</p> <p>v. Ratio of water required by crops per unit of area / Water supplied per unit area.</p>
	3. Sale of water to other users, brick kilns/ local industries.(Same as above )	WRD and WUA	<p>Quantity (<math>m^3</math>) – Date, duration (Time in hours) and gauge of supply.</p> <p>Ratio of supplied / total</p>



**Table 11.5 - Format of water delivery in each canal**

Name of canal ..... length ....Km Parent canal ....., authorized discharge at head .....  
Full supply depth at head .....Full supply depth at tail .....

	At the head of canal						At the tail of canal					
Date	Start time Hr. minutes.	End time Hr. minutes.	Total time minutes	Gauge m	Discharge in m <sup>3</sup> /s	Volume of water delivered m <sup>3</sup>	Gauge with start time Hr. minutes	Gauge with end time Hr. minutes	Total time in minutes	Discharge in m <sup>3</sup> /s	Volume of water delivered m <sup>3</sup>	Signature of recorder / water controller / monitor
1	2	3	4	5	6	7	8	9		10	11	12
1 to 31												

**Notes:** 1. If possible automatic water level recorders may be installed at important places.

2. Wherever there are intermediate gauges (preferably in long canals) or any discharge measuring device, its location and columns from 8 to 11 can be inserted before column 8.

3. The gauges at each off taking channels / outlets be recorded

simultaneously in the register of that channel.

4. The register of each channel must be given a number and an index given in the main register

5. Separate full time is not required for each canal . He will be a multi task person as discussed 10.5 and table 10.5. he will communicate with the head water master

**Table 11.6- Format of water delivery to each outlet and farmer**

Name of watercourse .....

		At the head of the outlet outside the canal					At the head of each farmer		
Date	Start time Hr. m.	End time Hr. minutes.	Total time Minutes	Gauge m	Discharge m <sup>3</sup> /s	Volume of water delivered m <sup>3</sup>	Repeat (Insert) column from 2 to 7. For change insert field number	Signature of water controller of WUA	
1	2	3	4	5	6	7	8	9	
1 to 31								1	

**Note:** 1. Column 8 is optional if a separate register is prepared for each farmer and that can be kept by him and got checked.

2. If above data are not possible for each and every farmer, at least

some fields must be evaluated.

3. Also see paragraph 6.18 for field evaluations and data of one filed must be collected jointly by the agriculture supervisor and the farmer.

**Table 11.7 LISTS OF WORKS FOR SOIL - AGRICULTURAL PRODUCTIVITY & MARKETING**  
(To be filled by the AAO and representative of WUA and further assessment by Dy. D Ag.)

No. Item of / parameters / Indicators (Deliverables)	Methodology	Outcome	Verification / Remarks / comments of the Monitor (separate sheets can be attached)	Marks / grading
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>1. Diagnostic appraisal</b> (This can be done Ag. Supervisor and AAO and in some stages, no additional staff required )				
Soil survey and Identification of field level existing situations with respect to:	<ul style="list-style-type: none"> <li>• Participatory discussion</li> <li>• Visuals</li> <li>• Base line survey findings</li> <li>• Field visits</li> </ul>	Better informed about soil and crop related problems and increased consciousness for improving and sustaining soil health and crop productivity. Soil maps are published.	% removal of deficiencies and increase in yield of each field ( see table 11.8) in comparison with last year	
<b>2.Crop Planning</b>				
Preparation of crop plan according to water availability for diversified and multiple cropping (It can be done WUA wise/ zone wise, it may hold true for 10 years)	<ul style="list-style-type: none"> <li>• Participatory discussion</li> </ul>	Enhanced knowledge and changed attitude towards diversified cropping to match with water delivery & more productive cropping pattern.	% increase in area with increased cropping and irrigation intensities in comparison with last year	
<b>3. Improvement in crop management practices</b>				
Crop stand establishment (Tillage, sowing/planting, seeds, fertilizer application, plant protection)	<ul style="list-style-type: none"> <li>• Participatory discussion</li> <li>• Field visits</li> </ul>	Enhanced know- how's Motivation for mechanized crop stand establishment	% larger crop area having better crop stand and protection from pests and diseases resulting in higher crop productivity in comparison with last year	
<b>4. Nutrient management</b>				
• Appropriate level, method & time of nutrient application	<ul style="list-style-type: none"> <li>• Participatory discussion</li> </ul>	Increased knowledge of crop nutrient management	% larger crop area having soil-test based nutrient application and I.N.M.	

No. Item of / parameters / Indicators (Deliverables)	Methodology	Outcome	Verification / Remarks / comments of the Monitor (separate sheets can be attached)	Marks / grading
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
• Integrated nutrient management involving organic manure including G.M., chemical fertilizers, and bio-fertilizers	• Field visits for identification of nutrient deficiencies	practices	in comparison with last year	
<b>5. Field-level irrigation management</b> (This job is generally avoided, but it must be done (see figure 6.13 to 6.47))				
• Irrigation scheduling under adequate and limited water supply (see figure 6.38 to 6.41)	Participatory discussion	Increased knowledge: • Crop requirement based irrigation scheduling including critical crop growth stages • Crop-specific irrigation & drainage methods • Efficiency of uniformity and application.	Crop and area where done. Increased crop water use efficiency, see table 11.8 in comparison with last year	
• Irrigation methods				
• Layout of irrigation (check basin, border strip, furrow)				
• Drainage management				
• Irrigation evaluation of some fields				
<b>6. Cultivation of high value crops (Only if water availability permits otherwise it can be dropped)</b>				
• Vegetables	Participatory discussion	Increased knowledge and motivation for cultivation of high-value crops	Increase in area of high value crops accompanied with higher and regularly flowing income in comparison with last year	
• Mushroom				
• Fruits				
• Fodder crops				
• Spices				
• Medicinal plants				
<b>7. Adoption of allied enterprises (fisheries depends upon water spare by WUA )</b>				
• Animal husbandry and dairying	Participatory discussion	Increased knowledge and skill for A.H., animal nutrition,	Enhanced employment and income with increased involvement in allied	
• Fishery				

No. Item of / parameters / Indicators (Deliverables)	Methodology	Outcome	Verification / Remarks / comments of the Monitor (separate sheets can be attached)	Marks / grading
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
• Agri-based enterprises (honey-bee farming)		dairying and fish production	enterprises in comparison with last year	
<b>8. Bio farming</b>				
Imparting knowledge of:	Participatory discussion	Gaining know how and motivation	Increased production and marketing of bio-farming products in comparison with last year	
• Raising crops using exclusively organics				
• Certification requirements				
• Linkage with the marketing chain				
<b>9. Women empowerment in selected agro-enterprises</b>				
Imparting know how in selected agri enterprises:	Participatory discussion	Gaining know how and motivation	Increased involvement of women in agri-enterprises by forming SHGs and micro financing in comparison with last year	
• Organic farming				
• Vermi composting				
• Nursery raising of high-value crops (vegetables, fruits, spices and medicinal plants)				
• Plant propagation practices				
• Preparation of quality seeds of imported crops				
• Mushroom cultivation				
• Know how of SHG formation and micro financing				
<b>11. Post-harvest management</b>				
Imparting know how of improved post-harvest management practices-	Participatory discussion	Increased know how of avoiding post-harvest losses	Avoidance of post-harvest losses in comparison with last year (it can be	

No. Item / parameters / Indicators (Deliverables)	Methodology	Outcome	Verification / Remarks / comments of the Monitor (separate sheets can be attached)	Marks / grading
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
• Threshing, cleaning and storage of grains			expressed in Kg lost) Also see figure 10.3.	
<b>11. Marketing of agricultural produces ( see Figure 10.3)</b>				
Imparting know how about:	• Participatory discussion	Increased know how knowledge about:	• More number of E-choupal and more informed marketing system	
• Marketing of agricultural produces	• Visit to E-choupal and market centers	• Marketing chain and marketing of produces	• Improved marketing practices in comparison with last year	
• Linkage with marketing chain		• Group marketing processes		
		• Marketing linkage		
		• Marketing information system		
<b>12.On-farm seed production</b>				
Imparting know how about seed production, processing and storage technologies (adopting seed-plot technique)	Participatory discussion	Increased know how about seed production technology at individual farm level	Increased on-farm production of quality seeds, at lower cost and seed replacement rate in comparison with last year	
<b>13. Diffusion / transfer of agricultural technologies</b>				
Imparting know how about diffusion processes of agricultural technologies	• Participatory discussion • Demonstration • Field visit	Increased know how about diffusion / Transfer processes of agricultural technologies	More number and better delivery of communication, training, adoptive trials and demonstrations resulting in more effective diffusion of agricultural technologies in comparison with last year	

Notes to table 11.7:

Many of above trainings are being done by DOA for last several years (see table 10.6 and some comparisons must be shown to explain the improvement. Trainings on many items not being done must be started immediately. This table is also an indicative of performance of DOA.



