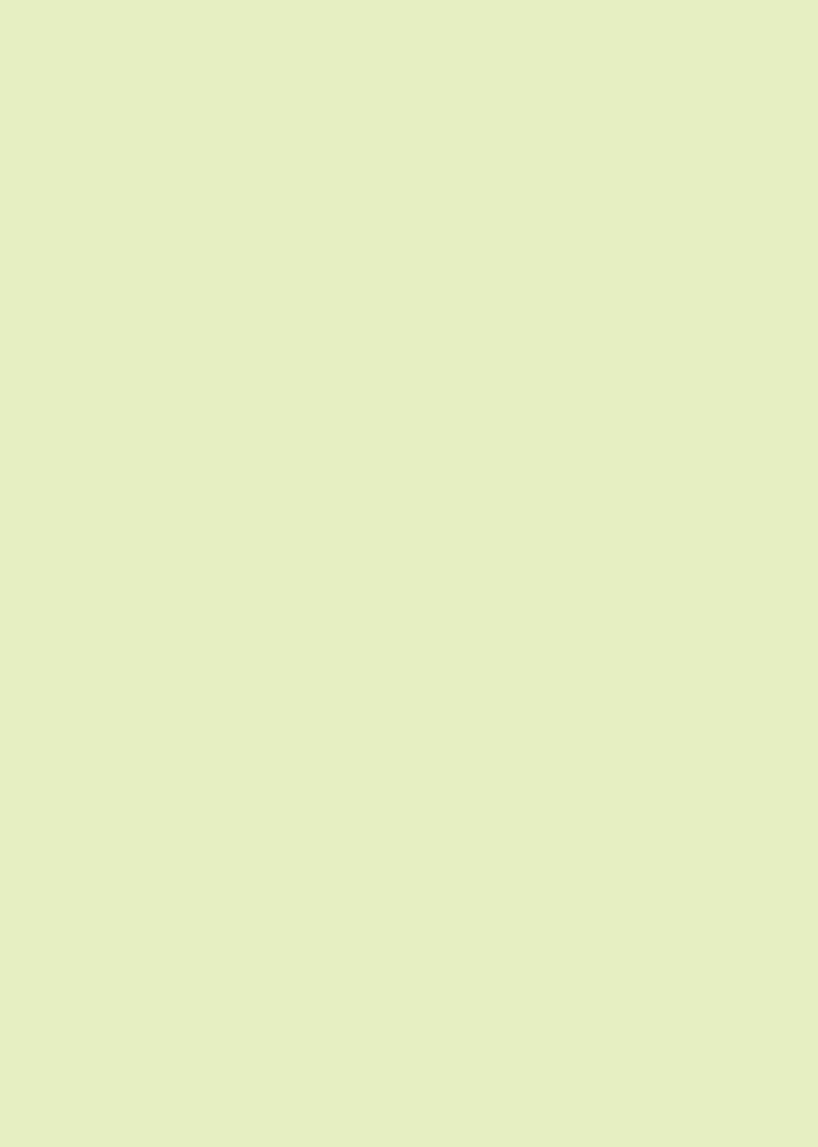# Benchmarking
# of Watershed Management Outcomes
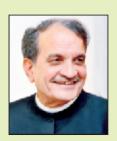

OPERATIONAL GUIDELINES

Department of Land Resources
Ministry of Rural Development, Government of India
NEW DELHI
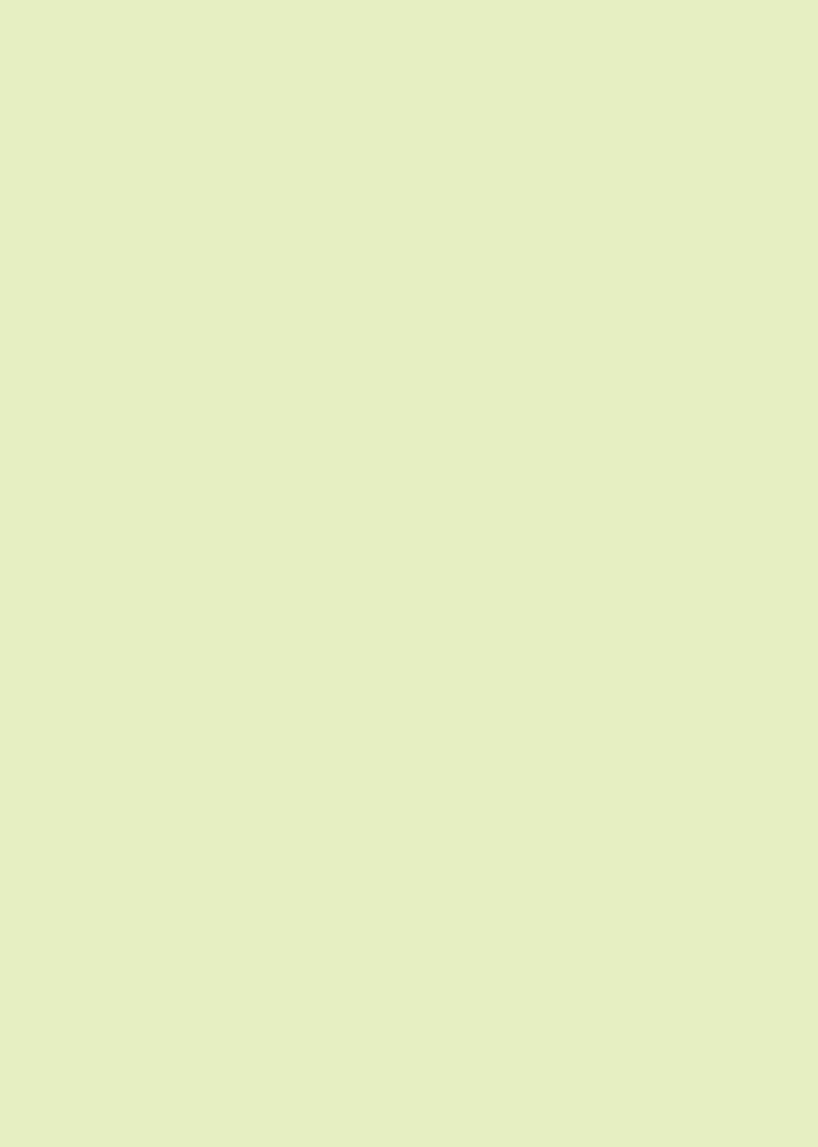
2015

