Guidelines for JSA Assessment

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1 Background

1.1 About the Jalyukt Shivar Abhiyan

The Jalyukt Shivar Abhiyan (JSA) is a flagship program of Govt. of Maharashtra (GoM) launched in 2015, as per the Government Resolution (G.R.) dated 5th December, 2014. The program aims to tackle the question of recurring droughts and make Maharashtra drought-free by the year 2019. The program is being implemented at village level and is supposed to cover all the villages in five years in a phased manner. Every year few villages in each taluka are selected for the implementation based on pre-defined criteria (i.e. existing incomplete projects, drinking water scarcity, low agricultural productivity, groundwater exploitation etc.). Around 5000 villages are selected each year.

JSA is watershed program with main focus on soil and water conservation activities like trenches, gabions, percolation tanks, cement bunds, nala-deepening, farm level soil conservation activities and so on. Through these activities the program strives to conserve and harvest as much rain-water within village boundary as possible and resolve the problems of water stress during dry spells in monsoon season, shortage of water during rabbi season and drinking water scarcity, especially during summer season.

Expected outcomes of the program are to increase in availability of drinking water in the village, increase in level of ground water, increase in area under irrigation, increase in area under fodder crops, Reduction in area under dry land crops and increase in area under irrigated crops, increase in agricultural productivity, increase in moisture protection of land, public participation, environmental improvement etc.

The planning and implementation of the above works is done through convergence of funds from all existing state and center-level watershed programs as well as from MP, MLA and CSR funds. The planning at the village level has to be carried out in coordinated manner i.e. with the help of all concerned departments (Agriculture, Forest, Minor Irrigation, GSDA, RWS and so on) and the plan is to be discussed in the Gram Sabha. The District Collector is supposed to oversee the implementation of the program at the district-level.

1.2 About the Assessment

One of the requirements of the program is that all the villages should be assessed after the completion of works in the village. This assessment is to be done by third-party and is supposed to be overseen by the District Collector.

This document outlines the process followed by Technology and Development Solutions Cell (TDSC), CTARA IIT Bombay for Third Party Technical Evaluation of watershed works under Jalyukt Shivar Abhiyan in Palghar District. This methodology is a work in progress and is updated as more data, experience and inputs from experts is obtained.

It consists of methodology for assessment, survey formats, planning and steps to be followed, post- visit analysis and finally report writing.

2 Methodology

The components of the assessment are prepared by aiming to satisfy habitation level and structural level needs. Thus, assessment is categorized under three main heads;

2.1 Components of the assessment

1. **Rapid assessment of village plans** – the major deviations in the preparation of village plan are assessed with intervention planning.

   Concept and background: To study JSA Village plan and understand whole JSA process. Each JSA village will have a village plan or DPR prepared by the Krushi Sahayak which contains village profile, baseline study, water budget, details of existing interventions and proposed interventions, financial details, revenue map with interventions marked on it, consent letter signed by Sarpanch, Krushi Sahayak, Gram Sevak, TAO etc. This document is an account of the whole planning process and each planning step needs to be understood and assessed in detail before visiting the village.

2. **Structure level assessment** – the structure level assessment is further divided in two aspects named under heads of **structural assessment and utility assessment**

   Concept and background:

   Structural assessment – To assess the location and quality of works done under JSA.

   The on-field assessment is intervention-centered. All the soil and water conservation works need to be visited in the village and need to be geo-tagged. The quality of works need to be assessed (dimensions, construction quality, engineering appropriateness, locational suitability, adherence to watershed principles etc.). The assessment of works on above criteria needs to be done through simple measurements, primary investigation, visual inspection and farmer/resident interviews.

   Utility assessment – To understand the utility of works.

   Along with the quality check, it is important to assess the utility of the work done and benefits accrued. The benefits can be in terms of increased groundwater availability or reduction in soil erosion or increase in farm incomes or increase in drinking water availability. This needs to be assessed through visual inspection and farmer/resident interviews.

3. Village level assessment

– To pay special attention to areas which were not addressed and solution for the same.

Along with the assessment of individual works, it is important to understand the impacts of JSA on the village as a whole. For this, basic knowledge about the village, its terrain, soils, land use, rainfall patterns, demographics etc. should be acquired through secondary data analysis (before village visit) and through discussions with the villagers during the visit. Based on this understanding, the vulnerable zones (i.e. areas

where soils are poor, groundwater availability is poor etc.) should be identified and visited. Interviews of few farmers in these zones must be carried out to understand their problems, proposed solutions and reasons for which these were not taken up under JSA.

Key interviews with different government officials (Krushi Sahayak, Gram Sevak, TAO, DSAO and officials of other departments) as well as with Sarpanch, members of Village Watershed Committee, Village Water Supply and Sanitation Committee etc. can help in understanding issues faced by them during planning or implementation.

2.2 Steps of assessment

Steps of assessment consisting of data procurement, desk assessment of JSA plan, preparation for assessment, field visit assessment, post-visit analysis, report writing. All the steps are described below in detailed. A general schedule of assessment work for a village could be as follows:

1. Data procurement

- Documents needed with the resource person

Sr. No.	Documents needed	Department/officer
1.	Original Jalyukt Shivar Abhiyan Village Plan and modified, if any for the year for selected villages	TAO, Agriculture Dept.
2.	JSA final expenditure report for the year for the village	DSAO, Agriculture Dept.
3.	Single Map (revenue map) showing location of interventions	TAO, Agriculture Dept.
4.	Gat No.-wise (Survey plot No.-wise) list of all works done under Jalyukt Shivar Abhiyan.	TAO/AAO, Agriculture Dept.
5.	Gat No.-wise list of farmers	Talathi/ Tehshildar

- Contacts required

Contact other department officers and request for expenditure list of completed works and estimate of each work. Contact person to procure data and for arranging the field visit could be the same

Sr. No.	Department	Officers	
		For documents	For field visit
1	Agriculture	Taluka Agriculture officer	Assistant Agriculture officer
2	Forest	Range forest officer	Forest guard
3	Minor irrigation	Assistant Executive engineer	Junior engineer
4	GSDA	Assistant Executive engineer	Junior engineer