**Table 11.8 List of performance indicators of an irrigation project and their estimation – also see Ch 2, 6, 10 and tables from 11.1 to 11.7**  
(To be filled by the AAO, AE and representative of WUA and further assessment by Dy. D Ag. And EE WRD)

(1) Indicators of performance and its Description	(2) At the field (Farm may be small to big size)	(3) At distributary / minor head	(4) At the source (reservoir / weir)
<b>1. Physical performance</b>			
Irrigation Ratio (Intensity of irrigation), see Eq. 2.20	Crops and their area of irrigation are recorded at the field level. Earlier it was recorded by irrigation Patwari now to be by WUA (see table 11.1)	It is summation of cropping pattern and irrigation.	Cropping pattern and intensity of irrigation of the whole project are summarized.
Sustainability of irrigated land, Eq. 2.21	Water logged and saline land should be measured at the field level.	Data are summarized	Only summarization of Data required
<b>2. Water use performance</b>			
ground water levels fluctuations in wells	Before the season	Average	Average of whole area
Relative water supply (RWS) Eq. 2.18	Crop water demands are estimated at field level and can be on agro-climatic zones. *	Water supply is computed from recorded tables...	Water supply is computed from recorded tables.
Relative Irrigation supply (RIS) Eq. 2.19			
<b>3. Water conveyance Efficiency</b>			
Seasonal Efficiency of the project. Eq. 2.1, at distributary head- Eq. 2.2 and Eq. 2.3; at the field- 2.5	Efficiency of water application can be computed from Table 11.5 to 11.6.	Efficiency of conveyance can be computed from Table.	Overall Efficiency. Can be computed from Table
<b>4. Economic performance</b>			
Effectiveness of fee collection (EFC) Eq. 2.16	Earlier it was recorded by irrigation Patwari in Khatoni and now WUA has to do.	Data are summarized. cost can be taken from WUA wise cash book	Data are summarized.
Financial self sufficiency (FSS) Eq. 2.17	Not required		Data are summarized
<b>5. Agricultural performance</b>			
Output per unit of land cropped $\left(\frac{\text{US\$}}{\text{ha}}\right)$ Eq. 2.11	Local price can be used. All other parameters are computed above. Can be done at WUA level	1. Only summarization of Data is required. 2. Summarization can be done at PC / WRD/DOA level 3. It is not a tough job. Earlier all data were summarized manually then how it is tough in computer era. In the beginning one/ two years it may appear tough and once we are accustomed it becomes easy. Compilation can be done though the year. With present huge staff there is no problem.	
Output per unit of the command area $\left(\frac{\text{US\$}}{\text{ha}}\right)$ Eq. 2.12			
Output per unit of irrigation supply (US\$/ha) Eq. 2.13			
Output per unit of water consumed $\left(\frac{\text{US\$}}{\text{ha}}\right)$ Eq. 2.14			
<ul style="list-style-type: none"> <li>Agro-climatic zone wise, crop water demands must be made available by Agriculture department and same can be used.</li> </ul>			

### 11.5.3 Performance assessment of WUA for agricultural productivity & marketing

Much training are being conducted, methodology of conducting has been discussed in paragraph 10.7.4 and table 10.6 to 10.7. The very purpose of increase in production is not easily seen in any progress reports. They need some modifications as discussed there. Here items / parameters (indicators) their qualitative quantification are given in table 11.7 along with table 11.8 that will show the performance of DOA as well as that of WUA and farmer satisfaction.

### 11.5.4 Overall Performance assessment of irrigation projects and WUAs

This is the end product of the irrigated agriculture (that means of the irrigation project) as a joint responsibility of the WRD and DOA and WUA. Here no data are collected, all the data collected throughout the crop season are compiled and an analysis is presented to everyone to know the performance, just like the examination results of the children. If the result is good everyone is very happy, after all this the output of one semester of 5 to 6 months.

This analysis is required at least at three locations viz. -i) At the field level ii) At the distributary /minor head, iii) At the source (reservoir/weir). It can be more depending upon the levels of canal (see figure 3.2). No one should be afraid of the magnitude or complicated calculations. A list of performance indicators is given table 11.8. No one should get horrified from the face of the table. It very simple and is generally only summation of data from other tables and some calculations explained in Chapter 2. Therefore it is required to be done by the respective department for the items concerning to them and finally combined (jointly by both organizations- DOA and WRD) end result (mark sheet) is produced. This can be depicted for publicity.

Because of sheer number of WUA or individual farmers heavy monitoring cannot be rejected and is essentially needed and must be carried out in the command area of each and every project for an

effective PIM/ WUA. The WUAs should be categorized in four types on the basis given in paragraph 11.5.1.

No additional staff is required. Present strength (year 2014) in Rajasthan appears adequate, see figure 10.5. There is nearly 5000 Ag. Supervisors and 870 AAO in DOA and the priority of improvement lies as under:

*1st to irrigated command areas, 2nd to good rain fall areas say > 500mm/year, 3rd medium rain fall areas > 250 and < 500 mm per year, and 4th lastly in desert areas of rain < 250mm (work is very little).* Presently in Rajasthan, there are 1130 WUAs (see table 10. 2) and may increase slowly. In general, it appears that one Ag. Supervisor can be easily available for one WUAs and one AAO for every 4 to 5 supervisors and work load do not appears heavy.

Now it is high time that the performance of agriculture must be shown on the basis of agro-climatic zones. After all this effort is not for just a show piece and entire production depends upon it.

After all their capacity is five times in the same time in private , than what they are doing in government. Only a start up by top is needed without any if and buts or arguments. At least they do one and see results.

So far they been escaping it, trying to be unaccountable and may still try it under the banner of responsibility of WUA. But may not be allowed in future, otherwise their own organisation will be in doom. The WUA may soon become defunct and not only the huge money spent in their creation, capacity building may be lost, but also create a depleted state of the project. The objective of higher efficiency will vanish and we may be at the same place as where we were or rather worst than that.

Where projects have been transferred to WUA by a simple order without preparation of any inventory (see paragraph 10.3.3) and responsibility and no monitoring is being done as discussed above, the irrigation system has started deteriorating and after some times WUA will be declared as a failure and huge cost will be required to restore the project. Typical examples of very poor maintenance are the canal systems of Gang, Bhakra and IGNP. An inventory can now be prepared. WUA can be activated by guidance, support and monitoring .

## **11.6 ROLE OF AGRICULTURE IN EMPLOYMENT AND GROWTH IN GDP**

The national growth is measured in terms of GDP (Gross Domestic Product, see paragraph 1.3.1). There are only three major sectors of growth, viz. service, agriculture and industry. Wikipedia, the free encyclopedia, (<https://en.wikipedia.org>) has reported the data and the population employed in above sectors as given in figure 11.3 and 11.5. The contribution of agriculture in terms of GDP was 53% in the year 1950 and has now declined to 14% in 2011. Similarly the contribution of Industry which was only 17% in the year 1950 has increased to only 27%, where as that of service sector has increased from 30% to 59%, see figure 11.3. Important sub sectors of service sector are shown in figure 11.4. The situation of employment in all the sectors is shown in figure 11.5. Notes given at the end of each figure explains the actual development and its implications.

### **11.6.1 Changes proposed in the present system of agriculture production, subsidies and Services**

In view of above discussions it is imperative that changes in the agriculture policies, subsidies are urgently required. Figure 11.6 explains the present practices and required along with the service network to boost the agriculture production and economy. Also see figure 6.44 The new policy and its implementation plan in the annual budget must be based on agro climatic zones and irrigated area (perennial and non perennial) as well as small and marginal farmers. The policy cannot be permanent for several years, but must be flexible to be declared along with the annual budget.

### **11.7 REWARDS FOR HIGHER PERFORMANCE (GOOD WORK)**

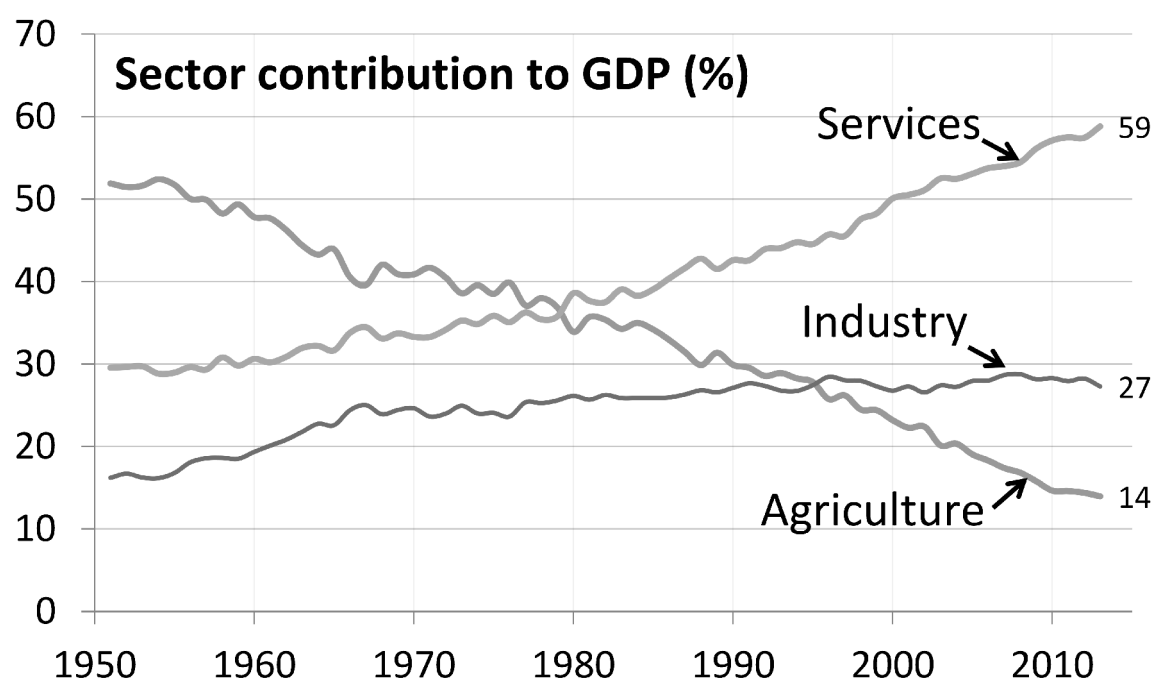
Almost in all spheres of life and everywhere there are awards, prizes, like in sports, film festivals, artists', invention promotions, export, colleges, schools etc. There are some awards in Govt. also, generally in Police, Indian administrative services and very limited in other and particularly in DOA and WRD. Another concept of same ranks / posts,

equal qualifications and same work and same expected quality is also very popular. Then why the concept of right person for right job / specific jobs is used and where are such criteria? Is the output/performance of everyone is same. Generally it is not so. Even the concept of merit formula in some states has many serious lacunas and sincere persons are not happy with it. It only depicts the liking of someone with someone and the same is unsuitable to another. It has become only political affiliations in utter disregard of output and its quality. It does not depict the performance / output. Similarly the concept of some higher scale after 9, 18 and 27 years service on the same post is only a console for no promotion. Anyway all these issues are unending, debatable and unpalatable. Also there is no such intension. Entire purpose is how to improve output and the quality. Then why not create some department wise rewards. After all rewards encourages and motivates for higher performance. Therefore it is proposed that rewards at WUA level, district and state level and for each level of staff of DOA and WRD and must be given. No extra funds are required, but it can be apportioned from the same budget allotment. Every child is happy with some reward and so are the phenomena of life at any age / post. It definitely improves performance and motivates him and others. Also think to reward departmental personals to encourage publishing papers, books, charts etc. other than the departmental reports.

