

## **A Critical Appraisal of Integrated Watershed Management Programme in India**

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**Abstract:** *The present paper briefly discusses about the concept of “integrated watershed management programme” adopted by developing countries and the main objectives of the programme. Keeping in view the objectives of the programme, a review was made in India and the necessary driving factors for adopting watershed technology. Sketching out the administrative implementation-chain in India, this paper explains the recent initiatives taken up for successful and efficient implementation of the programme. An attempt is made to present a critical analysis of the performance of the programme in terms of no. of projects, area covered and funds released by the Government of India and provides a comparative analysis of the states in India by calculating the average amount of funds released per project in relation to the extent of rain fed area in the states and the proportion of rain fed area covered by the projects sanctioned to total rain fed land in the states for assessing the successful implementation of the programme. As concluding remarks, the paper briefly provides some of the success stories and impact assessment studies of the programme as observed by the Government of India.*

**Key Words:** *Watershed, natural resource management, agricultural productivity, poverty alleviation, capacity building, economic empowerment.*

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### **I. Introduction:**

“Watershed” in general is an area that supplies water by surface or subsurface flow to a given drainage system or body of water – a stream, river, wetland, lake or ocean. The interaction between land and water and its use and management decides the characteristics of the water flow and its relationship to the watershed. Hence, experts argue that watershed should be the basic unit for an integrated planning of land and water use. The ‘watershed’ approach becomes the important driving factor when a country has been moving towards sustainable development of agriculture sector and achieving food security to all the people, particularly in developing countries. In recent decades, in many parts of the world, watershed degradation has emerged as a most serious problem causing natural resource degradation, which has been acting as a “pull factor” for the efforts of achieving food security and led to negative environmental and socio-economic consequences (World Bank, 2010a,b). Watershed degradation refers to the degradation of both soil and water in a watershed and also refers to long-term reduction of the quantity and quality of land and water resources. (Government of India, 2015). Particularly in rural areas, changes in the farming system, high population growth rates, poor economic opportunities in urban areas have led to widespread cultivation on steep and highly erosion-prone marginal lands. Inequitable land distribution and the resultant overloading of carrying capacity and replacement of good cultivation practices by bad ones as an answer to external shocks like falling crop price have also resulted into degradation of watersheds. In rural areas, livestock plays an important role in the economic activities particularly in developing countries and for landless laborers and marginal and small farmers. The demographic pressures and economic necessities often influence the stock of livestock above the carrying capacity of the respective areas and land to overgrazing, which negatively impacts the vegetative cover and loss of fertile top soil. These necessities often cause a reduction in water infiltration rates, increase in run-off and accelerate soil erosion.

No doubt over the last 50 years, land and water management had met rapidly rising demand for food importantly due to input-intensive and irrigation-intensive mechanized agriculture. It was estimated that the world’s agricultural production has grown between 2.5 and 3 times over the period while the cultivated area has grown only by 12.0 per cent (FAO, 2011). In too many places, achievements in production were associated with management practices that have degraded the land and water systems. It is a proved fact that irrigation bestows both direct and indirect benefits in terms of production and incomes and indirectly in terms of reduced incidence of downstream flood. That was why it was argued that there is a strong linkage between poverty and the lack of access to land and water resources. It was also estimated that in most of the developing countries the

poorest have the least access to land and water and are locked in a poverty-trap of small farms with poor quality soils with high land degradation and climatic uncertainty (FAO, 2013). The Report on Global Hunger Index observed that the level of hunger in the world remains “Serious” with 870 million people going hungry (IFPRI, 2014).