बीरेन्द्र सिंह
Birender Singh

Foreword

Success, it is said, has many fathers; failure is an orphan. Success is the yardstick on which all programmes are judged. Yet, what is the yardstick for measuring the achievements? As we move from an output-oriented to an outcome-oriented system, it is necessary to develop measurable indicators of success. When evaluations and impact assessments are undertaken, without clear-cut indicators, it would be difficult to measure success. In the context of the Integrated Watershed Development Programme it would be difficult to ascertain whether the water table increased on its own or through the interventions of the programme, whether agricultural productivity increased due to the multifarious government interventions or due to a booming monsoon, whether incomes in the villages rose because of sustained interventions undertaken under IWMP or of other extraneous factors.

To be able to assess the performance of the IWMP after a great deal of brainstorming and consultations with State governments, multilateral agencies, academic institutions and other Departments, a set of indicators was developed wherein the country was divided into eight agro-climatic zones. 55 Indicators were identified in six identifiable core areas like soil health, hydrology, forestry, agriculture and horticulture, social and economic factors and the benchmarks drawn up. Some were based on stand-alone interventions of IWMP while others were dependent on successful convergence with other Departments and programmes. The benchmarking of outcome indicators puts into place a credible matrix leading to a transparent system of performance. Besides, it also serves as a management tool for the implementers of the programme - right from the Central Government till the Village Watershed Committee Benchmarks would reveal whether the project implementation is on the right track or needs course correction. Benchmarks would also set the path for successful implementation. They would reveal the gaps in the implementation of the programme.

India being a vast county, it is correct to say that 'one size does not fit all'. States have to further fine-tune the benchmarks to suit their regional variations and peculiarities. However, while doing their regional exercise, they cannot decrease the levels already communicated through these benchmarks, as this is the least what is expected from them. Of course, they are free to raise the bar and come out with enhanced benchmarks that would imply a more efficient methodology of project implementation and success.

Birender Singh

C O N T E N T S

List of Abbreviations

AI	Artificial Insemination
ATMA	Agricultural Technology Management Agency
AWLR	Automatic Water Level Recorder
CBO	Community Based Organization
CGWB	Central Ground Water Board
CPR	Common Property Resources
DAHD	District Animal Husbandry Department
DAO	District Agriculture Officer
DDP	Desert Development Programme
DFSM	District Food Security Mission
DHM	District Horticulture Mission
DL	Data Logger
DoLR	Department of Land Resources
DOM	District Oils Seed Mission
DPAP	Drought Prone Area Programme
FPI	Farmer Producers Institutions
FGD	Focus Group Discussion
GoI	Government of India
GP	Gram Panchayat
HYV	High Yielding Varieties
ICAR	Indian Council of Agricultural Research
IDM	Integrated Disease Management
IMD	Indian Meteorological Department
INM	Integrated Nutrient Management
INR	Indian Rupees
IPM	Integrated Pest Management
IRMA	Institute of Rural Management Anand
IWDP	Integrated Watershed Development Programme
IWMP	Integrated Watershed Management Programme
KVK	Krishi Vigyan Kendra

M& E	Monitoring and Evaluation
MI	Micro Irrigation
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
DMM	District Mechanization Mission
MoRD	Ministry of Rural Development
NDVI	Normalized Differential Vegetation Index
NMR	Nuclear Magnetic Resonance
NRLM	National Rural Livelihood Mission
PBR	People's Biodiversity Register
PIA	Project Implementing Agency
PRA	Participatory Rural Appraisal
PRI	Panchayati Raj Institutions
RCT	Rotavators Combines and Tractors
SASA	State Agricultural Statistical Agency
SHG	Self Help Group
SLNA	State Level Nodal Agency
TRG	Tipping-bucket Rain Gauge
WC	Watershed Committee
WDT	Watershed Development Team
WLR	Water Level Recorder
ZP	ZillaParishad/Panchayat

BENCHMARKING OF WATERSHED MANAGEMENT OUTCOMES

OPERATIONAL GUIDELINES

I. BACKGROUND

1.1 The Department of Land Resources (DoLR), Ministry of Rural Development(MORD), has been implementing the Integrated Watershed Management Programme (IWMP) since 2009. A flagship programme of the Government of India, the IWMP is expected to treat approximately 25 million ha during XIIth Plan period (2012-13 to 2016-17). Based on a regional classification, the treatment costs are Rs 12000 or Rs 15000 per hectare and shared as 90:10 between the Government of India and implementing states. The actual execution of projects from planning to consolidation is undertaken by the States.