### **11.8 START UP FOR PERFORMANCE ORIENTATION**

It is hoped that the importance of all that have been discussed so far from Chapter 1 to 11 will be well realized by the Govt., WRD and DOA and shall carry out the monitoring and reporting as discussed so far. Let us start ourselves to make attempt to come out of budget orientation to field performance (area and production) orientation. Some simple things as below in irrigated areas can be easily started in our reporting.

- i. Area using bio fertilizers and yield
- ii. Area adopting INM and IPM (after all it affects our health)

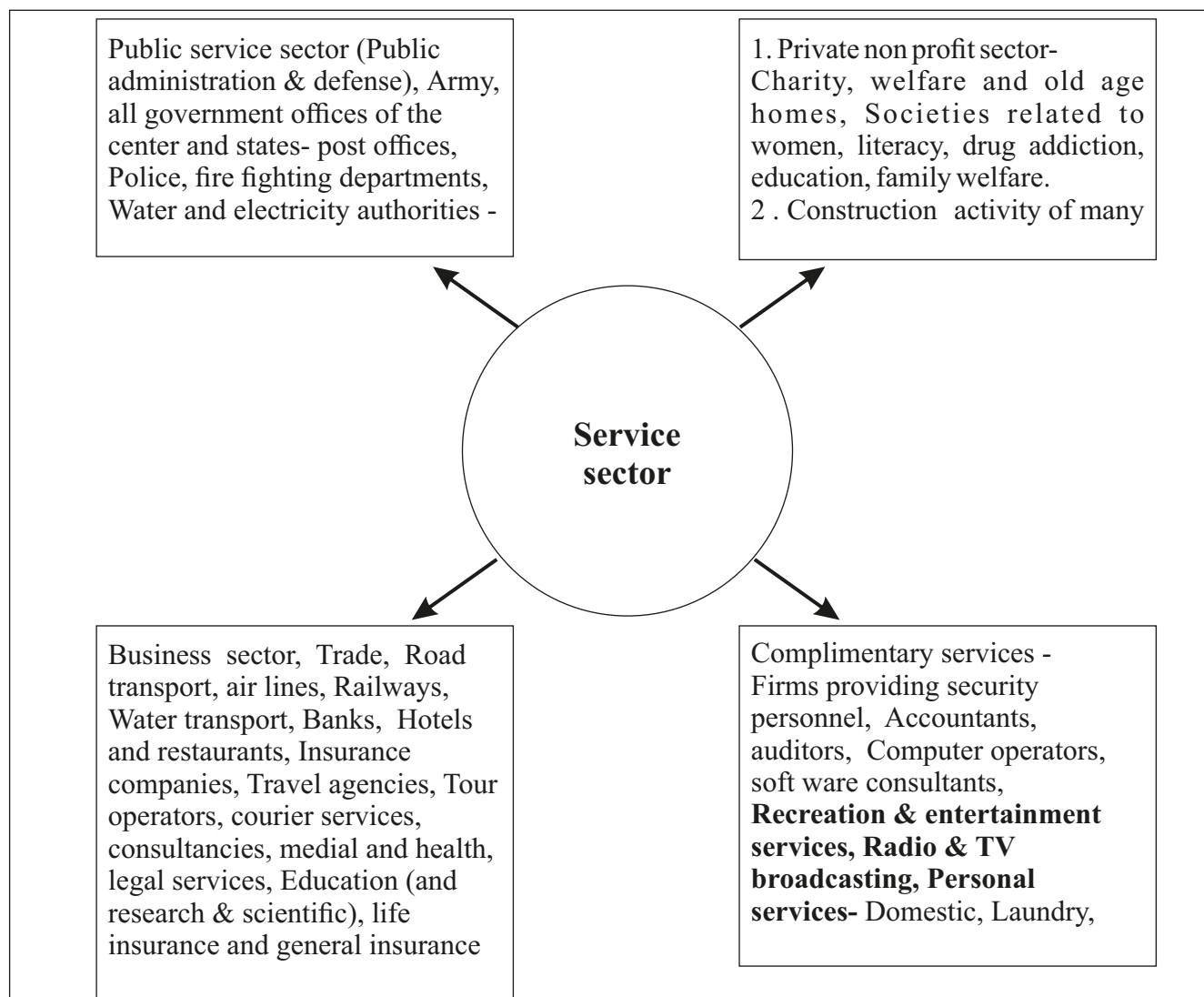


**Figure 11.3 Sector wise national growths in GDP**

**Notes to figure 11.3:**

1. In spite of increase of irrigated area from 22.6 Mha in the year 1950 to 110 Mha in the year 2015 (see table 1.1); growth of GDP in agriculture has fallen from 53% to 14% in the year 2010, which appears a negative growth.
2. Though GDP of agriculture decreased from 36% in 1982 to 25% in 2002 and that of industry remain stand still are not bad, but are good sign of growth in service sector. Higher % growth in one sector reduces the % growth of other sectors, though there may be reasonable growth in other sectors also.
3. Further reduction of GDP in agriculture may not be desirable as it feeds people and supports raw material to lot of industries.
4. In fact agriculture and industry cannot support too much employment in order to cut cost of production. In industry there is rather more scope of expansion of existing capacity as well as for new industries, but in agriculture, there is no scope unless and until new areas are opened for agriculture, which is in not practical in view of severe constraints on land and water. Even the present irrigation potential created is declining due to increasing dark zones of ground water (see figure 8.1). Also agriculture land is decreasing due to urbanization and industrialization. The only scope in agriculture is to increase irrigated area through interlinking of rivers and increase productivity per unit of land and water; otherwise it cannot sustain. Also see paragraph 6.2.7.4.
5. Agriculture and industries are constantly modernizing or improving by use of more modern machinery. Though these provide some employment in manufacture and maintenance workshops, yet also reduce employment in agriculture. But these are also creating environmental problems. Therefore for a sustainable development and management a comprising policy is required, such as encouraging human and animal powered (labour oriented) machineries through incentives and subsidies and discouraging diesel / electric operated machineries through heavy taxes and levies. Also see figure 10.3 and 11.3 to 11.6 and notes in them.
6. For a strong economy, it is good that service sector is rising, but a balance of all the three sectors is required, otherwise service sector would not rise rather may fall.





**Figure 11.4 Sub sectors of growth in service sector in national growth**

**Notes to figure 11.4**

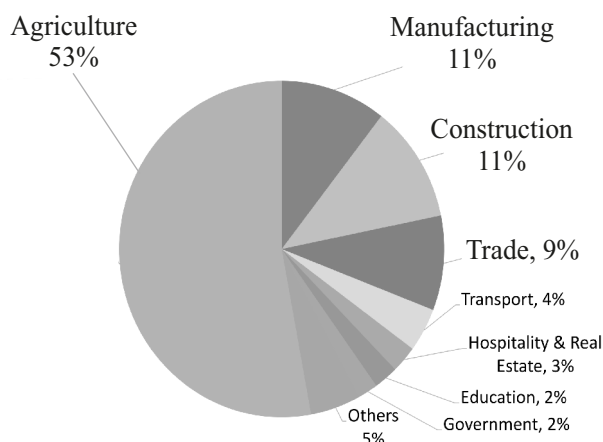
1. Above is a brief list of services. Actually there are many more services. Only service sector can employ largest number of people. Govt. can not be a big employer, but it has to boost the service sector over wide range so as to ensure easy availability to every common man.

2. Agriculture and industry can be not big employers. The scope of agriculture is limited due to already heavy cost of production which has to be reduced. Also with the development of farm mechanization and which is essential, employment is reducing. However services to agriculture are presently very low. It can be increased by proper subsidized and better market policies such as screening and grading of crops (say 1 to 5), better storage and govt purchase policy for itself and for industries. In actual practice much more regulation is required then in any sector. We should not be afraid of mediators. Actually they are required to invest more money in the market and provide faster and better services, see figure 10.3.

Small traders are more beneficial to the society at large. Their profit is less as compared to large malls. Big Bazaars or like wall marts. Their employment is much less then the employment in retailers. They make huge money because of heavy publicity, some discount on few items and heavy charge on many other items. Their investments is not higher than the total overall investment of small investors. In fact through a better policy, small traders can be encouraged through loans or 3 P (public private partnership) and supply even to public distribution shops (ration shops). This will reduce huge cost of transportation and government management.



### Employment by Sector (%), 2009-10



**Figure 11.5 Contribution of Agriculture and other sectors in national employment** (by courtesy of en.wikipedia.org)

Notes to figure 11.5:

1. This figure shows the sector wise employment. Still the employment in agriculture is highest at 53% and the present practices / trend cannot support it.

2. The employment in agriculture was around 80% in the year 1950 and decreased to 53 % in the year 2010. But actually, the overall situation is not so. In the year 1950, the 80% of population of 34 crores =  $0.8 \times 34 = 27.2$  crores (272 M) and in the year 2010, 53% of 121 crores =  $0.53 \times 121 = 64.13$  crores (641 M), which is more than double, whereas the net sown areas increased from 118.75 M ha to 141.58 M ha in the year 2010. It is very evident that agriculture cannot support that much employment and therefore **the condition of the small and marginal farmers (nearly 55% - holding only 14% lands, see figure 1.1, 1.2 and paragraph 1.10, table 1.6) is getting poorer and poorer.**

With more than 60% un-irrigated cultivated land, there is only one crop season of about 5 months. Thus these farmers are more poor and poorer and they need alternative employment. Also during adverse weather conditions, no lively hood is available to them. Maximum suicide is committed by this category of farmers. 5610 farmers committed suicide in the year 2014 as per the national Bureau of crime records. Urgent rehabilitation of such and marginal farmers is required. This is a herculean task and not easy, but has to be done.

3. With increasing population, land holding is decreasing and so small and marginal farmers increases. With further division / bifurcation of land, it's supporting capacity decreases and so they sell land and rich people buy. Thus richer are getting richer and poor as poorer. Thus the cycle of increase and decrease of small and marginal farmers continues, still on the whole it is increasing. Still a good policy for them is required and a different policy for rich is required to increase agriculture production. Some of these rich farmers may be multimillionaire or big company and paying income tax. Also a simultaneous policy of ground water management and development of waste land is required. Also see paragraph 1.10, 8.6, figure 1.2, 8.1 and 8.2.