All these human-centered economic activities have propelled to adopt “Watershed Management Approaches” for an integrated land and water management by recognizing the casual link between upstream land and water use and downstream impacts. The typical nexus between the degradation, depletion of resources and the resultant poverty was identified by the Governments of the majority of the developing countries. It was also observed that upland of developing countries are typically more fragile and have less productive environments where natural resource management and rural poverty are commonly linked (FAO, 2012). Being influenced by these consequences, focus was laid on the farming systems of the poor in upland areas in order to achieve poverty reduction and conservation of natural resources simultaneously. As a result, from the 1990’s, watershed management programmes supported by the International institutions have targeted livelihood improvements and poverty reduction objectives with special focus on resource conservation. These programmes also aimed at adopting integrated farming systems and participatory and demand-driven approaches implemented at the decentralized level. Primarily these watershed management approaches aim at:

1. Conservation of soil, water and vegetation
2. Improvement in productivity of resource use in ways that are ecologically and institutionally sustainable
3. Benefits to the local population, and
4. Poverty reduction.

## **II. Methodology:**

### **Objectives of the Paper:**

Keeping the importance of Integrated Water Management Programmes for strengthening and improving the conditions of rain fed areas in India, the present paper deals with the following objectives:

1. To review and present the necessity of integrated watershed management programme for the rain fed areas in India.
2. To discuss about the administrative implementation-chain and recent initiatives taken up and implemented by the Government of India for the effective implementation of the programme.
3. To assess the performance of the integrated watershed management programme during the years 2009-10 to 2014-15.
4. To provide a critical analysis of the performance of the programme with reference to no of projects, area covered and funds released for the states in India, and
5. To present some of the success stories, so as to evaluate the beneficial impact of the programme with reference to its objectives in India.

### **Sources of Data:**

This paper, for satisfying the above objectives, primarily hinges on secondary sources of information collected from the Annual Reports of the Government of India published by the Department of Land Resources, Rural Development and international research papers prepared for the Department of Land Resources and by “teri”. The research reports published by ICAR and NAAS, New Delhi, Proceedings of the National workshop on Pro-Poor International Strategies in Irrigated Agriculture in Asia, published by International Water Management Institute, Colombo, Srilanka, NCC Research Report on Impact of Climate Change on Land Degradation over India published by National Climate Centre, Pune, Report on Agricultural Statistics at a Glance-2014 published by Oxford, and reports of World Resource Institute and Watershed Organisation Trust were consulted for necessary supporting material. Some of the e-sources were also consulted to prepare the paper.

## **III. Analytical Discussion and Results:**

Being influenced by the experiences of the watershed development programmes implemented in most of the developing countries, national policies on watershed management approaches were designed and implemented by many of the agro-dominant and resource-depleting developing countries like India. India accounts for only about 2.4 per cent of the world’s geographical area and 4.0 per cent of its water resources but has to support about 17.0 per cent of the world’s population and 15.0 per cent of the livestock. India has 328.73 m.hectares of geographical area, of which 182.51 m.hectares account for arable land and 140.02 m.hectares (42.6 per cent of the geographical area) accounts for net area sown. The net area irrigated accounts for 63.26 m. hectares (45.2 per cent of the net area sown). The cropping intensity and irrigation intensity work out to 137.3 per cent and 136.6 per cent respectively (Ministry of Agriculture, Government of India, 2010). Besides low cropping and irrigation intensity, 178.0 m.hectares (54.0 per cent) is converted into waste lands for one or other reasons, including 40 m. hectares of degraded forest. It was estimated that of the 140.02 m.hectares of net

cropped area, 80.6 m.hectares was degraded due to faulty agricultural practices ([www.sciencelog.net/2014](http://www.sciencelog.net/2014)). The spatial distribution of degraded and wastelands estimated by the ICAR and NAAS (2010) show that water and wind erosion (85.67 m.hectares), chemical degradation (17.45 m.hectares) and physical degradation (1.07 m.hectares) together caused degradation to the extent of 104.19 m.hectares in India. Ankita Rai (2015) estimated that India is losing Rs. 28,500 crore, at current prices, on account of degraded lands which comes to about 12.0 per cent loss as per the total value productivity of these lands.