5	RWS	Assistant Executive engineer	Junior engineer
6.	Water conservation	Assistant Executive engineer	Junior engineer
7.	Gram panchayat	Sarpanch/talathi	Gramsevak

2. Preparation for on-field assessment

Collect maps and other secondary data to understand the whole village.

a) Taluka Map

Download Taluka Map from MRSAC website http://www.mrsac.gov.in/en/taluka-maps. It helps to understand the location of village in the Taluka, adjoining villages, and village boundary and transportation network.

b) Groundwater Recharge Priority map

Download GW Recharge Priority Map from GSDA website. https://gsda.maharashtra.gov.in/english/index.php/GWRechargePriorityMap. It has drainage map overlaid on village revenue map with survey numbers.

c) Rainfall data

Download rainfall data of the required circle from Maharain website. https://www.maharain.gov.in. The website provides normal annual rainfall, daily rainfall, annual rainfall, number of dry spell with days, heavy rainfall event etc. recorded at rain gauge circle for current and previous years. Observe worst rainfall year, good rainfall year.

d) Drinking water status

Download drinking water information from NRDWP website.http://indiawater.gov.in/IMISReports/Reports/Profile/rpt_SearchProfile.aspx?%20Rep=Y Get habitation level information about drinking water and study source details, source type, delivery report and their functioning status.

e) Soil type map, Land-use, Land-cover map, drainage maps, contour map

Download images from MRSAC website http://mrsac.maharashtra.gov.in/gsda/ or http://mrsac.maharashtra.gov.in/geoportal/ and georeferenced it using GIS tools. Observe maps single crop/double crop area, non-agriculture area and prepare a list of key locations and gat number of farmers to survey.

f) Google earth pro

Get the village shape file and load on google earth. Google Earth has a feature to see images of selected dates from back years. Observe green patches (agriculture area), habitations, storage structures etc.

g) Census data

Download census data from website http://censusindia.gov.in

h) Treatment Potential Map

If the assessed village is one selected in 2017-18 or later, there is a treatment-potential map generated for the village by the WCD which should be available at District Agriculture or Taluka Agriculture office. This map contains most of the above-mentioned attributes (such as contour, streams, stream order, land use etc.) and also contains possible locations for soil and water conservation works. Study this map in order to have some idea of the village micro-watershed and possible locations for interventions. The map can also found at https://wcd.maharashtra.gov.in/capacity-treatments

- Arrange with TAO and fix date and schedule of village visit. Write formal letter and also request to TAO to arrange for presence of concerned line department officials along with estimates.
- Go through the assessment formats and take printouts-based on summary sheet of structures in the village. Prepare check list of survey numbers of beneficiary farmers (2 on either side for each structure) and non-beneficiary farmers to interview during field visit.

3. On-field Assessment

1. List of equipment for field work

a) Data collection tool: ODK software or hard copy formats
b) Rebound Hammer
c) Measuring Tape (preferably 30 meters)
d) Laser Tape
e) Spirit Level
f) A GPS device or smartphone.

Note:

(For Palghar assessment of JSA works TDSC has used a mobile-based application (android app called ODK or open data kit) was used for data collection)

2. Structure level assessment Protocol for JSA Interventions/Works

In order to accomplish above two objectives, intervention-wise survey formats have been designed which are to be used as guides for recording observations (Annexure B1).

Sample protocols for the assessment are as follows-

1. Earthen Nala Bund

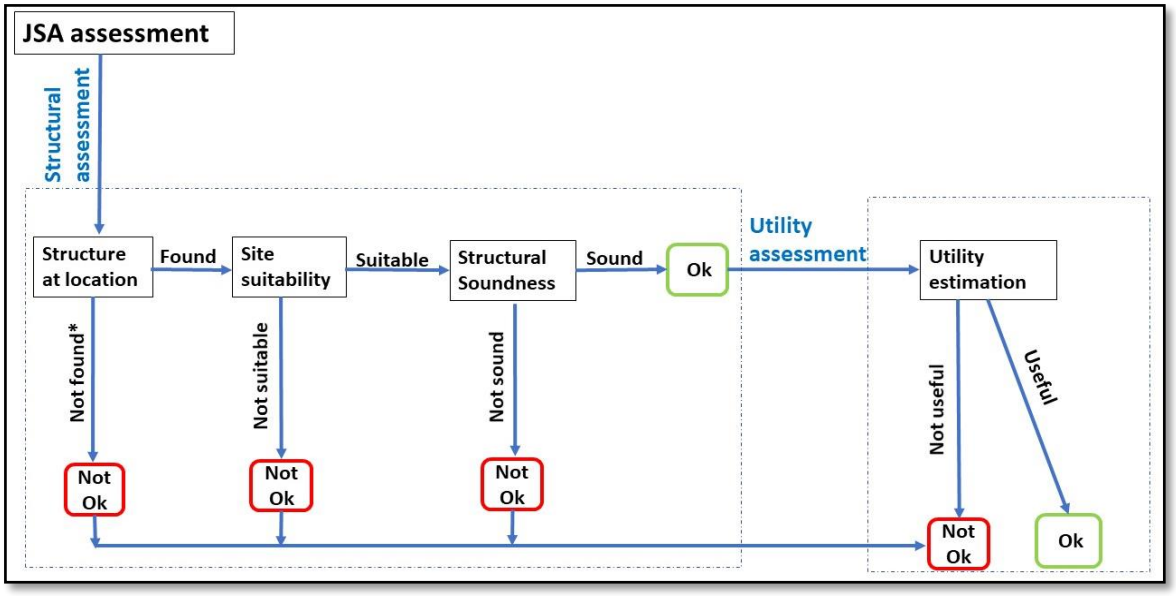
a) Identify all the ENBs constructed and code them.
b) Visit each ENB and fill corresponding form-
   • Using smartphone or GPS device capture geo location
   • Fill answers in the form for suitability of location- order of stream, bed slope etc.
   • Check structural soundness and fill answers in the form- Dimension, spillways provided, pitching, compaction etc.
   • Check utility- Identify at-least two farm plots on either side of the ENB which are possibly equidistant and belong to different farmers

c) Identify the farmers and interview them using Farmer Interview form (Annexure-B2)

- Plot area, gat number, cropping area and yield for last 2-3 years.
- Effect of JSA - increase in water level in dug well, bore well, soil moisture increased, negative effect like water logging
- Benefit of the JSA works in increase in yield, cropping area

This both are finally represented in OK-Not OK terms each engineering intervention was marked as OK/Not-OK based on detailed formats prepared for each engineering structure which included their technical soundness, their suitability of location and their utility.