Therefore with increasing population employment in agriculture must be brought down below 30%. Even this is equal = 390

million ( $0.3 \times 130$ ) which is no less. Reduction on agriculture dependency is a herculean task as there is already huge unemployment in the country. In USA, only less than 4% population is working in agriculture with land holding of individual farmer as not less than 50 or 100 ha.

4. For a reasonable level of life, an unskilled labor in India earns Rs.350/- per day or on average Rs10, 000/-per month or say Rs. 1.0 lac per year in the year 2015 (may slightly vary from place to place). In irrigated agriculture, say wheat average production is nearly 3 tons/ ha and price @ Rs.15000/- per ton = Rs.45000/- and net benefit of labor (after deduction of other expenses of say 30%) may be Rs.31500/- only in five months = Rs. 6300/- per month. Thus an individual farmer is not able to earn that much from his labor in agriculture land excluding the expenses of seeds, fertilizers etc. How can he support his family? However some alternative employment may be available to him through animal keeping and animal supported carts and machineries which need protection policies. Also see notes below and figure 10.3 and 11.3 to 11.6 and notes in them.

5. Population supporting capacity of land- There are following aspects – Feeding the population and other lives, supply of raw materials to industries, supporting employment and poverty alleviation within all limited resources of land, water and minerals.

6. Employment in agriculture can be divided in following major groups

i. Irrigation in one season and 2nd rain fed

ii. Irrigation in two seasons

iii. Rain fed agriculture – only one season

Also see important Terms used in the Land Utilization Statistics, page....

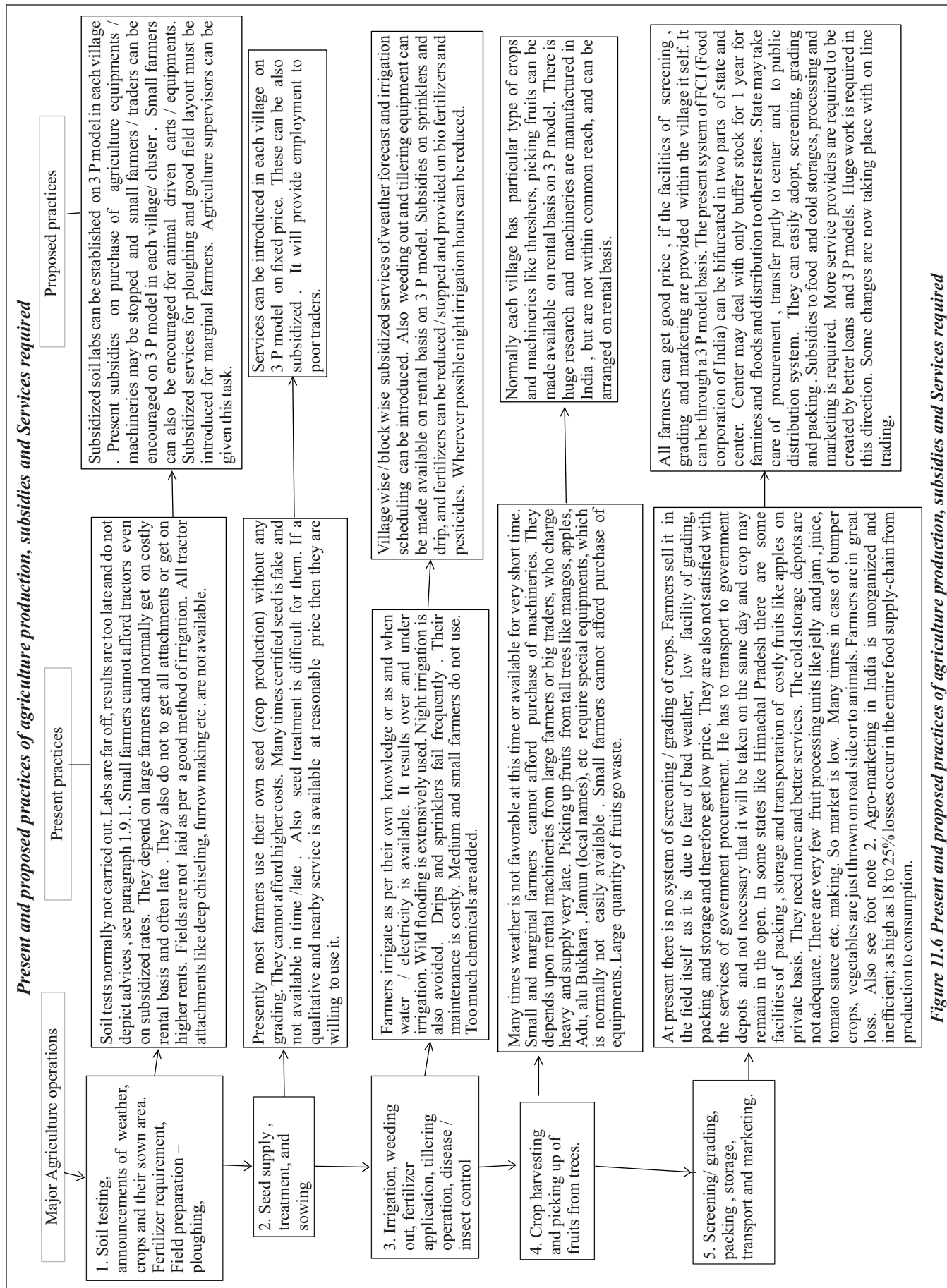
Considering improved average food production of 4.5 tons /ha per season and irrigated agriculture in two seasons and price @Rs.17000/- per ton / ha in the year 2015, annual income per ha may be =  $2 \times 4.5 \times 17000 = \text{Rs.}76500/-$  and further considering labor input as 70%, the annual net income = Rs 107100/- per ha. Thus one ha irrigated land in both seasons can support only one person. Thus minimum 2 ha are required for one season irrigated land and 1 ha for two season irrigation. Thus the employment supporting capacity of land is limited and becomes worst in bad weather.

Now consider a farmer having 10 ha of irrigated land in two seasons. His annual income will be =  $10 \times 107,100 = \text{Rs. } 10,71,000/-$  Now where is a need for subsidies to such farmers? There are 24% large land holding farmers (holding 86% land). Thus the benefit of most of subsidies is taken by them, and making poor farmers' poorer and poorer and rich to richer and richer.

7. The employment in manufacture i.e. industries is still only 11% and there appears huge scope in it in view of huge imports in other sectors than crude oil. Similarly there appears good scope in other sectors of trade and many service sectors.

8. Though huge investments and efforts are being made in each five year and annual plans to improve the productivity of agriculture, poverty alleviation, yet the improvements are slow and low. It can increase only through creation of service sector in agriculture such as providing machinery on hire basis at each village level (no individual subsidies), crop grading and packaging, storage, marketing etc. Also see note below.

9. Increase in agriculture and industrial production increases employment in service sector and export due to more opportunities in transport, marketing and allied services.



**Figure 11.6 Present and proposed practices of agriculture production, subsidies and Services required**

Notes to figure 11.6:

Soil testing has two parts - (i) type of soil up to 2 m below ground. This helps in decision for deep chiseling, choice of methods of irrigation and irrigation scheduling. This is normally one time or may be once in 20 to 30 years as the soil type does not change unless huge admixtures are added. Soil type sheets can be numbered and printed like G T sheets for easy use by many. (ii) Health of the soil relates to the status of fertilizers and other elements. This is required before every crop season or at least once in a year for every field. Now there is a good stress on preparation of soil health cards and that is a good start.

3P model = public private partnership (see paragraph 1. and <http://www.pppinindia.com>)

Present practice cannot enhance agriculture production. And merely talking to increase agriculture production has no meaning without other items of grading, marketing and transport to deficient areas as discussed in above figure.

A section of the society feels that every thing should be provided by a welfare Government. Well any government cannot do everyday's or more business and there will be many complaints against it. However it can only be a regulatory authority. Therefore a 3P model is better than even public sector undertakings. But the 3 P model cannot be same for every job. It will be different for different jobs. WUA is also a form of 3 P model.

In general it can be seen that vegetables are transported to urban areas from a vicinity of about 50 Km. Where as their production is better in other areas with better irrigation facilities and climate. The prices in these areas are very low and not ruminative to the farmers. A good grading, packing and forwarding policy/service can help every one.

1. For agricultural machineries see, Central Institute of Agricultural Engineering (CIAE, Product Catalogue, 2008). There are many low cost farm machineries

2. Dr. Abdul Kalam (Former President of India, 1998) has reported vision of post harvest technologies and agro food processing for short, medium and long term masseurs. Many of them are still to be implemented.

Unless and until the present system of agriculture production and subsidies are not changed, agriculture production is not likely to improve. While improving agriculture production, storage and other facilities must also be improved.

3. At present there are a number of subsidies, huge agriculture policies, huge budget allotment in agriculture (see annual and five year plans) for the welfare of the farmers and boost of agriculture, still the marginal farmers are getting poorer. In general large farmers are getting the advantage of subsidies. Then who is responsible? Then a rethinking is required to discontinue of many subsidies, like fertilizers, purchase of machineries, supply of seeds etc. and can be easily diverted to other heads as above. Also see figure 10.3, 10.5 and paragraphs 1.10.7.2.1, 10.7.4.

4. Withdrawal of subsidies in fertilizers and pesticides may very difficult due to established practices and politics, but can be reduced slowly by limiting to per ha basis on irrigated area wise or district wise and transfer of money to bank accounts and increasing subsidies to bio fertilizers and their manufacture. After all no government can permit to play with the health of the people with poisonous food. What is the use of such subsidies which make the public ill and unhealthy. Also see paragraph 10.7.2.1.

5. Improvement of agriculture is very important for national economy, as it feeds a large number of industries and also alleviate poor farmers. Present conditions in the year 2015 are not satisfactory. Only a revision of agriculture policy can help. It has to be agro climatic zone and irrigated area basis.