Besides this 'sorry state', the average size of landholdings in India has declined from 2.28 hectares in 1970-71 to 1.15 hectares in 2010-11 (Department of Agriculture and Cooperation, 2015). The Agriculture Census -2010-11 shows that 85.0 per cent of total land holdings are marginal and small holdings with an operational area of 44.6 per cent (less than 2.0 hectares). The percentage of female operational holdings account for 12.78 per cent of the total holdings and marginal and small holdings operated by females accounts for 25.8 per cent of the total holdings (Government of India, 2015). The statistics on yield of principal crops in India show that the yield (3721 kgs.) was low compared to the average yield of the world (4568 kgs.), China (6775 kgs.) and even Bangladesh (4621 kgs.) and very low compared with yields achieved in Egypt (9530 kgs.) and USA (8549 kgs.) (Government of India, 2014). Though the Global Hunger Index score for India was estimated at 17.8 in 2014, which has declined from 31.2 in 1990, still India is classified as "serious", continues as home to the highest number of chronically malnourished children. The socio-economic indicators in terms of percentage of population living below poverty line (2011-12 Tendulkar Methodology) ranges from a high of 52.6 per cent in Odisha to the national average of 21.9 per cent.

All these facts certainly demand the promotion of linkages between small scale agriculture, income-generating activities, natural resource management techniques and improvement of nutrition and reducing poverty.

#### **Integrated Watershed Management Programme:**

Watershed Development (WSD) in India has been a part of the national approach to improve agricultural production and alleviate poverty in rain fed regions since the 1970's aimed at restoration of degraded watersheds in rain fed regions to increase their capacity to capture and store rainwater, reducing soil erosion, and improving soil nutrient and carbon content so that they can produce greater agricultural yields for local consumption and income generation and other benefits. Watershed is also defined as a geo-hydrological entity from where the excess water drains through a common outlet. It is the land mass and the natural resources having a common drainage point. Hence, the drainage point becomes the focal reference that decides the watershed and its area that may include arable, non-arable, public and private lands. As the majority of India's rural poor live in these regions and are dependent on natural resources for their livelihoods and sustenance, improvements in agricultural yields improve human welfare while simultaneously improving national food security (Ahmad et al. 2011; GOI 2012; Kerr 2002). Following the government's decision to condense the Centrally-sponsored schemes, "Integrated Watershed Management Programme" as a flagship programme of the government was designed and implemented. The former area development programmes of the Department of Land Resources, including the Drought Prone Areas Programme (DPAP), the Desert Development Programme (DDP) and the Integrated Wastelands Development Programme (IWDP) have been integrated into a single modified programme called "Integrated Watershed Management Programme (IWMP)" and was launched in 2009-10. The Government of India has allocated an amount of Rs. 29,296 crore for IWMP in 12th Plan for the implementation of the programme as an area development programme by which all the people living in the area shall be benefitted. As said earlier, more than 54.0 per cent of cultivated area across India is rain-fed. Further, these areas are also plagued by poverty, water scarcity, low productivity, malnutrition and prone to severe land degradation. The watershed development programme has been adopted as a tool to address problems of the rain-fed or degraded areas in the country. The cost of the project shall be shared in the ratio of 90:10 between Central Government and State Government.

In India, management of a watershed entails the rational utilization of land and water resources for optimum production but with minimum hazard to natural and human resources. Thus it is a process of guiding and organizing land use and use of other resources in a watershed to provide desired goals and services without adversely affecting soil and water resources. The primary objectives of integrated watershed development programme are:

1. Harnessing, conserving and developing degraded natural resources – soil, vegetative cover and ground water table
2. Prevention of soil run-off
3. Rain water harvesting and recharging of ground water table
4. Increasing the productivity of crops
5. Introduction of multi-cropping and diverse agro-based activities, and
6. Promoting sustainable livelihoods and increasing the household incomes.