Flow chart for decision on structural level assessment:



4. Post field Analysis

After the completion of field visit, sort out all the collected data and field visit photos. Mark all locations of intervention on revenue map and prepared a map of that. Mark all habitations on map. Prepare tables and graphs to analyze collected information using structural assessment, beneficiary interview, and drinking water assessment formats Structural assessment formats

If data collected through the app, then aggregate the data and consolidate the form. The location information can be used to generate maps on Google Earth/ GIS showing the location of the work sites with the work type and assessment status. Construction status, presence or absence of water, local stream, dimensions, and assessment and some sample structures and pictures taken at each site from all sides analyze this data.

5. Report writing

Overall assessment has to be write in the report. Structure for report writing described below for taluka,

Executive summary

1. Introduction

2. Assessment methodology
3. Work details and summary of taluka expenditure
4. Rapid assessment of JSA village plan - verification of water budget, selection criteria, cropping pattern, proposed interventions and discrepancies if any.
5. Findings and recommendations - observations about JSA planning and implementation, Analysis- intervention assessment summary table (ok-not ok), list of farmers benefited (yes-no), graphs for farmers perspective on effect and benefit due to JSA works, area and drain line treatment works, fallow land utilization. Recommendations- Suitable alteration in existing process, planning and implementation, assessment. Action to be taken, reasons thereof.
6. Village level report
7. Annexure

Annexure 1 – Village level assessment

Question	Possible answer	Mode of data collection	Whom to ask	Intend
Name of Village	i.e. Aase			
Name of the habitation (pada)	i.e. Rautpada, Kumbhipadaetc	Interview or NRDWP Site	Villagers	
Name of villager/ Liaison		Interview	Villagers	
Liaison contact number				
Number of households	unit per pada or total of all	interview	Villagers	Demand calculation
Anganwadi present	Yes/ No	interview	villagers	
School present	Yes/ No	interview	villagers	
Tanker fed: (from last how many years)	3	interview	Villagers/ farmers	Water scarcity
Presence of water supply scheme?	Yes/ No	Interview	Villagers	Current Drinking Water situation
Condition of RWS	Working/ not working	Interview	Villagers	Status
If samaik well present, month till sufficient water is available	February	Interview	Villagers	Assured water
General Irrigation practices	Rabbi – area in acre Total	Interview	Villagers	Productivity
Heard about JSA?	Yes/ No	Interview	Villagers	Awareness
Attended Gram sabha for JSA	Yes/ No	Interview	Villagers	Considered farmers opinion in preparation of plan
Effect of JSA works	Well level increase, DW problem, No use,Crops increased etc.	Interview	Villagers	Overall Impact of works
Other Drinking Water Problem	1. No well present 2. Damaged existing 3. Distance from source in km	Interview	Villagers	Current situation
Suggestions	Provide Shivkalintaki, wells etc.	Interview	Villagers	Improved version

Annexure 2 – Intervention wise Assessment formats

List of Forms

Form 1: Cement Nala Bund (CNB)

	Question	Possible options for answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask?	Purpose
	1 Location					
1	Lat/Long			GPS		
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	
	2 Suitability					
1	Depth of Nala	Less than 1.5 m More than 1.5m		VI		Storage capacity
2	Slope of Nala bed (Should be less than 3%)	Steep/moderate/flat		VI/QGIS		Main structure can fail on slope due to excess water pressure on u/s side
3	On sharp curve	y/n		VI/Google earth		Erodes (scouring of sides) side of Nala
4	Order of stream	$2^{nd}/3^{rd}$		VI/QGIS		Should not be done on bigger stream (catchment area should not be more than 1000 hectares)
5	Bed strata / soil type	1. Soil 2. Hard rock 3. Can't find 4. Other		VI	Govt. official	Purpose to fulfill (percolation /storage)
6	Is it gets filled in rainy season	y/n		Interview/ VI	Farmers	Catchment should not be too small than storage capacity
7	How far back water is present	e.g. 100m		Interview/ VI/ Google earth	Farmers	Approximate Storage capacity

7	Height of Bandhara above bed Nala level is correct or not?	Foundation depth + Height of main body app 3m		VI/Estimates		Structural stability
	A.3 Structural Soundness					
1	Dimensions of main body	Length Breadth Height (m)		Tape/ laser meter		Approximate Storage capacity & as per estimates
2	Apron presence	y/n		VI		To avoid d/s erosion
3	Freeboard at least 0.3 m	y/n		Tape		To escape surplus water easily
4	Does water enter into adjoining fields during monsoon?	y/n		Interview	Farmer	To check utility of freeboard.
5	D/S slope provided	y/n		VI		Structural stability to resist water pressure
6	Flank wall dimensions	Length Breadth Height		Tape/Laser meter		Protect side banks
7	Leakages at main body	Heavy/light/no/can't figure out		VI/ Interview	Farmers	Cracks in the concrete structure causes leakages, reduces strength and fails
8	Leakages at side walls	Heavy/light/no/can't figure out		VI/ Interview	Farmers	Reduces strength and fails
9	Overall Anchorage of all parts	y/n		VI		To carry self-load and water load together
10	Silt deposition	Heavy/mild/no		VI/ Interview	Farmers	Reduces water storage capacity
11	Condition of main body	Good/mod/bad		VI/ Interview	Farmers	To check quality