1.2 As detailed in the Common Guidelines for Watershed Management Projects (2011), IWMP aims to restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water. The outcomes are prevention of soil run-off, regeneration of natural vegetation, rain water harvesting and recharging of the ground water table. This enables multi-cropping and the introduction of diverse agro-based activities, which help to provide sustainable and alternative livelihoods to watershed communities.

1.3 DoLR is also in the advanced stages of preparation of the World Bank supported Neeranchal National Watershed Project. Neeranchal is expected to positively influence the outcomes of the IWMP through technical and financial support for better delivery and impacts through improved planning approaches, capacity building, convergence and supportive research and development.

1.4 Given the magnitude of the investments envisaged, it becomes imperative to ensure accountability and set benchmarks, the minimum acceptable performance standards of watershed outcomes, by assigning specific values to the indicators identified for the purpose, to track the implementation and impacts of the watershed projects.

Stakeholder Consultations

1.5 DoLR in collaboration with the World Bank, New Delhi and Institute of Rural Management Anand(IRMA), Gujarat organized a two-day national level workshop on 16-17 June 2014 at Ahmedabad for developing indicators and benchmarks. A multi-disciplinary group of domain experts from Agriculture, Horticulture, Forestry, Animal Husbandry, Dairy Fisheries, Soil Science, Hydrology, Economics and Environmental Sciences were involved in the process.

1.6 Further, as a follow up to this, DoLR organized a one-day interface on 9[th]September, 2014 in New Delhi. A select group of domain experts and practitioners participated. The primary objective was to refine and finalize indicators and benchmarks.

II. RATIONALE FOR BENCHMARKING & ITS OPERATIONAL DEFINITION

2.1 As compared to the previous watershed programmes such as the Drought Prone Area Programme (DPAP), Desert Development Programme (DDP) and Integrated Watershed Development Programme (IWDP), the IWMP is more diverse and socially inclusive. Further, given the magnitude of the expenditure envisaged, and more significantly, the urgent need to secure rural livelihoods of small and marginal farmers and the asset-less, in terms of food

security and incomes, it becomes imperative to ensure accountability and set the minimum acceptable standards of performance and achievement for investments in the sector. While the overarching objective is that of ensuring sustainable livelihoods, a major indicator of which would be improved incomes, the watershed approach would need to assess the performance of its building blocks, positive outcomes of which would ultimately translate into sustainable livelihoods.

2.2   The widening scope and complexity of watershed management processes have made results based management inevitable for realizing the goals of the programme. The current planning-evaluation framework focuses on project specific targets and overlooks the bigger picture, often resulting in contiguous areas having divergent targets for the same sector. Often, any small improvement over the baseline is acceptable as an indicator of success. This negates the necessity to realize the real potential of the investment whether in terms of conservation or production outcomes. As a consequence, the overall objective remains in most cases fractionally realized, way below what should be achieved or required for long term sustenance.

2.3   Realistic benchmarks so set would serve as a handy management tool for realization of watershed outcomes, which could be evaluated at different phases of project implementation. These outcomes could be captured through concurrent monitoring with opportunities for correctives and enable realization of outcomes on a wider scale which at present is primarily project based.

2.4   Benchmarks would facilitate tracking the performance of the watershed projects. Incentives and awards for performing watersheds as well as enable midcourse correctives for non-performing ones, could be addressed on the basis of defined benchmarks.

2.5   In the above context, there is an urgent need for benchmarking specific outcomes of the programme. The comprehensiveness of the programme with a widened scope has made this task more challenging. When the focus was only on soil and water conservation activities, the assessments were rather straightforward and covered a relatively limited number of indicators. The new approach has broad- based the programme within a dynamic and interdependent system, covering environment, economic, agriculture and allied sectors as well. The outcomes in all these sectors need to be monitored and assessed for effective management of the programme. Hence, there is a need to set standards or threshold levels for related sectors.

Benchmarking Defined

2.6   Benchmarking is a process of setting realistic standards of watershed outcomes by assigning specific values to the indicators identified for the purpose and taking into consideration agro-ecological regional variation and production processes across the sectors.

III.   RELEVANT SECTORS CONSIDERED FOR BENCHMARKING

3.1   By its very nature, watershed management is an integrated approach with a multiplicity of interrelated sectors. These could be broadly classified under natural resource management, production systems and livelihoods for the asset-less, along with supporting structures such as capacity and institution building, monitoring &evaluation (M&E), convergence, etc. In the present context, it is confined to the core sectors and with the premise that the results are tangible, measurable and comparable with specific indicators identified for the same. The benchmark values would in all likelihood vary significantly from one agro-climatic region to the

other, and even the sectors identified may not be all applicable to every agro-climatic region.

3.2   The sectors that need to be benchmarked obviously stem from the areas of intervention under the programme. Some of the sub areas under consideration for identification of indicators and enumeration of benchmarks within the watershed context are, illustratively, overall incomes, agriculture, livestock, biomass, soil, hydrology, livelihoods for the asset-less, etc.

3.3   Most relevant sectors considered for Benchmarking, in the context of Watershed Management are: Agriculture & Horticulture, Animal Husbandry Dairy and Fisheries, Forestry, Soil health, Hydrology and Social&Economic.

IV.   MAJOR ECOLOGICAL REGIONS CONSIDERED FOR BENCHMARKING

4.1   Given the substantial regional variation with respect to topography, as well as agro-climatic situation, uniform benchmarks may not fit into the programme at the national level. Hence, there is a need to set standards at a regional scale.