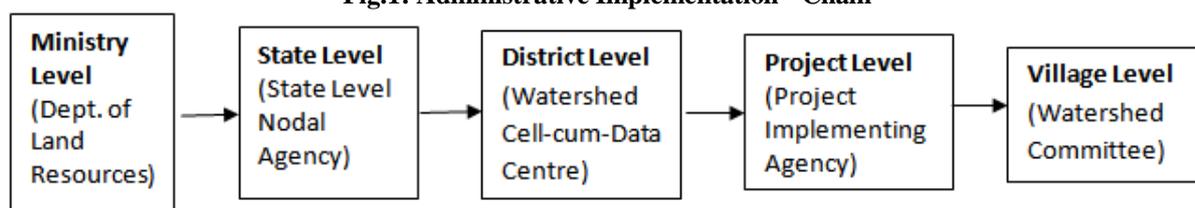
**Institutional set up for Implementation:**

The activities under integrated watershed management programme are distributed over the following three phases:

1. The preparatory phase ( 1 to 2 years)
2. Watershed works phase ( 2 to 3 years)
3. Consolidation and withdrawal phase ( 1 to 2 years)

The cost norms for integrated water management programme is Rs. 15,000/- per hectare for hilly and difficult areas and Rs. 12,000/- per hectare for other areas and up to Rs. 15,000/- per hectare in integrated action plan districts. The funding pattern under this scheme is in the ratio of 90:10 between centre and states. A cluster of micro-watersheds of area about 5000 hectares in rain fed/ degraded areas having no assured irrigation. This programme has the administrative implementation-chain as shown below:

**Fig.1: Administrative Implementation - Chain**



At the ministry level, the department of land resources is the central mechanism , in association with related departments and at state level, the State Level Nodal Agency is the implementing authority. At district level, watershed cell - cum- data centre supervises and coordinates the integrated watershed management programme projects, set up in DRDA/Zilla Parishad and as per the convenience of the state governments. Project implementation is supervised by the Project Implementing Agency as per the Common Guidelines for Watershed Projects- 2008(revised in 2011). Panchyats, Government and NGOs function as project implementing agencies by constituting a Watershed Development Team (WDT) comprising technical experts. Watershed committee would be constituted by the Gram Sabha for implementing the project at field level. This watershed committee consists of at least 10 members, comprising the members representing Self-Help Groups and User Groups, SC/STs, women and landless. One member from Watershed Development Team also represents the Watershed Committee.

**The Recent Initiatives:**

The department of Land Resources (Government of India, 2015) has taken up a no. of initiatives for strengthening the implementation of integrated watershed management programme with the following promotional activities:

1. “Neeranchal” – World Bank assisted Watershed Management Project
2. Project Financial Management System
3. Third party concurrent monitoring and evaluation
4. Use of Remote sensing and GIS technology
5. Use of Bhuvan Geo Portal of Integrated Watershed Management Programme
6. Convergence of Agriculture and allied sector schemes with integrated watershed management programme, and
7. Benchmarking of watershed management outcomes.

**Performance of Integrated Watershed Management Programme in India:**

The state level nodal agencies for successful implementation of integrated watershed management programmes were notified in all 29 states of India with an institutional support of Rs. 159.545 crore from 2009-10 to 2014-15. (Government of India,2015, Annexure-XXXVII) The total no. of projects sanctioned and the areas covered during this period is presented in Table. 1.

**Table. 1: Performance of Integrated Watershed Management Programme in India**

Year	No. of Projects Sanctioned	Area Covered ( in million hectares)	Funds Released (Rs. In Crores)
2009-10	1324	6.310	501.48
2010-11	1865	8.824	1496.83
2011-12	1898	9.080	1865.92

2012-13	1066	5.000	2720.54
2013-14	1051	5.046	2162.80
2014-15	1010	4.809	2099.45
Total	8214	39.069	10847.02

Source: Government of India (2015) Annual Report -2014-15, Ministry of Rural Development, p.283, Annexure- XXXVIII.