6. **Environmental effect of too much irrigation and irrigated area-** It refers to excess water application and excess area irrigated. Though irrigation is not free from environmental effects, yet it is necessary and cannot be avoided, but environmental effects can be reduced to a reasonable extent. Even the above agriculture operations have some bad effects on the health of the farmers as well as of other public. With too much working in water causes severe fever, fine dust during ploughing creates breathing problems, spraying of pesticides and fertilizers adds slow poisons in the body, dust during threshing also effects breathing and so on. This can be seen in intensive irrigated areas of Punjab, Gang and Bhakra canal, IGMP (Shri Ganganagar, Hanumangarh, Rajasthan) and many other parts of India. Spurt of too many private doctors, hospitals and medical shops are the evidence of the same and not of good development. The consumption of medicines is very high and bears a relation to consumption of fertilizers and pesticides. All of these can be considerably reduced by change in policy and technology (see Ch 6)



- iii. Crop diversification being adopted and proposed (crop seasons and yearly change)
- iv. Decrease in area from dark zones or reduction in ground water abstraction
- v. Physical increase in efficiency due to drip and sprinklers or increase of irrigation area
- vi. Area using furrows/borders
- vii. Availability of increase of machinery on rent in time and at reasonable cost to many farmers
- viii. Area irrigated per M cft or M m<sup>3</sup> of water
- ix. Many others and etc.

Let us think of one agro-irrigation cum farmer development policy and not in isolation of individual programs and policies. There are huge funds in 12th plan for preparation of agriculture district plans, kindly prepare only on agro-climatic zone wise and irrigated area wise.

## 11.9 PROPOSED METHODOLOGY OF IMPROVEMENT

Performance of all irrigation projects can be considerably improved by adopting following measures:

- 1) Policy reforms
- 2) Administrative reforms
- 3) Capacity building
- 4) Use of appropriate modern technology

In fact all the above 4 are highly inter active and work together. These are written separately only for ease of explaining and understanding. Any half heartedly attempt to improve one item and ignore the second is wastage of funds.

### 11.9.1 Policy and Administrative reforms

Policy and Administrative reforms are highly interrelated. Any single reform is of little use. Policy reforms are like combination of agricultural and water policies, changes in irrigation and drainage acts (revision of irrigation charges), introduction of PIM acts and their implementation plan, modification in laws etc.

Administrative reforms mean the mechanism through which the policy is to be implemented, i.e.

staff and their new roles, responsibilities, budget allotment etc. Thus both are interactive. These have to be very clear simple and implementable with the detailed implementation schedule.

Policy and administrative reforms started in India, from 1970 in the 4th plan, when the CAD concept was introduced and was followed by creation of IMTI/WALMI (1980-85).

As in the year 2011, there is a huge network of 97 ICAR institutes, 46 state agricultural universities; five deemed universities and one Central Agricultural University and 589 KVKs spread across the country, besides many IMTI, WALMI and irrigation research and training institutes. Still the agriculture production per unit land and efficiency of irrigation are low. **Why?**

A real breakthrough came with a legislation of PIM act (1997- 2005). Even the PIM act is still partial as it does not have a strong mechanism of regular training, transfer and monitoring them, see Chapter 10 and above paragraphs.

Therefore for an effective implementation, still changes in existing organizations and their functioning are urgently required for monitoring the WUAs, helping, training and arranging the equipments required, water auditing etc. and all the items listed above and in the tables .

One cell (may be called as monitoring cell) must be placed directly under the Government to have effective control, feed back and take corrective actions. TSG at different levels have been suggested in paragraph 10.9.

A modified manual for operation and maintenance with new jobs, roles and responsibilities should be prepared. If the audit reveals any irregularity, then officers responsible must be subjected to shifting and disciplinary action.

The cell should co-ordinate, monitor and give timely guidance to field officers so as to implement reforms in the right direction. Speedy decisions should be made. Monitoring cells will facilitate and guide field personnel in real time problems, to improve upon performance of irrigation projects.

### **11.9.2 Capacity building of DOA WRD and Application of appropriate technology**

It means only improving the capabilities in view of new technologies such as use of remote sensing, use of internet services within the command area and the inter communications with in the inter related offices. It must be arranged by the senior officer within the house through active participation through web sites and research institutions.

The weak link in irrigation assessment is measurement of crop-wise irrigated area in each season. This is more time consuming and moreover, there have been instances of omissions in assessment and favoritism. To have correct assessment of area, use of **satellite imaging** for assessment of area under different crops can be started.

**Use of information technology (Study groups - Quality circles):** Irrigation management is a dynamic process, as it involves changes in climate and dealing with a large number of human beings. Various study groups involving top officials, field officers, and agriculture experts, socioeconomic experts involved within the department to provide in-depth report on crucial topics of irrigation management must be online interlinked.

#### **Capacity building of agriculture supervisors and farmers:**

Huge money spent an little results. Also see paragraph 10.5.

Soon from the year 1970 onwards, during development of irrigation projects, the Indian planning commissions, the working groups, CWC, politicians and everyone started feeling the low performance of irrigation projects. But even till the year (2015), there is no strong mechanism of time to time multiplying the capacity from one to next one like a chain reaction. The consultancies for this job are of little use besides being exorbitantly costly.

#### **Bench marking in projects:**

Most irrigation offices suffer availability of their correct dimensions of structures and hydraulic behavior (see figure 3.11) due to changes during

constructions or after wards. This is resulting in improper regulation and running of canals (see paragraph 2.15.3). This can be easily done through an in house cell from quality divisions and some field staff within each irrigation zone and in a reasonable time of one year, lot of data can be compiled without hampering their regular work. This arrangement is much better than giving the job to a consultant.

#### **Promotion of water conservation technology:**

For details and implementation see Chapter 6 and 9. It has been proposed to be the responsibility of DOA.

### **11.10 SOME EXPERIENCES OF OUTPUTS OF CONSULTANCIES**

The object of these discussions is not simply to find faults or criticize consultants, but to learn from their works, methodology, outputs and finally compare, draw lessons for future and make the contracts tougher (wherever necessary), prepare details of desired output more clearly with time frame work and monitor with respect to that, timely and regular monitoring and issue reports, or reduce the consultancies, be wise enough (like Tata and Birla and other corporate offices) and good pay master of the public money for the outputs (pay as per quality).

In India, planning, design, development, construction, operation and maintenance of irrigation projects had been and are still the responsibility of government departments.

Before the year 1947 (independence), the works were planned and carried out by the Public works department (PWD) of the state. After 1949, when a large number of irrigation works were started, irrigation organizations in the state and some interstate construction boards were created (around the year 1951) for fast execution of works (see table 1.1). A central agency of government of India, known as Central water and power commission was created around the year 1950 to design medium and large structures. Small structures were designed at local level.

The system developed was based on the system in



advanced countries, like USA. In USA, the survey and designs were carried out by USBR, Core of engineers, US army, US soil conservation service (all government organizations) etc. These agencies produced very high quality design manuals, design of dams, power houses and canals. Their publication soon became popular through the world.

Practically no private consultants were involved nor were available. However the services of experienced retired engineers of high integrity and respect in the political leadership and public were taken through re-employment or extension.

Slowly, each state developed their own planning and design wings, equally strong enough as CWPC. (Design wings of Bhakra Beas construction board, UP, Gujarat irrigation department and others became very popular). This resulted in fast and high quality design and construction of most of the complicated projects. By the year 1980- 1990, India was at the threshold of export of engineering technology.

Slowly, with huge political differences between the states, politics within the state itself in transfer postings, promotions, favoritism, the quality and quantity declined.

With the increasing pressure of the funding agencies like World Bank and others for private consultancies, a shift started around the year 1990 onwards. Many international funding agencies came in to give loans and laid certain conditions of consultants. Their feeling was that the government work is slow, costly and poor quality. Perhaps, they had the experience of high quality and fast output of consultants. They were in hurry to get the works completed in time and have quick output. They had a strong feeling that the output and its quality are fast and better in private than in government. Earlier their conditions were not accepted, but slowly they made strong room in the government.

Any way there is big difference between the private companies, their products and the consultancies to the private and to the government. In private the consultant is answerable till the result is achieved

and rebuked / fired if there is loss or rather punished also and future business is discontinued. There may be written or oral agreement. But in the government there is no such system nor can it be easy, due to complex system of irrigation projects even after a written document. This fact is still not being well realized, but must be understood by the next generation.

Here only some typical examples of experiences are narrated below, for everyone to realize.

#### **11.10.1 Design of Som river canal aqueduct (1981-82)**

The structure is medium size canal aqueduct on Som River in Udaipur (Rajasthan), very wide and un-frequent high floods. For early design and good progress of works, its design was allotted to a private consultant. They made some calculations and submitted a nice looking drawing. Fortunately or unfortunately the drawing was sent to the design organisation for scrutiny. The design calculations were sought, but the firm refused to supply the same on the argument of its propriety rights. Then it was decided to make fresh design calculations and check the drawing. Soon it was revealed that the structural drawing was unsafe. This was informed to the concerned. The firm became angry and strongly agitated as their payment was withheld. They wanted the calculations which were refused on the same argument as of theirs. Now they came up with their calculations and tried peaceful discussions. Soon they were convinced of the errors of design loads.

They redesigned the structure and made fresh drawing and came with calculations, which after one / two sittings were finalized.

Anyway the firm got lot of experience and capability and subsequent designs were easy. They started a good record system of designs. With the good record system next design was easy and cheaper and their profit increased. Now in the computer era, the cost reduction and profit is more and no gain to the client. Slowly the design organisation lost the experience and capability due to poor record keeping and non reference of past

designs.

#### **11.10.2 USAid works In Rajasthan (1981-85)**

The US funded a loan for medium irrigation projects lying uncompleted for want of funds.

The projects were selected on the basis irrigation and cost of further investment per ha. The government did not agree to their condition for appointment of consultants and it was agreed to get the designs approved from CWPC, Delhi. To facilitate fast designs, the same were prepared by the state design organisation and were scrutinized and approved by the CWPC. Huge money was saved not only in consultancy but as well as economy in cost due to good designs. Also it improved the capabilities of local engineers.

#### **11.10.3 KFW works in Rajasthan (1982- 84 and 1990-2000)**

Japan (KFW) funded the construction of some minor irrigation projects. Their engineer worked in Jaipur to prepare the document for funding. The design criteria were prepared jointly by them and the design organizations and approved by them. The condition of consultancy was not agreed and it was decided that he designs will be prepared by the local engineers on the guide lines jointly approved and project reports will be scrutinized by Kfw officers and finally approved in joint meetings. This resulted in economical cost and huge saving in design costs. Later they insisted the construction evaluation and monitoring to be done by an independent agency. But after two three meetings it was agreed to have in house monitoring and evaluation, but independent from the construction and supervision. Final review indicated a good designs, constructions and farmer satisfaction. It saved huge cost to the government exchequer.