4.2   IWMP covers 28 States and a very large number (126) of agro-climatic regions as classified by the Indian Council for Agricultural Research (ICAR). The objective of this initiative is not to capture in minute details benchmarks for each agro-climatic region and each sector/sub-sector identified. With the investments made in watersheds as the basis, the focus is on enumerating acceptable levels of improvement, for major ecological regions, that are defined as a percentage for the identified sectors/sub sectors.

4.3   Based on homogeneity within a region and distinctiveness across regions on parameters like physiography, slope, soil types, forests, and availability of water resources, broadly   eight ecological regions are earmarked for the purpose of benchmarking, viz: (i) In Western and Eastern Himalayas, (ii) Eastern Highlands, (iii) Deccan Plateau, (iv) Central Highlands, (v) Eastern and Western Ghats, (vi) Coastal Plains, and (vii) Desertand (viii) Indo-Gangetic Plains including Brahmaputra & Barack Valley(Refer **Annex-I & II**). It would be important to note that islands will have similar indicators as those of Western and Eastern Ghats. Further, greater scope is provided to the States to enlarge the regionalization as per their location.

4.4   It is emphasized here that while a broad classification with certain States in mind has been attempted, any assessment would need to look further at specific characteristics within the States. For eg.a large no. of States would have hilly regions, plains and coastal areas. This would imply that the State would in turn may have to further refine the benchmarks into these regions. However, the States would not be permitted to lower the benchmarks given in this document while refining their own regional benchmarks.

V.   INDICATORS & BENCHMARKS SET FOR RELEVANT PRODUCTION SECTORS, COVERING MAJOR ECOLOGICAL REGIONS

5.1   **Soil health**

Watershed Programmes would considerably impact the soil and water conservation regime in a given watershed during the project period. Two important indicators namely Soil Organic Carbon and Erosion Reduction Status have been set. Benchmarks levels to assess the performance over baselines have also been indicated for various ecological regions; refer Table-1 for details.

5.2 Hydrology

Hydrology parameters would be impacted by the Watershed Programmes implemented over a period of time in a given watershed. Six important hydrology indicators namely rainfall, stream flow, ground water level, status of water bodies, drinking water availability and soil moisture availability have been set. Benchmarks levels to assess the performance over baselines have also been indicated for various ecological regions; refer Table-2 for details.

5.3 Forestry

Watershed Programmes would positively impact the forestry related parameters in a given watershed over a period of time. Five important indicators namely tree cover, Normalized Differential Vegetation Index (NDVI), survival percentage; families engaged in agro-forestry and species richness have been set. Benchmarks levels to assess the performance over baselines have also been indicated for various ecological regions, refer Table-3 for details.

5.4 Agriculture and Horticulture

Agriculture and Horticulture activities would develop in a given watershed as the soil and water conservation regime improves over a period of time as the Watershed Programme interventions grow and sustain.Fifteen important indicators have been set in this area. They include: fallow and waste land areas brought under agriculture and horticulture, crop diversification, increase in area under High Yielding Varieties (HYV) and Micro Irrigation (MI), adoption of Integrated Pest Management (IPM)/ Integrated Nutrient Management (INM), various extension processes undertaken, productivity, cropping intensity, etc. Benchmarks levels to assess the performance over baselines have also been indicated for various ecological regions; refer Table-4 for details.

5.5 Animal Husbandry, Dairy and Fisheries

Watershed development programmes would impact on animal husbandry and dairy development activities as the bio-mass and the feed fodder regime improves in the watershed areas. It would also provide scope for the inland fisheries wherever the water levels in the ponds and stream flow increases. Six important indicators namely increase in grass lands on Common Property Resources(CPRs), increase in area under fodder cultivation, shift form open grazing to stall feeding, animal health camps, adoption of Artificial Insemination (AI) and increase in fish productivity have been set. Benchmarks levels to assess the performance over baselines have also been indicated for various ecological regions; refer Table-5 for details.

5.6 Economic, Financial, Process, Assets, Institutional, Risks and Convergence

This is a major dimension of the impact of the Watershed Programmes covering the areas like economic, financial, process monitoring, watershed assets, institutional, Capacity building (CB), risk management and convergence. Twenty one important indicators have been set for this sector. Benchmarks levels to assess the performance over baselines have also been indicated for various ecological regions; refer Table-6 for details.

VI. OPERATING THE INDICATORS & BENCHMARKS EXPLANATION FOR COLUMNS IN THE SECTORAL TABLES

6.1 There are **xiii** columns in the sectoral tables. The first one being the serial number of the indicators identified, the real operational columns are **xii** in number. The next four are: **(ii)** the

name of the indicator, **(iii)** methodology of the measuring the indicator, **(iv)**indicating "who" should be doing the task of measuring indicator and **(v)** frequency /stage of measurement.

6.2 Columns **vi** to **xiii** represent the 8 Ecological Regions identified for this benchmarking purpose namely: **(vi)** Western and Eastern Himalayas, **(vii)** Eastern Highlands, **(viii)** Deccan Plateau, **(ix)** Central Highlands, **(x)** Eastern & Western Ghats**, (xi)** Coastal Plains, **(xii)** Desert and **(xiii)** Indo-Gangetic Plains.

6.3 Columnwise explanation is provided as follows:

Column (ii) Indicator: It indicates the name of the indicator- Important indicators have been identified and enlisted for benchmarking purpose for relevant sectors (production processes) grouped under six heads like Soil Health, Hydrology, Forestry, Agriculture & Horticulture, Animal Husbandry, Dairy and Fisheries, and Economic, Financial, Institutional, etc.

Column (iii) How to Measure?: It indicates the specific methodology prescribed for measurement of the indicator. It specifically mentions the instruments used for measurement or the methodology.