The data presented in Table. 1 show that the no. of projects sanctioned has been continuously declining from 2011-12 onwards and the area covered also declined significantly. However, the funds released though increased up to 2012-13, and then onwards declined to Rs. 2099.45 crore in 2014-15 compared to Rs.2720.53 crore in 2012-13. To sum up, under integrated watershed management programme , a total of 8214 projects, covering an area of 39.07 million hectares were sanctioned to 28 states. The target for sanctioning of new projects for the year 2014-15 was 4.8 million hectares. A total of 1010 projects were sanctioned by SLNAs and an amount of Rs. 2099.45 crore were released during the year 2014-15, Since inception of the programme, an amount of Rs. 10847.02 crore were released to states as central share for the projects sanctioned.

### The other side of the Performance:

An attempt is made to a critical analysis of the state-wise performance of the watershed management programme in India , so as to assess the linkage between the rain fed area and the no. of projects sanctioned in each state, area covered and funds released. Since the watershed programme primarily targets at the betterment of dry lands, make them irrigable and raise the remunerative crops for increased farm income, the estimated rain fed area of the state has been taken as the criteria for the sanction of projects, area to be covered and funds to be released. The states with highest rain fed area (in lakh hectares) are selected to analyse the performance of integrated watershed management programme. Table. 2 provides the correlation between the rain fed area, no. of projects sanctioned, area covered and funds released.

**Table 2: Performance of Integrated Watershed Management Programme in India: A Comparison**

S. No.	States Selected	Rain fed Area (in Lakh Hectares)	Total from 2009-10 to 2014-15 (as on 31-12-2014)			Percentage of Rain fed area covered by the Projects sanctioned (5/3)
			No. of Projects	Area Covered (million hectares)	Funds Released (Rs. In Crore)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Maharashtra	146.44	1186	5.128	1504.46	35.0
2	Rajasthan	113.45	1025	5.764	1448.33	50.8
3	Madhya Pradesh	101.24	517	2.937	793.18	29.0
4	Karnataka	74.66	571	2.589	1286.74	34.7
5	Gujarat	66.28	610	3.100	834.25	46.8
6	Andhra Pradesh	61.72	432	1.810	517.73	29.3
Sub-Total		563.79 (65.6)	4341 (52.8)	21.328 (54.6)	6384.69 (58.9)	37.8
7. Remaining 22 States		293.28 (34.8)	3873 (47.2)	17.741 (45.4)	4462.33 (41.1)	60.5
All 28 States		857.07 (100.0)	8214 (100.0)	39.069 (100.0)	10847.02 (100.0)	45.6

Source: Calculated from the Government of India (2015) Annual Report-2014-15, Ministry of Rural Development, pp.281 and 283, Annexure – XXXVI and XXXVIII

The data presented in Table. 2 facilitate to draw the following conclusions:

1. The Six selected states which have 65.6 per cent of the total rain fed area in the country were sanctioned 52.8 per cent of the total projects for covering an area to the extent of 54.6 per cent with 58.9 per cent of the total funds released.
2. The remaining 22 states which have 34.8 per cent of the total rain fed area could get 47.2 per cent of the total projects sanctioned for covering an area of 45.4 per cent with 41.1 per cent of the total funds released.
3. The rain fed area covered by the projects sanctioned works out to an average of 37.8 per cent only for the selected six states, with a high proportion of area covered in Rajasthan (50.8 per cent) to a low of 29.0 per cent in Madhya Pradesh and 29.3 per cent in Andhra Pradesh.
4. In the remaining 22 states, 60.5 per cent of the total rain fed area was covered. For all the 28 states, only 45.6 per cent of the total rain fed area was covered by 8214 projects sanctioned.
5. An estimation of the average amount of funds released per project sanctioned works out to only Rs. 1.47 crore for the selected six states and it was Rs. 1.32 crore for the remaining 22 states and on an average Rs. 1.15 crore was sanctioned per project for the total 28 states.

6. To sum up, comparatively Madhya Pradesh, Andhra Pradesh, Karnataka and Maharashtra could not receive the funds released even to cover at least half of their rainfed area under integrated watershed management programme. Particularly, Madhya Pradesh, Andhra Pradesh and Karnataka could receive only 7.3 per cent, 4.8 per cent and 11.9 per cent of the total funds released respectively under this programme.