#### **11.10.4 Dam safety works (1994-2000, World Bank funded project in Rajasthan)**

Many dams, suffering from remedial measures, rehabilitation and restoration were taken up with World Bank funds. Here also they stressed for consultancy. Here a question arose who has to finally approve the designs and drawings, before

payments. Without detailed design calculations, drawings cannot be approved. That meant lot of time of the local engineers and therefore it was finally agreed that the designs will be prepared by the local engineers and approved by the CWPC, Delhi. However, it was also agreed to facilitate fast designs, some designs were to be given to the consultants. The consultants also could not prepare them in time and what ever done could not convince the officers. This resulted in leaving out some of the projects.

#### **11.10.5 Feasibility and detailed designs of irrigation projects in Ethiopia (2006-2010)**

Ethiopia is a developing country. It is known as the water tower of Africa as it has high rain fall in comparison to rest of Africa and most of the rivers originate and have large catchment in this country. The estimated annual surface water resources are about  $120 \text{ B m}^3 = 120 \times 10^9 \text{ m}^3 = 120 \times 10^5 \text{ ha m} = 12 \text{ M ha m}$ .

A large number of studies had been carried out by many foreign consultants. These are as under:

1.0 Study by BCEOM (1971): BCEOM-ORSTOM of France carried out study of Wabe Shebele basin between years 1969 to 1971. It prepared many volumes and identified a number of project sites for investigations, but did not rank them.

2.0 Studies by WAPCOS (1980-1990): Preliminary Water Resources Development (WRD) Master Plan for Ethiopia. It also prepared many volumes and identified a number of project sites for investigations, but did not rank them. Some prefeasibility reports were also prepared. Many pre feasibility reports appeared in haste and without good principles.

3.0 MoWR - Wabe Shebele River Basin Integrated Master Plan, 1998. – This document was prepared by the Govt. itself and appeared much better.

4.0 Studies by WWDSE, MCE and WAPCOS (2002-04); Integrated Development Master Plan Study for Wabe Shebele river basin, carried out in three phases and published reports as under

- Phase I - Reconnaissance - Published in 3 sections
- Phases II - Data Collection, Site Investigations, Surveys and Analysis - Published in 3 sections
- Phases III - Master Plan Formulation - Published in 7 volumes

These documents had lot of improvements, better clarity and understanding.

Still all the documents did not prepare a detailed plan of further investigation and implementation.

#### 5.0 Feasibility and detailed design study reports

Besides above major studies, some pre feasibility, feasibility and detailed design reports for some projects were prepared by different consultants. Some reports can be ranked as satisfactory and others far below satisfactory. All companies drew their complete payments.

The above system of preparations of reports through consultants had following drawback / disadvantages:

- i. This is very costly. Cost of pre feasibility and feasibility reports is very high.
- ii. The consultants only look at the tasks / TOR given to them. They do not look beyond that. For example some sites are very promising / very strong sites for power cum irrigation projects. But if power component or vice versa irrigation is missing in their TOR, they will not propose changes. Similarly the scope of some sites can be enhanced due to better storage space available and water availability can be increased from diversions from nearby catchments. Even that can be in 2nd stage, but consultants will not include those aspects.
- iii. Similarly some sites can be or must be rejected due to very high cost or may be clubbed (amalgated) to another nearby project. But consultants never do it.
- iv. It has also the drawback that screening and no comparison of good potential sites is readily available; no priority ranking of them can be made for semi detailed investigations and examination for construction.

v. Normally its impact on the upstream and downstream site as well as in the basin is not available. Therefore another multipurpose project may be left out and may not be feasible at a later stage due to non availability of water.

vi. Local Engineers though associated with foreign consultants, yet they are not able to acquire sufficient knowledge and confidence and this process of training is slow, time consuming and strong.

vii. It is normally against the policy of foreign consulting firms / consultants to impart sufficient knowledge. They have no time and interest.

viii. Sometimes low priority or low benefit project may be taken up first for construction, where as promising site or a low cost project may be left out may be taken later on. This does not boost the economy. On the contrary first good potential, low cost and high benefit sites must be taken up for construction.

ix. Sometimes firms propose consultants of low caliber or they may not know all the pros and cons nor may not analyze all the possible alternatives. They do not expose themselves. They pretend more and try to blame or give some or other excuses for whatever they do. He may also not have enough field experience.

x. Sometimes the project is very costly, or false economy is shown.

xi. Most of the identified sites remain pending further investigations, preparation of reports and comparative analysis of sites and expected benefits.

Therefore a strong system of training of local engineers and preparation of reports through them is the best alternatives. Services of foreign consultants can be hired for training and guidance in preparation of reports. Also individual consultants are better than a consultancy company.

#### **11.10.6 Improvement/rehabilitation of irrigation projects and WUA capacity building programs in India**

##### **(a) Capacity Building of WUA in MP (Madhya Pradesh, 2006- 2011- Water Sector**

**Restructuring Project (MPWSRP)** in Sindh, Ken, Tons, Chambal & Betwa basins, 654 minor, medium and major irrigation schemes with an aggregated culturable commanded area (CCA) of about 6, 20,000 ha.

The above program is part of MPWSRP (Madhya Pradesh water sector restructuring project, as a loan of 396.0 M US \$ to India) to modernize existing irrigation schemes and provision of appropriate extension for agriculture, horticulture, livestock management and fisheries and WUA strengthening and preparation of GIS based thematic maps on land use, soils, crops, water bodies and other agricultural and geomorphic attributes for the Sindh and Tons basins on GIS platform.

The important consultancies (together with estimated base costs) under this project include:

- i. Consultancy for topographic and cadastral survey and asset inventory (5.33 Million US \$)
- ii. Consultancy for basin planning and decision support system (444,000 US \$)
- iii. Building special technologies capacity (222,000) US \$
- iv. Basin social and environmental assessment (222,000 US \$)
- v. Consultancy for water rights study ( 333,000 US \$)
- vi. Training of staff on basic and advanced application of computers (1.78 Million US \$)
- vii. Institutional Reforms (1.78 Million US \$)
- viii. Consultancies for MIS component such as data computerization, networking
- ix. collaborative computing systems etc.( 2.45 Million US \$)
- x. Consultancy for Monitoring and Learning ( 500,000US \$)
- xi. Consultancy services for participatory irrigation management, capacity building and
- xii. strengthening of Water Users Associations etc. mostly through NGOs (1.44 Million US \$)
- xiii. Consultancy for technical examination of

works (444,000 US \$)

Many consultancies could not be allotted in the sequence of the work. For example the

Consultancy for topographic and cadastral survey and asset inventory (5.33 Million US \$) was allotted much later after the allotment of PIM capacity building. There was very little clarity in the output, quantum and quality of work of most consultants.

In the capacity building program of WUA, the World Bank wanted that the WUA be motivated to construct the water courses, but the chak plan of the water course with details of size, location of out lets, command levels, command and un-command area were not prepared by the design / survey consultant. Therefore no construction of the water courses could be taken up by WUA.

The WRD laid major thrust on lining of existing canals, without any justification of the same (see Chapter 9), and command levels etc. Most of the WUAs were not happy with the project without consultation with them. They raised many voices for proper powers to WUA and transfer of some funds for management of assets, but were not heard, see 10.3.2, 11.5.1.3.

In the capacity building of WUA, the approach of appointing one community organizer for each WUA was better than that adopted in Rajasthan (see paragraph below). It would have been much better if it could have been a water master of WUA as discussed in paragraph 10.6, in place of community organizer. A training of about 2 days to the community organizer and some monthly monitoring without actual field operation of the canal system was not adequate. Details of actual capacity built as discussed in paragraph 10.5 to 10.6 are not available. An early assessment of actual performance of WUA as per paragraph 11.5.1 is urgently required before the projects are too much deteriorated. Also see table 11.10 for details of methodology of payments for consultancy. The capacity building consultant took twice the payment against the in their bid, as they kept only half of the staff against the strength of the bid and took full advantage (cheated the PMU) of the non



clarity in the contract.

#### **(b) Rajasthan Minor Irrigation Improvement Project (RAJA MIIP)**

The Rajasthan Minor Irrigation Improvement Project (RAJAMIIP) executed from year 2007-8 to 2014-15 under the finance from JICA, Japan, through the Water Resources Department of Government of Rajasthan. Its scope was to rehabilitate a large number of minor irrigation projects and some minors of other medium/ major projects in 20 Districts of Rajasthan with a view to increase the efficiency of water use and thereby boost agricultural productivity.

A quality based- Management & Engineering (M &E) Consultant was awarded to a foreign consultant at a heavy cost. The high lights of the project are as under:

Total Culturable Command Area (CCA) of these 415 sub-projects is 1, 27,422 hectares. The current irrigated area under 415 sub-projects is estimated to be 90,000 hectares on completion of the project it is planned to be expanded to approximately 1, 02,000 hectares. Sub-projects in A Priority were further examined and sub-projects satisfying the second screening and appraisal criteria were implemented. The consultant also had the responsibility of investigation, designs and preparation of detailed project reports (DPR). Sub consultancy was also permitted under their supervision. Also a lead NGO was appointed as per the guidance and under the supervision of the E and M consultant. Short review comments on it are given below in table 11.9. This table shows that most of the times there was creation of awareness in WUAs and no field performance as discussed in Chapter 10 and 11 was carried out. Also a comparison of methodology of payments in some consultancies and comments are given in table 11.10. Now an early assessment of actual performance of WUA as per paragraph 11.5.1 is urgently required without any fear of audit reports (audits or punishment can be barred) before the projects are too much deteriorated, and the basic purpose of IMT is lost.

#### **11.10.7 Rehabilitations designs of small scale lift schemes in Ghana:**

Ghana is a developing country in Africa. It has good rain fall, but still agriculture requires irrigation. Many major and minor irrigation schemes both gravity and modern lift schemes were designed around the year 1997 and constructed around 2007. In some lift schemes, works typically land shaping and grading were left incomplete. Generally and almost 80 to 90% works were constructed in all these schemes. This resulted in non utilization of huge investments and deterioration / damages / thefts of costly items. It was decided around the year 2011, to rehabilitate these schemes with some investments and consultancies were awarded around the year 2012-2013.

The lift schemes are generally lift cum gravity-permanent pump installation. Water is pumped from the river and stored in NSRs for further distribution. Pumps are Centrifugal electrically operated.