Column (iv) Who should Measure? : Here an indication is provided for who should operate the measurement or carryout the task. The names of the possible functionaries or agencies or combination thereof are enlisted in this column.

Column (v) Frequency/Stage of measurement: Here the frequencies of measurement are indicated. There are indicators, which to be measured on an annual basis, and then there is a category of indicators, which are to be measured towards the end of the third or fifth year that is mid-term and end of the project period respectively, as the case may be.

Columns (vi) to (xiii) Identified 8 Eco-Regions (Already mentioned in 6.2 above)

These 8 columns represent the identified Ecological regions for benchmarking exercise. Each State Level Nodal Agencies(SLNAs) may first identify the specific Eco-Region or Regions as applicable to their State and see the Benchmark levels (acceptable performance standards) against particular indicators. Broadly, these have been indicative percent age increases (say 5%, 5-10%, 10 to 15%, etc.) over the base lines identified by the States. The benchmark values (performance levels) would likely to differ from eco-region to eco-region.

VII. THE WAY FORWARD- ACTIONS BY THE SLNAs

7.1 There would be three specific pre-requisites that each SLNA should work out namely: (i) identification of the Eco - Region or regions as applicable to the State, (ii) see that the bench mark values are set and pilot test the indicators and benchmark values in the agro-climatic zones of the State, and whether further refinements are necessary and (iii) then set the baselines for various indicators (as applicable to the State or Agro-Climatic Zone in a State or for the project level) for comparing the performance of the benchmark values for the period set (Annually, or at the end of 3rd year or end of the 5th year). This is to be used for comparative analysis of the project impact through the prevailing M&E system.

7.2 The SLNAs would review the indicators and benchmarks as relevant to their State and examine their usefulness & relevance to the WS programmes in various agro-climatic zones in the State.

7.3 Each SLNA to organize an orientation programme for the project functionaries to make them understand the concept and operation of the Benchmarking exercise.

7.4 Benchmarking of Watershed Management Outcomes requires State specific refinement and adoption of identified indicators and benchmarks before the actual integration within the IWMP processes. It would be necessary to launch a few pilot studies so that these indicators and benchmarks are adjusted to make them relevant to the actual ground situation. This could be taken up by any National or State agency/institution having adequate experience in this area.

7.5 The Benchmarking process is directly linked to the watershed management support mechanisms, i.e. Baseline report, Detailed Project Report (DPR) preparation (planning), capacity building, monitoring and evaluation, adoption of technology, convergence, etc. Hence there is need for local adaption of the indicators and the Benchmarks.

7.6 The indicators & benchmarks so pilot tested and finalized for the State should be incorporated in the DPRs for all the identified sectors, with project specific baseline values that help in capturing the achievement of targets during the implementation and at the end of the project.

7.7 SLNAs to immediately set the baseline values for the identified indicators. It is against these baseline values, that achievements shall be monitored and compared against the benchmarks by the M&E process to assess the short term and long term impacts of the project interventions in a given watershed.

7.8 This would require training and capacity building measures of all relevant stakeholders through appropriate training institutes, modules and materials. The training and capacity building arrangements would specifically involve the functionaries involved in measurement methodologies set for indicators under various sectors.

7.9 In order to achieve a results-based management framework, monitoring and evaluation support would be required to ensure periodic updating of the status vis a vis projected timelines for achievement of intermediary and final results.

7.10 These indicators and benchmarks would not only be useful in mid-term and end-term impact assessments but also in concurrent monitoring. The monitoring and evaluation would subsequently refer to these values for assessment of performance levels.

7.11 Proper Management Information System (MIS) plan integrating indicators, benchmarks, M&E processes, institutions and stakeholders would needs to be evolved. This should be taken up by the SLNAs in consultation with the institute of adequate experience and repute.

Ecological Regions

Ecological Region-wise Slope in India

Slope (in Degree)

- Less than 1
- 1-3
- 3-6
- 6-12
- 12-18
- 18-24
- 24-30
- 30-36
- 36-42
- 42-48
- 48-54
- 54-60
- 60-66
- 66-72
- More than 72

Ecological Regions
1 Western and Eastern Himalayas
2 Eastern Highlands
3 Deccan Plateau
4 Central Highland
5 Eastern and Western Ghats
6 Coastal Plains
7 Desert
8 Indo-Gangetic Plains, Brahmaputra & Barak Valley

Ecological Regions & the States

Ecological Regions of India

Legend:
- Western and Eastern Himalayas
- Eastern Highlands
- Deccan Plateau
- Central Highland
- Eastern and Western Ghats
- Coastal Plains
- Desert
- Indo -Gangetic Plains; Brahmaputra & Barak Valley

km
300 150 0   300   600   900

Table 1: Soil Health

SN	Indicators	Measuring details			Ecological Regions — Benchmark Values (in %)							
		How	Who	Frequency /Stages	1	2	3	4	5	6	7	8*
(i)	(ii)	(iii)	(iv)	(V)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)	(xiii)
1	Soil Organic Carbon Increase	NMR Spectroscopy	Expert/ M&E agency	5 Yr	5	5	5	5	5	a5	5	5
2	Erosion reduction	Gully formation .	Expert/ M&E agency	3 Yr	15 to 20	15-20	15-20	15-20	15-20	15-20	10-15	15-20
		Sediment loss (gauges)		5 Yr	20-25	20-25	20-25	20-25	20-25	20-25	15-20	20-25

Index for Ecological Regions: 1. Western and Eastern Himalayas ● 2. Eastern Highlands ● 3. Deccan Platue ●