12	Strength of main body	At left corner – 3 readings at 1m (top) (Bottom) - 3 At middle (top) – 3 (bottom) - 3 At right end (top) – 3 (bottom) -3		Rebound hammer		Concrete grade (mix proportions) defines strength of concrete
13	Strength of flank wall (grade of concrete mix)	Left and right Top – 3 readings Bottom- 3 readings Middle – 3 readings		Rebound hammer		Strength of concrete
14	Excavated soil is filled with surrounding the embankment	y/n		VI		Water flow should not be disturbed and silted
15	Are there boulders in the main body	y/n		VI/ Interview	Farmer	To check quality
	A.4 Utility					
1	How many month water is stored	e.g. 1 month		Interview	Farmer	Analyze water availability
2	Water present till which month	Name of month		Interview	Farmer	Analyze water availability
3	Found useful in the last dry spell	y/n		Interview	Farmer	Check Utility
4	How many times it gets filled	e.g. 2 times		Interview	Farmer/ Govt official	Storage capacity
5	Water used for	Domestic, Irrigation etc.		Interview	Farmer	Utility
6	Is there a well near by (number if many)	y/n		Interview	Govt official/ farmer	Well recharge
7	Well water level increased due to CNB construction	y/n		Interview	Farmer	To check utility/Impact

Form 2: Earthen Nala Bund

	Question	Possible options for answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask?	Purpose
A.1 Location						
	Lat/Long			GPS		
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	
A.2 Suitability						
1	Nala slope less than 3%	y/n		VI/QGIS		Main structure can fail on slope due to excess water pressure on u/s side
2	Impervious soil strata on site (fine soil or clay)	y/n		VI		Earthen material to stabilize the structure
3	Is it gets filled in rainy season	y/n		Interview/ VI	Farmers	Catchment should not be too small than storage capacity
4	Back water spread provided	y/n		VI		Water should not enter into farms
5	Order of stream	$2^{nd}/3^{rd}$		VI/QGIS		Should not be done on bigger stream (catchment area should not be more than 500 hectares)
A.3 Structural soundness						
1	Cross section is trapezoidal	y/n		VI		Stable shape
2	Spillway provided?	y/n		VI		Excess water to flow without damage
3	Is there any leakage? [Core section is impervious]	y/n		VI/ Interview	Farmer	To prevent seepage through main body

	Question	Possible options for answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask?	Purpose
4	Dimensions	Length Breadth Depth		Tape		Storage capacity
5	Compaction	Good/bad/mod		VI		To reduce permeability and to increase stability
6	Pitching on u/s	y/n		VI		Protect u/s side from erosion and seepage
7	COT	y/n		Interview	Farmer	To prevent stored water seeping out below the base
8	Rock toe	y/n		VI/ Interview	Farmer	To provide stability to the structure
A.4 Utility						
1	Water present till which month	Name of month		Interview	Farmer	Analyze water availability
2	How many month water is stored	e.g. 1 month		Interview	Farmer	Analyze water availability
3	Found useful in the last dry spell	y/n		Interview	Farmer	Check Utility
4	How many times it gets filled	e.g. 2 times		Interview	Farmer/ Govt official	Storage capacity
5	Water used for	DW, Irrigation etc.		Interview	Farmer	Purpose
6	Is there a well present near to ENB (number if many)	y/n		Interview	Govt official/ farmer	Well Recharge
7	Well water increased due to ENB construction	y/n		Interview	Farmer	To check utility/Impact

Form 3: Unlined Farm Pond

Sr No.	Question	Possible options for answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask?	Purpose
A.1 Location						
	Lat/Long			GPS		
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	
A.2 Suitability						
1	Pond location in farm	Higher side / lower side of farm		VI		Higher side expected (to recharge lower side)
2	Pond elevation compared to stream elevation	Higher / lower/ same		VI		Lower than stream elevation expected (to get filled by stream runoff)
3	Type of bed strata soil	Black cotton/ /sandy/hard rock		VI/ Interview	Farmer	Less percolation
4	Farm pond under which program?	MTS / private / other		Interview	farmer	
A.3 Structural Soundness						
1	Dimensions	Length : Breadth: Depth :		Tape/ laser meter		Storage capacity
2	Berm present	y/n		VI		Avoid breaching of bund
3	Outlet provided	y/n		VI		Allow excess water to drain
4	Maintained Slope of pond sides	y/n		VI		To protect the sides of pond to slide down into the pond.
5	Soil compacted	y/n		VI/ Interview	Farmer	Overall stability of pond
6	Pitching or revetment	y/n		VI/ Interview	Farmer	Sides sag down into pit and erodes sides
A.4 Utility						

Sr No.	Question	Possible options for answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask?	Purpose
1	Water present till which month	Name of month		Interview	farmer	To analyze Water availability
2	Is there a well near to pond (number if many)	y/n		Interview	farmer	Well recharge
3	Well water level increased due to pond construction	y/n		Interview	farmer	To check utility/impact

3

Form 4: Lined Farm pond

Sr No.	Question	Possible options for answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask?	Purpose
A.1 Location						
1	Lat/Long			GPS		
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	
A.2 Suitability						
1	Farm pond under which program	NHM / MTS / private		Interview	farmer	
2	Location of farm pond	In the nala/ on farm		VI/ Interview	farmer	On farm treatment & flow should not obstruct
3	Plastic cover present?	y/n		VI/ Interview	farmer	Reason if plastic not present (e.g. lack of funds)
4	Source of water?	well / borewell / tanker etc.		Interview	farmer	Stored water comes from
5	Where is the stored water lifted/used?	distance in feet		Interview	farmer	Is the water being used in same survey plot or different
A.3 Structural Soundness						
1	Dimensions	Length: Breadth: Depth:		Tape/ laser meter		Storage capacity
2	Berm present	y/n		VI		Avoid breaching of bund
3	Maintained Slope of pond sides	y/n		VI		To protect the sides of pond to slide down into the pond.
4	Soil compacted	y/n		VI		Overall stability of pond
5	Pitching or revetment	y/n		VI		Sides sag down into pit and erodes sides

Sr No.	Question	Possible options for answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask?	Purpose
A.4 Utility						
1	How many times farm pond gets filled?	y/n		Interview	farmer	
2	Water present till which month	Name of month		Interview	farmer	To analyze Water availability
3	Farm pond used for which crop	Crop name		Interview	farmer	Purpose to fulfill