The initial design consultants left the design of pump and pump house at the mercy of pump supplier on the ground that the pump supplier would be responsible for producing the detailed design of the pumping installation in accordance with their specifications and outline designs. This approach allowed the pump supplier to adopt the most efficient and cost effective layout for his particular equipment and avoids disputes between the civil and M&E contractors. However the details of comparative analysis of the alternatives were not made available and it is very difficult to say that the choice of pump installation was cost effective. Therefore it may be desirable to force the consultants to provide comparative analysis of options of pumps, layouts and civil works. However, they may collect information from many firms. The civil works contractor should be also required to provide detailed drawings of the proposed installation for approval by the engineer.

Instead of leaving many schemes incomplete, some could have been completed and more works left in other schemes or not taken up. This starts giving



returns instead of blocking a large fund. This problem arises due to price rise, under estimation or unforeseen expenses etc. To resolve it, the allotment of construction work can be taken in phases with a reasonable time gap.

The civil works contractor be also asked to provide detailed drawings of the proposed installation for approval by the engineer. Instead of leaving many schemes in complete, some could have been completed and more works left in other schemes or not taken up.

#### 11.10.8 CONCLUSIONS ON CONSULTANCIES

1. Most of consultants do not have the experts of the domain in house. Therefore they hire the experts on man day's basis and hence it generally do not reach intended objective wholesomely.

2. The experts arranged by the consultants generally do not have the inclusive experience of the field conditions and data which makes the report generalized version rather than the optimum solution.

3. The departmental officers responsible for accepting the consultant's report are not equipped enough to pin point the deficiencies and the real requirements as per the terms of reference and hence accepts whatever is being provided by the consultants.

4. Once consultant is appointed the departmental officers never bother for the requisite inputs with in time frame which forces consultants to give their reports with incomplete data and a huge blame.

5. A large number of consultancy reports is lying without implementing the recommendations thereby of little /nil benefit to the government and money spent is sheer wastage.

6. It is also true that the output of officers in the government is low as well as the quality of consultants is not high. Many consultants do not act as faithful advisers.

7. Lastly a consultant is a contractor to render certain services and the experience in India is that

their quality of output is not very good unless and until hammered continuously. The general experience is that the firms, companies, NGOs, contractors and other similar organisation are experts in mal / foul practices, making huge profits by rendering very poor services, threatening the officers and misusing political affiliations. They are experts in finding faults and lacunas in the agreement and making false claims and litigations. Counter acting is generally lacking in the government.

8. The only option is to increase the accountability and answerability of the officers well as that of the consultants. Joint work may be preferred than isolated work or part work to consultants and part to officers.

9. The intension of above discussions is not to criticize or praise falsely, but to **say good to good and bad to bad**. Perhaps this appears as the only or one of the options to improve the quality and quantity of output with respect to money spent and as per the expectation of the public / farmers at large. Make the terms of reference more explicit and tough. Link them with expected output. Words like 'assist the Govt.' shall be avoided and clearly stated that the "consultant shall do..." must be written along with the time frame. Lastly specified output in terms of qualitative quantitative work (with indicators) must be specified.

10. Everyone connected with rehabilitations, improvement of irrigation projects and capacity building to increase efficiency of water use /irrigation through consultancies should examine the same in light of chapter 10 and 11. They should evaluate the performance of WUAs and grade them to show the quality of work done by the consultants and should pay according to that.

11. Before allotment of consultancies a detailed manual for expected quality output and performance indicators must be prepared with provisions for penalties / punishments in case of short fall.

Table 11.9 Short review comments on the output of E & M consultants on the Rajasthan minor irrigation improvement program and comparison with the capacity building program of MP		
Notes: In MP, capacity building of WUA was given independently to one agency and there were separate agencies for executions etc. see paragraph 11.9.7.1. Here there was only consultancy for improvement / rehabilitation of minor irrigation projects and capacity building. The approach of MP was better than Rajasthan. There was no problem of verification of bills and output was directly monitored by the WRD.		
S. no.	Provision in agreement and in MOD	Review Comments and comparison with MPWSRP, see paragraph 11.10.7.1 (Also this table must be read along with the Chapter 10 and 11).
1	2	3
1)	2 <sup>nd</sup> screening of the project in terms of technical, economic, social and environmental aspects and preparation of report.	Screening Report is only with respect to hydrology and that too based on century old method and improper assessment of free catchment. It does not do all other aspects.
2)	Establishing standards and guidelines for four sample projects	There is nothing new. The Guidelines are general existing practice of ID. Even the Performance is filled simply with simple yes / no answer and false with respect to contents in the DPR. No elaboration explained.
3)	Planning of SID works (survey, investigation and design)	SID-contractors were employed as per the advice of the consultant, guided and closely supervised by the E&M Consultant. In spite of all that the quality of output was very low. They even did not do the marking all the existing structures, outlets on the canals, existing water courses in the fields with sufficient hydraulic data, requirement of new structures, command and un-command areas and proper estimation of canals capacity and related designs (see figure 3.11) and rehabilitation of the same was planned on some tentative uniform section, practically same for all. No aspects of water management were included in the designs, see chapter 3 and 6. Sizes of gates, structures on the canals were not collected and so no gauge - discharges relationships were prepared. It did not prepare a crop calendar of agro-climatic regions as shown in figure 3.17 and 11.2. New chaks and outlets were proposed on adhoc basis of 30/40 ha. The SID-contractors were extensively favored. Surveys, investigations and designs were diluted. Final DPR were not thoroughly examined by the E & M consultant and a certificate was imposed on the concerned executive engineers.
		Heavy cost of improperly designed cut throat flumes (generally only one typical design which does not operate similarly everywhere) of fiber glass with cement concrete behind it were

		permitted. Whereas same could have been casted in situ with proper shuttering or constructed in stone/ brick masonry. In USA also flumes are cast in situ without any fiber glass flume. This would have saved huge cost. There was a big favour to a particular manufacturer. Most of the issues discussed in this book were hardly accounted / adopted.
4)	Approval of JICA for 4 subs projects.	The projects were approved with a strong faith on a quality based consultants. These were not examined by any engineering water management expert. These did not include any of the aspects discussed in Chapter 3 and 6.
5)	Evaluation and appraisal of DPR by E&M consultant and suggest modifications if required.	This was done quickly and grossly. Most of the certificates required to be given by the consultant were obtained from field officers. Also see item 3 a above.
6)	Status of Civil works 4 sample sub projects.	These were individual contracts being in different zones, so could be easily implemented. Monitoring of increase of project efficiencies could have been done in rest 5 years, but not done. Also see point 7 below.
7)	Making contract packages of civil works	The contract packages include more than 4-6 projects contrary to practice of individual sample projects. This practice favored in long time duration of 2- 3 or 4 years of completion. Sometimes contractors take 1 by 1 project, thus irrigation is delayed. No action was proposed or was possible during contract period. Small contracts would have completed the works faster say in 6 months to 1/2 years and also they do better quality works. There was no condition to complete works within 1 year and ensure irrigation as early as possible. Preference to canal works was not given in projects where ever feasible.
8)	Prequalification documents and tender documents and tender evaluation	The specifications for the works and draft contract document was simply a copy of IS and general contract in the department and were unnecessary in view of details available there and the practice in vogue. <i>The packages were such that generally fell within the competence of S.E and ACE. The E &amp; M consultant with drew from evaluation on the excuse of delays in routing the bids through all the channels and all the cases would be coming to headquarter (PMU) and proposed evaluation of only the cases within the competence of Chief Engineer WRD and government (limited to a very few).</i> Thus simplified their work and developed arguments to blame WRD later on.
9)	Construction supervision Supervising, and controlling the progress, quality control, safety Enhancing capacity for quality control and progress monitoring Finalizing /supervision and	Controlling the progress was beyond the capacity of the consultant as it was beyond his control due to the agreement between the EE and the construction contractor. The manual for construction supervision, quality control management and monitoring do not indicate the quality of material available at source and methodology of screening of sand stone / sorting of stones etc. and made usual observations as per the common practice of the department and blamed the field officers. The consultant visited site of each sub project at least once in three

	monitoring of works of water courses to be implemented by respective WUAs	months and as and when required, during construction.
<b>10)</b>	Construction / rehabilitation of water courses.	Knowingly or unknowingly this aspect was started too late, i.e. after rehabilitation of canal net work. In the command area survey, layout of existing outlets and water courses were not marked and left for further / future survey. In the DPR existing outlets were ignored and new were proposed on a basic concept of average size of 40 ha without any realistic assessment of CCA (suitability of agriculture land and command levels). Then suddenly it was decided that the existing water courses will be rehabilitated, against the earlier statements of laying proper outlets, water courses, including modification as per the command area survey. It was decided that the water courses will be earthen and will be constructed by the WUA. The cost will be paid to WUA and they were required to contribute only 15% of cost. This made the WUAs happy as they got lot of money and accepted almost all the conditions of the WRD. Thus rehabilitation started as usual past practice and the concept of water management, proper layout of the fields and appropriate methods of irrigation was left at the mercy of farmers, ignoring all the principles of good water management discussed in Chapter 3 and 6. The firm fooled the PMU / Government and made huge profits. For typical examples see DPR of Chandaran project, There are large un command areas (above FSL) in head reach and farmers lift water to feed their land. There are many more examples.
<b>11)</b>	Financial management of the project and proper maintenance of project accounts including certification of all payments and disbursement requests to JBIC	Monitoring physical and financial progress of the project, only compilation of progress reports from field offices, This also being done as routine matter in the department and noting new was done. The payments required to be made at least once in a month were never made and delayed resulting slow progress. Consultants only visited sites once in three months and issued inspection notes as if the execution wing was doing nothing. The EE had been executing works of more than Rs.1 crore as per departmental practice. The consultant only deteriorated the system by making complicated contract packages so that the field officers can be easily blamed. This activity was just to justify the very existence of consultants. Also see item 7.
<b>12)</b>	Appointment of NGO	Only one lead NGO was formed. It further appointed 10 sub NGOs, each with 10 to 20 WUAs. Each sub NGO appointed only one Community organizer (Co) to work for 3 to 7 WUAs. These Co were not from the WUA areas. This do not appears a strong proposal in comparison to MP project where 1 co was appointed for 1 or 2 WUAs.
<b>13)</b>	WUA formation and conduct proper elections	This was done by the WRD and consultant did not play any role.