4. Central Highlands ● 5. Eastern and Western ghats ● 6.Coastal Plains ● 7.Deserts ● 8. Indo Gangaitic Plains ●

*Indo-Gangetic plains include Brahmaputra and Barack Valley

Table 2: Hydrology

SN	Indicators	Measuring details			Ecological Regions — Benchmark Values (in %)							
		How	Who	Frequency /Stages		1	2	3	4	5 / 6	7	8*
(i)	(ii)	(iii)	(iv)	(V)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)	(xiii)
1	Rainfall (Intensity, no. of rainy days)	Rain gauge (TRG + DL)	WDT facilitation/PIA M&E agency	Daily	To be measured and correlated with following parameters							
2	Stream Flow Cum/sec (Monsoon flow on the selected streams in Watershed) Reduce	V Notch + Staff Gauge V Notch + AWLR (decrease)	WDT facilitation/PIA M&E agency	Daily	20 to 30	10 to 15	15 to 20	10 to 15	30 to 40	05 to 10	Up to 05	05 to 10
3	Ground water Level (in meter)/ Increase	Tape WLR	WDT/WC /PIA/M&E agency	Monthly	10 to 20	20 to 25	10 to 25	10 to 20	25 to 30	10 to 15	10	25 to 30
	Status of Water bodies (ponds, wells, springs)											
4.	a. Spread area Increase	Field Survey/ Remote Sensing	WDT/WC /PIA/M&E agency	Six Monthly	Up to 5	5 to 10	10 to 15	5 to 10	Up to 5	5 to 10	Up to 5	Up to 5
	b. Rejuvenation	Field Survey/ Remote Sensing	WDT/WC /PIA/M&E agency	Monthly	10 to 20	10 to 20	15 to 20	20 to 30	5 to 10	Up to 5	Up to 5	Up to 5

SN (i)	Indicators (ii)	How (iii)	Who (iv)	Frequency /Stages (V)	Benchmark Values (in %) — Ecological Regions							
					1	2	3	4	5	6	7	8*
					(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)	(xiii)
					To be measured and correlated with following parameters							
	c. New Water Bodies (In Numbers) Increase	Number/ Remote Sensing	WDT/WC /PIA/M&E agency	Monthly	05 to 10	05 to 10	10 to 15	10 to 20	05 to 10	05 to 10	10 to 15	10 to 15
5	Drinking water availability Increase	Survey / FGD	WDT/Expert/ M&E agency	3 Yr / 5 Yr	15- 20 / 20- 25	15- 20 / 20- 25	15- 20 / 20- 25	15- 20 / 20- 25	15- 20 / 20- 25	15- 20 / 20- 25	10- 15 / 15- 20	15- 20 / 20- 25
6	Soil moisture content **(only in pilot watershed)** Increase	Probes	Expert/ M&E agency	Quarterly	10 to 20	10 to 20	20 to 30	20 to 30	05 to 10	15 to 20	05 to 10	05 to 10

Index for Ecological Regions: 1. Western and Eastern Himalayas 2. Eastern Highlands 3. Deccan Platue
4. Central Highlands 5.Eastern and Western ghats 6.Coastal Plains 7.Deserts 8. Indo Gangaitic Plains

Note. All values under Hydrology are in relation to baseline values at sub watershed level. If baseline values are not available (e.g. rainfall), taluka/GP/block normal values to be considered as base values.

*Indo-Gangetic plains include Brahmaputra and Barack Valley

Table 3: Forestry

SN (i)	Indicators (ii)	Measuring details — How (iii)	Who (iv)	Frequency/Stages (V)	1 (vi)	2 (vii)	3 (viii)	4 (ix)	5 (x)	6 (xi)	7 (xii)	8* (xiii)
					Benchmark Values (in %)							
1	Tree Cover Increase	Inventory	WDT/WC/M&E agency	3 Yr	10-15	10	5-10	5-10	10-15	5-10	2-5	2-5
				5 Yr	15-20	15	15-20	15	7-15	15	3-7	3-7
2	Normalized Differential Vegetation Index (NDVI) Increase	Remote Sensing	Expert/M&E agency	3 Yr	10-15	10	5-10	5-10	10-15	5-10	2-5	2-5
				5 Yr	20-25	20	20-25	20	10-20	20	5-10	5-10
3	Survival of the number planted	By survey	M&E agency	3 Yr	50	45	40	40	45	40	20	50
				5 Yr	70	60	50	50	60	50	30	70
4	% families cultivating Agroforestry Increase	By survey	M&E agency	5 Yr	5-10	5-10	5-10	5-10	5-10	5-10	5-10	5-10
5	Species richness (diversity, PBR) Increase	Count Survey	Exp agency	3 Yr	4	4	4	4	4	3	3	4
				5 Yr	7	7	7	7	7	4	4	7

Index for Ecological Regions: 1. Western and Eastern Himalayas 2. Eastern Highlands 3. Deccan Plateau
4. Central Highlands 5. Eastern and Western ghats 6. Coastal Plains 7. Deserts 8. Indo Gangaitic Plains