Form 5: Loose Boulder Structure/ Gabion Bund

	Questions	Possible answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask	Purpose
	A.1 Location					
1	Lat/long			GPS		
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	
	A.2 Suitability					
1	Terrain slope (not more than 20%)	y/n		VI/QGIS		Withstand high velocity water
2	Order of stream (Catchment area should be less than 10 ha)	1^{st} or 2^{nd}		VI/QGIS		Volume of water is subjected with soil/silt it takes with on stream order
3	Stream width	2 to 10 m		Tape		To understand the construction Coverage on the nala width
4	Locally available stones for LBS	y/n		VI / Interview	Govt. official/ Interview	For construction
	A.2 Structural soundness					
1	Foundation width provided	y/n		VI		Stability
2	Adequate Distance between LBS	y/n		VI/ Tape		After silt deposition the LBS height fills with soil and crop cultivation is possible

	Questions	Possible answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask	Purpose
3	Provision of dip in the middle	y/n		VI		Stability
4	If no dip provided, are side embankments provided?	y/n		VI		Stability
5	Dimension	Length Width Depth		Tape		Verification
6	Tapered or trapezoidal Shape of LBS	y/n		VI		Stable or not
7	Max. height should be 1 m	y/n		Tape		Withstand high velocity water
8	Arrangement of stones/	Good/ bad		VI		Reduce Soil erosion
9	Covers entire stream width and 1m extra on both sides.	y/n		VI		Proper anchorage
	A3. Utility					
1	Soil erosion stopped	y/n		VI / Interview		Purpose to fulfill
2	Suggestions					

Form 6: Continuous contour Trenches (CCT)

	Questions	Possible answer	Answer to be filled in ODK form/hard copy	Mode of data collection	Whom to ask	Purpose
1	Lat/long			GPS		
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	
A.2 Suitability						
1	Slope	Steep/mild				0- 33% slope
2	Distance between trenches	Slope 0-4%-10m, Slope 4-8% -8m, Slope 8-15%-6m, Slope 15-33%-4m		VI/TAPE		Greater the slope lesser the distance between trenches
3	Type of trenches	Continuous contour trenches/ Staggered trenches		VI/QGIS		Maximize the runoff harvested by staggered trenches
4	CCT (continuous in length)	y/n		VI/ google earth		Arrest maximum runoff
5	Drainage line passing through trench	y/n		VI/QGIS		Can create gullies
6	Trenches on contour	y/n		VI/ QGIS		water flow can create gullies
A.3 Structural Soundness						
1	Dimensions	Depth Breadth		Tape/ VI		Storage capacity
2	Running Length per Ha	e.g. 1000m per Ha		VI/ Estimates	Govt. Official	Quantity of work as per estimate
2	Berm provided	y/n		VI		Excavated soil should not refill the trench

	Questions	Possible answer	Answer to be filled in ODK form/hard copy	Mode of data collection	Whom to ask	Purpose
3	Bund is Equal to Trench depth and maintained	y/n		VI		Reduce velocity of runoff water and recharge water
4	Grass/ small trees planted on bund	y/n		VI		Bund Protected against erosion
A.4 Utility						
1	Soil erosion reduced	y/n		VI/ Interview	Farmer	Purpose to fulfill
2	Water level increased in nearby structure	y/n		Interview	Farmer	Recharge
3	Suggestions					

Form 7: Stream deepening and widening/Desilting

	Question	Possible options for answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask?	Purpose
A.1 Location						
1	Lat/Long			GPS		
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	
A.2 Suitability						
1	Order of stream	$1^{st}/2^{nd}$ /$3^{rd/}.4^{th}$.		QGIS/VI		Should be done on $2^{nd}/3^{rd}$
2	Whether upstream of Bandhara?	y/n		VI		Should be preferred
3	Bed strata / soil type	1. Hard rock 2. Soil/Alluvium 3. Can't found 4. other		VI	Govt. official	Purpose to fulfill (percolation /storage)
4	Whether location certified by Sub-divisional Agriculture office?	y/n		Interview	Govt. official	Should be done
A.3 Structural Soundness						
1	Dimensions Before Excavation	Length Breadth Height (m)		Tape/ laser meter		Quantity of work as per estimate
2	Dimensions after Excavation	Length Breadth Height (m)		Tape/ laser meter		Quantity of work as per estimate
3	Depth below stream bed?	In m		Tape/ Interview	Govt. official	Less than 3 m or till hard rock
4	Volume of silt excavated?	In m3		Above dimensions/ Estimates		Quantity of work as per estimate
5	Silt Used for?	Farmer/Berm		Interview/ VI	Farmer/ Govt. official	Identify beneficiary

	Question	Possible options for answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask?	Purpose
6	Distance from CNB	In m		Tape/ Laser meter		Should be more than 5 m
7	Soil conservation works in upside of location?	y/n		VI/ Interview	Govt. official	Should be done
8	Berm provided/ maintained	y/n		VI/ Interview	Farmer	Excavated earth should not fall into stream again
	A.4 Utility					
1	How many month water is stored	e.g. 1 month		Interview	Farmer	Know water availability
2	Water present till which month	Name of month		Interview	Farmer	Know water availability
3	Found useful in the last dry spell	y/n		Interview	Farmer	Check Utility
4	How many times it gets filled	e.g. 2 times		Interview	Farmer/ Govt official	Storage capacity
5	Water used for	Domestic, Irrigation etc.		Interview	Farmer	Utility
6	Is there a well near by (number if many) Perceived recharge?	y/n		Interview	Govt official/ farmer	Recharge
7	Well water level increased?	number		Interview	farmer	Check utility/Impact

Form 8: Compartment Bunding (CB)

	Question	Possible options for answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask?	Purpose
A.1 Location						
1	Lat/Long			GPS		
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	
A.2 Suitability						
1	Slope of the land	Slope in %		VI/QGIS		Should be between 0-4%
2	Rainfall	In mm		Interview	Farmer	Should be less than 750 mm
3	Has CCT been done before?	y/n		VI/ Interview	Govt. Official/ Farmer	Should not be done.
4	Is it spread? Area affected	y/n, hectare		VI		Should not be spread/ area>50 hectare
A.3 Structural Soundness						
1	Dimensions	Length : Top: Bottom: Depth :		Tape/ laser meter		Cross section Dimensions are as per ground type Heavy-2.25*0.9*0.45 Medium-2.00*0.85*0.3 Light-1.8*0.75*0.3
2	Ground type	Heavy/medium/light		VI		
3	Outlet provided on main bund? PVC pipe-dia?	y/n, inches		VI		30cm above ground and 6-inch diameter
4	Position of outlet	Correct/ incorrect		VI		On main bund at corner
5	Is vegetation provided over bunding?	y/n		VI		Should be provided over bund.