<b>14)</b>	NGOs to help WUAs in their capacity building and improving competence of Water masters for achieving efficient water use.	The consultant did not propose the concept of water master till 2012 and blamed their non appointment. In place of Co. Water master should have been conceived from the beginning. NGO was not so trained as to build capacity building for efficient water use. Training manuals / programs were of little use in this regard. Also see paragraph.
<b>15)</b>	Prepare guidelines and manuals for capacity building of WUAs	Most of the manuals are less field oriented and do not include most of the issues discussed in Chapter 2 to 11 and are in English, beyond the capacity of trainers, as well as trainees, so were not used in capacity building.
<b>16)</b>	Supervision of NGO activities and certification of payments	In actual practice, only 6 months are adequate for awareness and another 6 months for capacity building and 2 year actual field work as per paragraph 11.5 to 11.5.4.
<b>17)</b>	Monitoring of Training and Institutional Strengthening Activities	Nothing good was done in this regard. No good trainings were arranged.
<b>18)</b>	Annual training plan and annual review reports	Nothing good was done in this regard. No good trainings were arranged.
<b>19)</b>	Review contents of training courses before implementation of training courses	Nothing good was done in this regard. No good trainings were arranged.
<b>20)</b>	Verification of payments	After too much delay, many blames on the client and heavy pressure by the funding agency the payment methodology was devised. In it firstly the JE, AE, EE then quality control AE, EE and then the consultant's supervisor signed and then the team leader signed authorizing the payment.
<b>21)</b>	Implementing M & E for training activities	Nothing good was done in this regard. No good trainings were arranged. Discussions with trainees and comparison with the text in Chapter 3 and 6 would reveal.
<b>22)</b>	Review & monitoring of Agriculture extension, Pro-poor and agricultural extension, pro-poor & health components.	This has been discussed in above items 17, 18, 20 and paragraph 10.7.4. Nothing good was done for pro poor component, see paragraph 1.10.
	Review of plan for agriculture extension, pro-poor, health component before their implementation and verification of payments	Nothing good was done in agriculture extension, see paragraph 10.7
		Nothing good was done in the health component, see example under table 1.10
<b>23)</b>	Overall Project Management	Nothing good was done in verification of payments.
		The overall project suffered delays in execution, payments, non monitoring of irrigation and preparation of any water accounts (see Chapter 4 and 5).



<b>24)</b>	Monitoring physical and financial progress of project & consultant shall device suitable MIS for proper monitoring of project activities	The Performa's devised did not show the bottle necks in the storage and achieving the irrigation and the performance of WUA in the operation and management.
<b>25)</b>	Preparing water management and maintenance plan & manuals	This was required right in the begging while preparing the rehabilitation plans and DPR. Subsequently were prepared very late and did not clarify what the WUA will maintain and what the WRD will maintain and how they will help each other.
<b>26)</b>	Preparation of operation and maintenance manuals for each individual projects	This was one of the important assignments, but nothing was done till the end of 6 years. In the end something done was very much diluted than required. All the aspects required in PIM act were neglected or deliberately ignored; see Chapter 11, paragraph 11.5, records to be maintained with their methodology and table 3.10.5, 11.1 to 11. 8. Also the data required such as the size of the gates, their rating curves, see figure 3.9, 3.11, 3.15, 3.19, 3.20 were not prepared. The capacity building did not include the operational aspects. The department was doing much better before this consultancy.
<b>27)</b>	Preparing completion reports of the sub projects	All the projects were existing projects and the work was only improvement and rehabilitation. Still the dimensions and capacities of structures were not prepared, see figure 3.14. Also final drawings of improvement carried were not prepared.
<b>28)</b>	Preparing quarterly progress reports, annual work plan and budget and project completion report	Team leader spent most of time only on item 28 activities.
<b>29)</b>	Preparing the proposal for the subsequent phase of the project.	This is done to enhance their continuation on the blame on the department. If the contract packages were formed by project wise it could have been easily completed in one / two years.

*Notes to table 11.9:- 1. The above items was prepared by the M and E consultant to show their quantum of work and divert the PMU from quality of output. High sounding words were used to attract, that actually confused and exaggerated the quantum of work. Quality of work (for improving irrigation) is not high.*

*2. The above comments are based on a short review of some reports of few projects. Each irrigation division or Project monitoring cell (PMU) should study each individual Project and prepare detailed comments with respect to the discussions in Chapter 3, 6, 10 and 11 without any fear. Detailed comments require study of individual projects and are beyond the scope of the present text, but PMU should do it for the future and be not afraid of staff required and time. 3. Issues – in conclusion, the main issues in the agriculture and irrigation sector of Rajasthan as below identified earlier and were left on one side during the entire phase of the consultants:*

- (i) Low agriculture productivity- It was left at the mercy of the farmers. Nothing was done even the agriculture extension program, see paragraph...*
- (ii) Water shortage- This depends upon rain fall. Still something could be done by conjunctive use, but nothing could be done*

<p>(iii) Low irrigation efficiency- No good efforts were made to improve and monitor the efficiency.</p> <p>(iv) Financial constraint &amp; low recovery of water Charges- No attempt was made in this regard.</p> <p>(v) Poor management practices, inequitable and unreliable water availability - No attempt was made in this regard. No policy was prepared as discussed in Chapter 3.</p> <p>(vi) Deteriorated conditions of facilities, :such as i) Encroachment in catchment resulting in reduction of inflows to tanks ii) Physical condition of dam embankment and deterioration of canal distribution system. - No attempt was made in this regard. No policy was prepared as discussed in Chapter 3.</p> <p>(vii) Over exploitation of Ground Water- No attempt was made in this regard. No data were compiled and no policy proposed, see Chapter 8.</p> <p>(viii) Non involvement of Beneficiaries in operation, maintenance &amp; management- No attempt was made in this regard. Even the WUA was not so trained as to do operation and maintenance effectively, see paragraph from 11.5 to 11.5.8.</p> <p>(ix) Non adoption of latest Agricultural Extension activities &amp; improved methods of Irrigation- Nothing</p>	<p>good was done for adoption of latest agriculture extension activities and improved methods of irrigation.(x) Even the contract administration such as checking and certifying the contractor's invoices, and resolution of claims, deviations, extra items, time extension etc., (visit to the site as &amp; when bills are received) of all the projects as claimed earlier was restricted to some projects only.</p> <p>(xi) All the site supervising engineers had no instructions to look in to the aspects of capacity building of WUA, preparation of canal sluice rating curves and physical monitoring of use of stored water and efficiency of irrigation.</p> <p>(xii) Consultants could have requested remote sensing agency for giving the details of irrigated data and that could have been analyzed to show their claims. They could have also shown to WRD for monitoring.</p> <p>(xiii) In fact the operation and maintenance manual should be part of DPR (detailed project report), so that all aspects of an efficient operation are included in the data collection, surveys and designs. This document can be easily checked by the concerned executive engineers.</p>
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Table 11.10 Comparison of Payment, monitoring and proposed system in above consultancies

S. No.	Name of consultancy	Office and ancillary	Major items of payment with comments Consultants and Staff	Reports of the consultants	General Comments
1.	Design of Som river canal aqueduct	Nil	Nil	5 Only after the designs were approved by the design wing. Detailed designs must be obtained.	6 This ensured better designs and proper scrutiny. No false payment
2.	Feasibility and detailed designs of irrigation projects in Ethiopia	Office within the campus of the client. One project managers of the client regularly interact with all experts of the company.	On report basis and per dime on monthly basis. This ensures payment on actual work days. But it is only 1% of wages. The payment on report basis is not good.	On report basis. Reports are bulky with false claims and difficult to understand. Also adequate staff not available in PMU to examine. Some times company requests for engaging a right person at home country and get the report from there, which is normally agreed. Indirectly it means that company does not have right person and a low quality bulky report is sent which cannot be easily understood. At home job is very cheap in comparison to the person working in another country and company makes lot of money.	Regular meetings with consultants helped in better coordination, timely resolution of problems. The caliber of consultants is also known to the client and sometimes replacements are sought. Also adequate qualified staff not available in PMU to examine. This resulted in no coordination in various reports and acceptance of reports of any quality.
3.	Capacity Building of WUA in MP	Some rented office away from the office of the client. No regular watch is made. No regular meetings with individual expert. Any office in the vicinity and frequent interactions improves the	On report basis. Company (consultant) promised to set up 5 offices and 5 experts in each office. But co. curtailed 2 to 3 experts in each office. Kept many on man days basis and used services on call basis for few days in a month and claimed for full month. Co. also employed low cost (quality) persons. Thus saved more than 70% cost. PMU was helpless	Reports are bulky with false claims and difficult to understand. Also adequate qualified staff was not available in PMU to examine. No detailed standards of output were readily available. This resulted in acceptance of reports of any quality. Strong strengthening of PMU with lot of initial work of preparation of expected outputs and monitoring is highly recommended before allotment of bids.	When the accommodation for the staff of co. is not available within the campus, the client should hire the accommodation and should not leave on the consultant itself. However local consultant having its own office can be permitted. But there should be regular meetings and presentation between the client and the consultant. Till the performance of capacity building is not

4.	Rajasthan Minor Irrigation Improvement Project	results.  Some rented office away from the office of the client. No regular meetings with individual expert. Any office in the vicinity and frequent interactions improves the results. Both know their short comings.	due to such provisions in the agreement.  Monthly payments on the basis of time sheets of individual consultants verified by the team leader. It ensured full attendance / regular working of the expert. But quality of report not ensured and payment are made before the same are received. However sometimes delayed for want of the reports.	Reports are bulky with false claims and difficult to understand. Any way the system of payment is better than in item 3 above. A more better may be part payment on time sheet basis, part payment on qualitative reports and part final payment on the basis of final output verses expected / proposed output appears a better solutions. Also adequate staff not available in PMU to examine. Strong strengthening of PMU is highly required.	available, only part payment on time sheets and part payment on examination and quality of report basis is better.  Part payment on time sheets and part payment on examination and quality of report basis would have better. Simply on report basis has drawback of not knowing sufficient persons working and their location. They may not be at the place of work. But there should be regular meetings and presentation between the client and the consultant. The performance of capacity building is not available.
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