*Indo–Gangetic plains include Brahmaputra and Barack Valley

Table 4: Agriculture and Horticulture

SN	Indicators	Measuring details			Ecological Regions — Benchmark Values (in%)							
		How	Who	Frequency /Stages	1	2	3	4	5	6	7	8*
(i)	(ii)	(iii)	(iv)	(V)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)	(xiii)
1	Fallow & Wasteland reduction as % of total agricultural land	Remote sensing/ Survey	Expert/M&E agency	5 Yr	15-20	15	15-20	15	7-15	15	3-7	3-7
2	Diversification in agriculture & horticulture Increase	Survey	WDT/Expert/ M&E agency	5 Yr	10-15	10-15	10-15	10-15	10-15	5-10	5-10	12-18
3	Area covered under improved varieties/HYV of total cultivable land	By survey	Expert/M&E agency	5 Yr	7-10	10-15	10-15	10-15	10-15	10-15	5-10	10-15
4	Area enhanced under Irrigation as to total cultivable land	By survey	Expert/M&E agency	5 Yr	5-7	5-15	5-15	5-15	5-15	5-15	4-7	5-15
5	Area covered micro irrigation system Increase	Survey	WDT/Exp agency/ M&E agency	5 Yr	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10-20

Index for Ecological Regions: 1. Western and Eastern Himalayas   2. Eastern Highlands   3. Deccan Plateau
4. Central Highlands   5.Eastern and Western ghats   6.Coastal Plains   7.Deserts   8. Indo Gangaitic Plains
*Indo-Gangetic plains include Brahmaputra and Barack Valley

Agriculture and Horticulture - Contd.

SN	Indicators	Measuring details			Ecological Regions — Benchmark Values (in%)							
		How	Who	Frequency /Stages	1	2	3	4	5	6	7	8*
(i)	(ii)	(iii)	(iv)	(V)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)	(xiii)
6	Demonstration of new technology Increase	Survey	WDT/Expert/M&E agency	5 Yr	5	5	5	5	5	5	5	5
7	Adoption of INM/IPM/IDM Increase	Survey	WDT/ M&E agency	5 Yr	20-25	20-25	20-25	20-25	20-25	20-25	20-25	25-30
8	No of Farmer Producers Institutions (FPIs) Increase	By survey	Expert/M&E agency	5 Yr	20 no.	20 no.	20 no.	20 no.	20 no.	20 no.	20 no.	20 no.
9	Local Innovations in watershed Increase	Survey	PIA /WDT/Exp agency	5 Yr	2-5 no.	2-5 no.	2-5 no.	2-5 no.	2-5 no.	2-5 no.	2-5 no.	2-5 no.
10	Farmers aware about climate change impacts Increase	Survey	WDT/Exp/M&E agency	5 Yr	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20

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4. Central Highlands   5.Eastern and Western ghats   6.Coastal Plains   7.Deserts   8. Indo Gangaitic Plains

*Indo-Gangetic plains include Brahmaputra and Barack Valley

Agriculture and Horticulture - Contd.

SN	Indicators	Measuring details			Ecological Regions — Benchmark Values (in%)							
		How	Who	Frequency /Stages	1	2	3	4	5	6	7	8*
(i)	(ii)	(iii)	(iv)	(V)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)	(xiii)
11	No. of farmers undergone trainings	Survey	WDT/PIA/ M&E agency	Yearly	200 farmers per annum per watershed							
12	Participation in Exposure visits organized	Survey	WDT/PIA/ M&E agency	Yearly	200 farmers per annum per watershed							
13	Mechanization, RCTs, Increased	By survey	WDT/PIA/ M&E agency	5 Yr	10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15
14	Cropping intensity Viz. Shift from single to double, triple/inter cropping Increase	Survey	PIA /WDT/Exp agency	3 Yr	15-20	20-30	20-30	20-30	20-30	20-30	10-15	20-30
				5 Yr	20-30	30-40	30-40	30-40	30-40	30-40	15-20	30-40

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Agriculture and Horticulture - Contd.

SN	Indicators	Measuring details		Ecological Regions								
		How	Who	Frequency /Stages	Benchmark Values (in%)							
					1	2	3	4	5	6	7	8*
(i)	(ii)	(iii)	(iv)	(V)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)	(xiii)
15	Improvement in Productivity											
	Cereals	Survey	WDT/ M&E agency	3 Yrs.	10	15	20	20	10	15	8	25
				5 Yrs.	15	20	30	30	15	20	10	35
	Pulses	Survey	WDT/ M&E agency	3 Yrs.	10	15	20	20	10	15	8	25
				5 Yrs.	15	20	30	30	15	20	10	35
	Oil Seeds	Survey	WDT/ M &E agency	3 Yr s.	10	15	20	20	10	15	8	25
				5 Yr s.	15	20	30	30	15	20	10	35
	Fodder	Survey	WDT/ M&E agency	3 Yrs.	10	15	20	20	10	15	8	25
				5 Yrs.	15	20	30	30	15	20	10	35
	Cash Crops	Survey	WDT/ M&E agency	3 Yrs.	10	15	20	20	10	15	8	25
				5 Yrs.	15	20	30	30	15	20	10	35

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Agriculture and Horticulture - Contd.