	Question	Possible options for answer	Answer to be filled in ODK form/hard copy	Medium	Whom to ask?	Purpose
6	Main bund and side bund.	Across and along		VI		Main bund should be across the slope and side bund along the slope
7	Use of excavated soil for bunding	Total/partial		VI/ Interview	Farmer	Whole excavated soil should be used for bunding.

Form 9: Terracing

Sr. No	Questions	Possible answer	Answer to be filled in ODK form/hard copy	Mode of data Collection	Whom to ask	Purpose
Location						
1	Lat/long			GPS		
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	
Suitability						
1	Slope of the land	e.g. 8%		VI		Slope less than 10%
2	Across a slope (on the contour)	Y/N		VI		
3	Soil depth after terracing	In m		Interview	Farmer	Min 0.15 m
4	Soil type	Pervious/ impervious		VI	Farmer/ Govt. Official	
5	Type of terracing	Broad based – entire farm up to 6%slope Grassed based – up to 15%slope Narrow based – ridge side		VI		
Structural soundness						
1	Leveling	Y/N		VI		For paddy land
2	Sufficient soil Thickness	Y/N		VI		Min 0.3 m
3	Area	Length Breadth		Tape		To check quantity as per estimate
4	Planted crops	Y/N		Interview /VI	Farmer	Under paddy or another crop
5	Excavated earth deposition	Well/ not well		Interview /VI	Farmer	Used for bund and level farm
6	Excavated soil used to farms	Y/N		Interview	Farmer/ Govt. official	Increase soil thickness

Sr. No	Questions	Possible answer	Answer to be filled in ODK form/hard copy	Mode of data Collection	Whom to ask	Purpose
7	Bund is provided	Y/N		VI		Reduce soil erosion
8	Fodder seed on Bunds	Y/N		VI/ Interview	Farmer	To protect bund
9	Outlet provided	Y/N		VI/ Interview	Farmer	Pass excess water
10	Provided bund trapezoidal shape	Yes/ No				Stability
Utility						
1	Cultivation of paddy	Yes/ No		Interview	Farmer	Purpose to fulfill
2	Name of farmer			Interview	Farmer	
3	Plot no/ gut no.			Interview	Farmer	
4	Crop productivity Increased	Yes/ No		Interview	Farmer	
5	Suggestions					

Form 10: Old paddy land repair

	Questions	Possible answer	Answer to be filled in ODK form/hard copy	Mode of data collection	Whom to ask	Purpose
Location						
1	Lat/Long					
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	
Suitability						
1	Was land under paddy Cultivation before?	y/n		Interview	Farmer/ Govt. Official	Repair should be done on paddy field
2	Were bunds 50% Eroded before the repair?	y/n		Interview	Farmer/ Govt. Official	50% eroded bunds
Structural soundness						
1	Bunds on all sides	y/n		VI		Stored water for paddy land
2	Dimensions of bund in m	Top- Bottom- Depth-		Tape		Top-0.45m Bottom-1.8m Depth-0.68m
3	Condition of bunds/ maintained	Good/mod/bad		VI		Quality of work
4	Crop planted on bund	y/n		VI/ Interview	Farmer	Maintain bund
Utility						
1	Productivity increased	y/n/can't say		Interview	Farmer	
2	Availability of water	y/n		Interview	Farmer	
3	Suggestions					

Form 11: Sub Surface bund (SSB)

	Questions	Possible answer	Answer	Mode of data collection	Whom to ask	Purpose
Location						
1	Lat/long			GPS		
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	
Suitability						
1	30-75cm below the ground level	y/n		VI /Interview	Farmer	farms are above SSB
2	In the vicinity of wells/handpump	y/n		VI/ Interview	Farmer	Drinking water source strengthening
3	Constructed in nala/stream	y/n		VI/ Interview	Farmer	Make sub surface flow available
Structural soundness						
1	Dimensions In m	Length Breadth Depth		Tape/ las er meter		
2	Constructed upto hard rock	y/n		Interview	Farmer/ Govt. official	Otherwise water percolates below
3	Perpendicular to direction of flow	y/n		VI/ Interview	Farmer	Obstruct the flow
4	Provided boulder check/recharge trench on u/s	y/n		Interview	Govt. official/ Farmer	Percolate surface flow underground
5	Drains on both sides	y/n		VI/ Interview	Farmer	Check percolation
6	Maintained	y/n		VI		Quality of work
Utility						
1	Increased Recharge to well	y/n		Interview	Farmer	Purpose to fulfill
2	Suggestions					

Form 12: Repair of Cement Nala Bund (CNB)

	Question	Possible options for answer	Answer to be filled	Medium	Whom to ask?	Purpose
1 Location						
1	Lat/Long			GPS		
2	Gat No./Survey No			Revenue map/ Interview/ QGIS	Govt. Official/ farmer	Check as per estimate
2 Suitability						
1	Objective of repair	Functional performance or leakages/ Durability/ Corrosion/ Increase strength/ Deterioration		Interview	Govt. Official/ farmer	Necessity of repair and to select repair method
2	Repair techniques	Grouting/ Surface Patch / retrofitting/ other		Interview/ VI	Govt. Official/ farmer	Based on objective of repair
A.3 Structural Soundness						
1	Repaired part	Main body/ Key wall/apron/ Wing wall		Interview/ VI	Govt. Official/ farmer	To check repaired area
2	Dimensions of main body	Length Breadth Height (m)		Tape/ laser meter		Approximate Storage capacity & as per estimates
3	Work done properly	y/n		VI/ Interview	farmer	To check quality
4	Condition after repair work	Good/mod/bad		VI/ Interview	Govt. Official	To check quality
A.4 Utility						