#### **Impact Analysis of Integrated Watershed Management Programme:**

An attempt is made to present some of the selected “success stories” in India for assessing the benefits derived by the people within the watershed area. Government of India has observed that watershed development programme has yielded desired results in many states.

An evaluation report prepared by Erin Gray Arjuna Srinidhi in Kumbharwadi is a rainfed watershed lying in the rain shadow region of Ahmednagar district in Maharashtra state. Project benefits were estimated based on data on key indicators for WOTR reports from 1998, 2003, and 2012. By adopting personal interview method for data collection, direct and indirect benefits were estimated. Direct benefits include increased income due to improvements in crop and livestock yields, avoided travel costs for migratory work and fetching drinking water, and avoided government supplied water tankers. It was observed that the project also improved fuel wood and fodder supplies, improved nutrition, increased enrollment in education, improved female empowerment, and supported greater community development. The authors have identified that the project also generated numerous co-benefits including habitat improvement, carbon sequestration from afforestation and reforestation interventions, and enhanced resilience to weather changes. It was noted that net annual income from agriculture and livestock increased dramatically between 1998 and 2012. A linear trend in net income growth based on net agricultural income was also calculated for the project (WRI and WOTR, 2013).

The Stop dams constructed in Datia tehsil of Madhya Pradesh had a favorable impact on improvement of irrigated area to the tune of 70 acres. The productivity of farm land has increased by 30.0 per cent. The water level in the wells, which fall under the command area of the project has increased by 7 to 8 feet. It was estimated that stop dam created in the village has impacted the livelihoods of 17 farmers in terms of economic empowerment.

An Integrated Water Management Programme –I project in Balood district of Chattisgarh taken up in 2009-10, a check dam was constructed. This project has reduced soil erosion and about 25.0 hectares of dry land was converted into irrigated land. As a result, paddy crop was raised and its productivity has increased from 12.0 quintals per acre to 17.0 quintals.

In Odisha a project under IWMP-II was sanctioned in Komna block of Naupada district. Formerly this area had the problem of environmental degradation, low agricultural productivity, large scale migration and soil erosion. After implementing the project, onion crop was raised on commercial basis and the farmers had received profits through grower’s cooperatives on a sustainable basis.

Under IWMP, a Dry Land Horticulture (DLH) activity was financed in Mulakalapalli mandal of Khammam district. This activity has helped in realizing the dreams of the farmers by creating sustainable livelihoods. Mango trees were planted under the project and intercrops were also cultivated in the mango orchards. Cotton crop was raised as inter-crop and the farmer could get a net income of Rs. 23,478/- during the first year (Government of India, 2015).

The impact assessment studies of the watershed development programme prepared by the Department of Land Resources, Ministry of Rural Development (2004) for 15 states – Andhra Pradesh, Bihar, Chattisgarh, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamilnadu, Uttaranchal, Uttar Pradesh and West Bengal-- reveal that watershed development programmes had a positive impact on land use, irrigation, cropping pattern and productivity, fuelwood and fodder availability, livestock population, employment generation, farm income, the no. of persons living below the poverty line and capacity building and people’s participation.

#### **IV. Conclusion:**

It is to be accepted beyond doubt that the integrated watershed management programme certainly had positively impacted the agro-economy and socio-capacity building features of the rural people in India. Besides augmenting the family incomes of the beneficiaries under the project area, this programme had a favorable effect on savings, consumption and human development and economic empowerment. The Governments are attaching much importance to the criteria fixed for allocation of target area to states under integrated watershed management programme, particularly the indicators like poverty index, percentage of SC/ST and marginal and small farmers, area under rain fed agriculture and extent of degraded land. However, the Government must think over to have ‘equity approach’ while sanctioning the projects and the soil and land degradation and moisture indices are to be given priority and to release the funds accordingly. The state governments must also initiate necessary measures to utilize the funds released in a more efficient way by strengthening the administrative – implementation- chain.

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