SN	Indicators	Measuring details		Frequency/Stages	Ecological Regions							
		How	Who		Benchmark Values (in%)							
					1	2	3	4	5	6	7	8*
(i)	(ii)	(iii)	(iv)	(V)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)	(xiii)
15	Improvement in Productivity											
	Ornamental vegetables	Survey	WDT/ M&E agency	3 Yrs.	10	15	20	20	10	15	8	25
				5 Yrs.	15	20	30	30	15	20	10	35
	Spices	Survey	WDT/ M&E agency	3 Yrs.	10	15	20	20	10	15	8	25
				5 Yrs.	15	20	30	30	15	20	10	35
	Plantation Crops	Survey	WDT/ M&E agency	3 Yr s.	10	15	20	20	10	15	8	25
				5 Yr s.	15	20	30	30	15	20	10	35

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Table 5: Animal Husbandry, Dairy and Fisheries

SN	Indicators	Measuring details			Ecological Regions — Benchmark Values (in%)							
		How	Who	Frequency /Stages	1	2	3	4	5	6	7	8*
(i)	(ii)	(iii)	(iv)	(V)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)	(xiii)
1	Increase in area under grasslands on CPR	Revenue record /Survey	WDT/ M&E agency/PIA	3 Yrs.	4-5	4-5	4-5	4-5	4-5	4-5	5-7	4-5
				5 Yrs.	5-6	5-6	5-6	5-6	5-6	5-6	7-8	5-6
2	Increase in area under cultivated fodder	Revenue record/Survey	WDT/ M&E agency	3 Yrs.	4-5	4-5	4-5	4-5	4-5	4-5	5-7	4-5
				5 Yrs.	5-6	5-6	5-6	5-6	5-6	5-6	7-8	5-6
3	Shift from open grazing to Stall feeding	Survey	WDT/ M&E agency	3 Yrs.	10-12	10-12	10-12	10-12	10-12	10-12	10-12	10-12
				5 Yrs.	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20
4	Health camps	Survey	WDT/ M&E agency/PIA	Yearly	Two camps per annum							
5	No. of livestock owners adopting Artificial Insemination (AI) services	Survey	WDT/ M&E agency/PIA	3 Yrs.	20-30	20-30	20-30	20-30	20-30	20-30	20-30	20-30
				5 Yrs.	20-30	20-30	20-30	20-30	20-30	20-30	20-30	20-30
6	Increase in production of aquaculture	Survey	WDT/ M&E agency/PIA	5 Yrs.	5-10	5-10	5-10	5-10	5-10	5-10	5-10	5-10

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Table 6: Economic, Financial, Process, Assets, Institutional, Risks and Convergence

SN	Indicators	Measuring details			Ecological Regions — Benchmark Values (in%)							
		How	Who	Frequency /Stages	1	2	3	4	5	6	7	8*
(i)	(ii)	(iii)	(iv)	(V)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)	(xiii)
	Economic Indicators											
1	Total Income	Survey	M&E Agency	3 Yr	20-25	20-25	20-25	20-25	20-25	20-25	20-25	20-25
				5 Yr	25-40	25-40	25-40	25-40	25-40	25-40	25-40	25-40
2	No. of families recorded positive change in income	Survey	M&E Agency	3 Yr	Increased by 25 % as planned							
				5 Yr	Increased by 50% as planned							
3	Distress migration	Survey	M&E Agency	3 Yr	15% reduction due to IWMP							
				5 Yr	30% reduction due to IWMP							
	Financial Indicators											
4	Finance/Credit linkages (SHGs/UGs/CIGs)	Survey	M&E Agency	5 Yr	20-25	20-25	20-25	20-25	20-25	20-25	20-25	20-25
5	Watershed Development Fund	Survey	M&E Agency	5 Yr	100% as planned							

SN	Indicators	How	Who	Frequency/Stages	Ecological Regions (1 2 3 4 5 6 7 8*)
6	Common Property Resources Maintenance mechanism	Survey	M&E Agency	5 Yr	60 - 80% as planned
	Process Monitoring				
7	Status of Area Treatment	Survey	M&E Agency	3 Yr	100 % As planned in DPR
8	Status of Drainage line Treatment	Survey	M&E Agency	5 Yr	100 % As planned in DPR
9	No. of social audits	Survey	M&E Agency	5 Yr	80% as planned under IWMP
10	Gram Sabha's participation in planning and management of watershed	Survey	M&E Agency	3 Yr	As per DPR
				5 Yr	As per DPR
	Formation of Institutions				
11	No. of SHGs/CBOs/Micro Enterprise formed	Survey	M&E Agency		3 Yr / 70-80% as planned by 3rd year
12	No. of Watershed Committee Functional	Survey	M&E Agency	3 Yr	100 % Functional

SN	Indicators	How	Who	Frequency /Stages	Ecological Regions							
					1	2	3	4	5	6	7	8*
Capacity Building of Institutions												
13	WC/PIAs/CBOs	Survey	M&E Agency	5 Yr	As planned under IWMP							
14	PRIs	Survey	M&E Agency	3 Yr	100% office bearers trained							
				5 Yr	80% members trained							
Watershed Assets												
15	No. of common watershed assets created	Survey	M&E Agency	3 Yr	80% as planned under IWMP							
				5 Yr	100% as planned under IWMP							
16	No. of private assets	Survey	M&E Agency	5 Yr	80% as planned under IWMP							
Risk Management												
17	No. of CBOs/Micro Enterprises linked to market	Survey	M&E Agency	5 Yr	50% as planned under IWMP							
18	Crop Production related risks	Survey	M&E Agency	5 Yr	50% reduction in crop failure per annum,							
Convergence												
19	Schemes	Survey	M&E Agency	Yr	60% as planned under IWMP Convergence Matrix							
				5 Yr	100% as planned under IWMP Convergence Matrix							
20	Institutional	Survey	M&E Agency	3 Yr	60% as planned under IWMP Convergence Matrix							
				5 Yr	100% as planned under IWMP Convergence Matrix							

SN	Indicators	How	Who	Frequency/Stages	Ecological Regions							
					1	2	3	4	5	6	7	8*
21	Technology	Survey	M&E Agency	3 Yr	60% as planned under IWMP Convergence Matrix							
				5 Yr	100% as planned under IWMP Convergence Matrix							

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