	Question	Possible options for answer	Answer to be filled	Medium	Whom to ask?	Purpose
1	Increase in Water storage	M3		VI/ Interview	Govt. Official /Farmer	After repair storage capacity should be increased
2	How many month water is stored	e.g. 1 month		Interview	Farmer	Analyze water availability
3	Water present till which month	Name of month		Interview	Farmer	Analyze water availability
4	Found useful in the last dry spell	y/n		Interview	Farmer	Check Utility
5	How many times it gets filled	e.g. 2 times		Interview	Farmer/ Govt official	Storage capacity
6	Water used for	Domestic, Irrigation etc.		Interview	Farmer	Utility
7	Is there a well near by (number if many)	y/n		Interview	Govt official/ farmer	Well recharge
8	Well water level increased due to repair	y/n		Interview	Farmer	To check utility/Impact

Form 13: Repair of Percolation tank (PT)/Earthen Nala bund (ENB)

	Question	Possible options for answer	Answer to be filled	Medium	Whom to ask?	Purpose
1 Location						
1	Lat/Long			GPS		
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	Check as per estimate
2 Suitability						
1	Objective of repair	Leakages/ Settlement/ Increase stability Other		Interview	Govt. Official/ farmer	Necessity of repair
2	Repair techniques	Increase height/ Compaction/ impervious material replacement / Pitching/ other		Interview/ VI	Govt. Official/ farmer	Based on objective of repair
A.3 Structural Soundness						
1	Repaired part	COT/ casing/hearting/ Spillway		Interview/ VI	Govt. Official/ farmer	To check repaired area
2	Cross section is trapezoidal	y/n		VI		Stable shape
3	Spillway provided?	y/n		VI		Excess water to flow without damage
4	Dimensions of main body	Length Breadth Height (m)		Tape/ laser meter		Approximate Storage capacity & verification

	Question	Possible options for answer	Answer to be filled	Medium	Whom to ask?	Purpose
5	Work done properly	y/n		VI/ Interview	farmer	To check quality/ purpose to fulfill
6	Condition after repair work	Good/mod/bad		VI/ Interview	Farmer/Govt. Official	To check quality
A.4 Utility						
1	Increase in Water storage	M3		VI/ Interview	Govt. Official /Farmer	After repair storage capacity should be increased
2	How many month water is stored	e.g. 1 month		Interview	Farmer	Analyze water availability
3	Water present till which month	Name of month		Interview	Farmer	Analyze water availability
4	Found useful in the last dry spell	y/n		Interview	Farmer	Check Utility
5	How many times it gets filled	e.g. 2 times		Interview	Farmer/ Govt official	Storage capacity
6	Water used for	Domestic, Irrigation etc.		Interview	Farmer	Utility
7	Is there a well near by (number if many)	y/n		Interview	Govt official/ farmer	Well recharge
8	Well water level increased	y/n/can't say		Interview	Farmer	To check utility/Impact

Form 14: Well repair

	Question	Possible options for answer	Answer to be filled	Medium	Whom to ask?	Purpose
1 Location						
1	Lat/Long			GPS		
2	Gat No./Survey No			Revenue map/Interview/ /QGIS	Govt. Official/ Farmer	Check as per estimate
2 Suitability						
1	Location of well related to other water structures	Higher ele/lower/same		VI/GIS	Govt. Official/ farmer	Necessity of repair
2	Source of well recharge	Increase height/ Compaction/ impervious material replacement / Pitching/ other		Interview/ VI	Govt. Official/ farmer	Based on objective of repair
A.3 Structural Soundness						
1	Material	RCC/ brick/ stone		Interview/ VI	Govt. Official/ farmer	To check repaired area
2	Broken	Yes/ No		VI		Stable shape
3	leakages	Yes/ No		VI		Excess water to flow without damage
4	silted	Yes/ No		Tape/ laser meter		Approximate Storage capacity & verification
5	Parapet wall	Yes/ No		VI	farmer	To check quality/ purpose to fulfill

	Question	Possible options for answer	Answer to be filled	Medium	Whom to ask?	Purpose
6	Casing	Yes/ No		VI	Farmer/Govt. Official	To check quality
7	Where repair work was done	Write the location		VI		
A.4 Utility						
1.	Increase in Water storage	M3		VI/ Interview	Govt. Official /Farmer	After repair storage capacity should be increased
2.	Pump / motor on a well	3/5 HP				
3.	Purpose of the well	Drinking, irrigation, etc.				Analyze water availability
4.	Water present till which month	Name of month		Interview	Farmer	Analyze water availability
5.	Found useful in the last dry spell	y/n		Interview	Farmer	Check Utility
6.	Water used for	Domestic, Irrigation etc.		Interview	Farmer	Utility
7.	Well water level increased	y/n/can't say		Interview	Farmer	To check utility/Impact

Annexure 3 – Intervention wise Assessment formats

Effects of JSA Work	Y/N	Remarks
Increase in dug well water level		
Increase in bore well water level		
Increase in soil moisture		
Increase in surface water availability		
Remarks about quality of JSA work		
If no effect of JSA work, please give reasons in Remarks column		

Benefits of JSA Work	Y/N	Remarks
Protective irrigation during dry spell		
Increase in kharif Area		
Increase in Kharif Yield		
Increase in Rabi Area		
Increase in Rabi Yield		
Shift towards high income crops		
Can't Say		
Others (specify)		

Farmer Name		Contact number	
Total land holding (in acres)			
Plot number			
Area (acres)			
Is farmer aware and attended gramsabha of JSA		Y/N	
GPS location			

Survey plot details			
Plot No		Plot size (in acres)	
Rainfed/irrigated		Single season/double season	
Is farmer beneficiary of JSA work? (Y/N)		If yes, which intervention?	

Kharif crop details								
Year	Crop 1				Crop 2			
	Name	Area (in acres)	Yield (Q/Acres)	Times of Watering	Name	Area (in acres)	Yield (Q/Acres)	Times of Watering
2017								
2016								
2015								

Rabbi crop details								
Year	Crop 1				Crop 2			
	Name	Area (in acres)	Yield (Q/Acres)	Times of Watering	Name	Area (in acres)	Yield (Q/Acres)	Times of Watering
2017								
2016								
2015								

Annual crop details							
Year	Name	Area (in acres)	Year of plantation	Watering source in summer	Name	Yield (Q/Acres)	Watering sufficient? (Y/N)
2015							
2016							
2017							

Irrigation source details					
		Dug well 1	Dug well 2	Bore well 1	Bore well 2
Depth (in feets)					
No. of hours motor runs in Feb.	2017				
	2016				
	2015				
New well/bore well in last three years (if any)					

Household Water Assessment Form

1	Village			Habitation					
2	Name of Household Owner						Contact No		
3	Household Size		Male		Female		Child	Household ID	
4	Location (Within Gaonthan-01; In basti (more than 10 households)-02; Scattered on farm-03)							Mark Lat-long	

A1	Drinking Water (Normal Season)								
Sr. No	Delivery points 1- Bottle Water 2- PWS- House Connection 3- PWS- Standpost/Cistern 4- Bore-well 5- Well 6- Hand-pump 7- Tanker	Distance 1- Within premise 2- 0-500m 3- > 500m	Ownership 1- Private (self) 2- Private (others) 3- Public	Source identification (in case of Public Asset) [RO Plant (Public)] [PWS-Name] [Community Well- Name]	Frequency (Number per week)	Estimated liters per day	Tariff/ Cost (Rs per month)	[In Case of Tanker] Duration (in Months) and Frequency Per week	Quality 1- Good 2- Okay 3- Bad
1									
2									
3									

A2	Drinking Water (Summer Season)								
Sr. No	Delivery points 1- Bottle Water 2- PWS- House Connection 3- PWS- Standpost/Cistern 4- Bore-well 5- Well 6- Hand-pump 7- Tanker	Distance 1- Within premise 2- 0-500m 3- > 500m	Ownership 1- Private (self) 2- Private (others) 3- Public	Source identification (in case of Public Asset) [RO Plant (Public)] [PWS-Name] [Community Well- Name]	Frequency (Number per week)	Estimated liters per day	Tariff/ Cost (Rs per month)	[In Case of Tanker] Duration (in Months) and Frequency Per week	Quality 1- Good 2- Okay 3- Bad
1									
2									
3									

Household Water Assessment Form

B1	Cattle Water						
Type	Number	Source (in normal months)	Distance	Estimated Quantity (in litres per day)	Source (in summer months)	Distance	Estimated Quantity (in litres per day)
Big (Cow etc)							
Small (Goat etc)							

A1	Drinking Water (Last Scarcity Year)								
Sr. No	Delivery points 1- Bottle Water 2- PWS- House Connection 3- PWS-Standpost/Cistern 4- Bore-well 5- Well 6- Hand-pump 7- Tanker	Distance 1- Within premise 2- 0-500m 3- > 500m	Ownership 1- Private (self) 2- Private (others) 3- Public	Source identification (in case of Public Asset) [RO Plant (Public)] [PWS-Name] [Community Well- Name]	Frequency (Number per week)	Estimated liters per day	Tariff/ Cost (Rs per month)	[In Case of Tanker] Duration (in Months) and Frequency Per week	Quality 1- Good 2- Okay 3- Bad
1									
2									
3									

Remarks, If any

DW1: Drinking Water Sources Survey

Sr. No	**Type** *Open dug-well, shallow tube well (handpump), deep borewell*	**Location** Mark-*Latitude, Longitude, Elevation (m)* (Gaonthan/Other)	**Depth(m)**	**Diameter (m)**	**No. of dependent households**	**Distance from Dependent households**	**Earlier Status** *In Use/Abandoned?* If in use – when dries? *If abandoned, why*	**Current Status**

Annexure 4 – Intervention wise Assessment formats

4.1 Rapid Assessment of JSA village plans

As per JSA GR it is mandatory to prepare village plan for every village which is selected under the programme. Village plan format suggested by GR involves the attributes like; terrain details with geographical area, rainfall, total population, selection criteria of the village, drinking water demand and Crop water requirement, runoff calculations, existing and proposed works, water balance, baseline survey details and other documents to be attached with the village plan.

Through this, we tried to understand the content and procedure followed in village plan preparation. For the rapid assessment of the village plans we analyzed the presence/absence of data (which is required as per GR format), correctness and consistency of the data. Table below shows the analysis of presence and absence of required attribute and other table with detailed analysis.

[redacted]Status of Village Plans for Available Content

Sr.No.	↓ JSA Village Plan Attributes	→ Village name				
1	Location					
2	Geographical area in ha.					
3	Total population					
4	Rainfall in mm					
5	Selection criteria					
i	Watershed programs					
ii	Drought declared (paisewari 50%)					
iii	Tankerfed in last 5 yrs.					
iv	Groundwater Overexploited					
v	Summary Criteria					
6	Village Water budget (demand+supply)					
7	Final water balance					
9	Survey result					
i	Available DW					
ii	Available DW in month					
iii	Ground water					
iv	Signed Certificate					
10	Structure wise intervention stable					
11	Map of village showing all proposed structure					
12	Photo attached (meetings, sabha, etc.)					

4.2 Section-wise Analysis of Village Plan

Terrain details:[1]

Type of area											
Total (ha)											
Agriculture (ha)											

Selection criteria:

	Criteria										
i.	Watershed programs										
ii.	Drought declared (paisewari 50%)										
iii.	Tankerfed in last 5 yrs.										
iv.	Groundwater overexploited										
v.	Summary Criteria										

Runoff calculation:

Runoff in TCM											
Runoff in JSA plan (Strange table)											
Runoff calculated (Inglis formula)											

Baseline Survey result:

Sr.no	Baseline survey attributes											
i.	Available drinking water in TCM and month											
ii.	DW demand											
iii	Ground water level till march in m											
iv.	Irrigated area in hector											
v	Crop density in % (irrigated area/ total area)											
vi	Area under fruit cultivation											

Crop water requirement:

Crop water demand											

[1] All tables are with rounded up decimals

Crop water requirement											

Water balance calculations:

	Water budget components											
i	DW											
ii	Total CWR											
iii	Demand (i+ii)											
iv	Runoff JSA plan											
v	Runoff calculated											
vi	Previous water storage											
vii	New storage											
viii	Total storage (v+vi)											
ix	+Surplus\- deficit (iii-vii)											
x	not used runoff(iv-v)											

Write analysis of very above content with respect to data, methodology, calculations etc.