EVALUATION AND IMPACT ASSESSMENT OF WATERSHED MANAGEMENT PROGRAMME ON NATURAL RESOURCES IN SURDI WATERSHED AREA

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Water is a precious natural resource which is essential for life on the earth. The relentless increase in the demand of water for various purposes brought about by the population growth, agricultural and economic development combined with increasing pollution of water supplies, have created water scarcity problems. The challenge, therefore, is to improve rural livelihoods through efficient and sustainable rainwater management technologies for increasing rain-fed productivity and thereby contribute to food and livelihood security. In India out of 329 Mha of geographical area nearly 50% land is said to be either waste of degraded nearly the land water and natural vegetation resources of for country area under tremendous pressure droughts floods and other climatologically extremes are common phenomenon in one or the other parts of the country. In the last 125 years the country has experienced 25 droughts when more than 70 percent area was affected in the last 50 year, the country has experienced more than 14 droughts of which 1987 drought was the worst, affecting almost half of land of country (Anonymous, 2000). Arid and semiarid regions of India are more prone to drought than the other climatic zones, the probability of drought being 20 percent of the years often the drought persists continuously for 3 to 6 years. Under such a scenario, the challenge is to manage land and water resources in a sustainable manner to achieve higher productivity levels, maintain resources for future generations and derive livelihoods in the most equitable manner possible. Watershed management has emerged as the cornerstone of rural development in the dry and semi-arid regions and other rainfed regions of the world. The watershed is the appropriate hydrological unit for technical efforts to manage water and soil resources for production and conservation. Watershed management programme would permit maximum possible stability through the process of production, consumption and regeneration. This approach has become the key for improvement of water resources and productivity of rainfed areas and ecological restoration. Integrated watershed development has been adopted as a major approach all over the country; its importance is seen as being particularly high in regions of the country where agriculture is dominantly rainfed. There is an increase in groundwater table due to enhanced recharge by watershed interventions. Augmentation of surface water availability in the watershed area etc. Increase in income of farmers/ landless labourers in the project area. The received rainfall is distributed in two river basins i.e. Godavari and Krishna River basin. An insight into the rain-fed regions shows a grim picture of water-scarcity, fragile ecosystems and land degradation pressure, poverty, low investments in water use efficiency measures, poor infrastructure and inappropriate policies.

AREA OF STUDY

Osmanabad district is located in the state's southern region. The majority of the district area is rocky, with the remainder being flat. The majority of the district is surrounded by a small mountain known as "Balaghat." This Balaghat mountain range includes the tehsils of Bhoom, Washi, Kalamb, Osmanabad, and Tuljapur. This district includes portions of major rivers such as the Godawari and Bhima. Osmanabad district comes under drought prone area of Maharashtra state. The elevation of Osmanabad is 625 m from mean sea level. The average annual rainfall of the district is 750 mm. The district is located on east side of Marathwada region within North latitude 17.35 to 18.400 and east latitude 75.16 to 76.400. The area of district is 7512.4 Km2 out of which 241.4 km2 is urban area (3.21 % of total area) and 7271.0 km2 is rural area (96.79 % of total area).

Surdi is a village 50 kms from Osmanabad City. The watershed area is 2374.39 ha. Surdi watershed is developed by a well-known NGO 'Pani Foundation'. The people's participation was very successful right from the planning phase. 13 percolation tanks, 11 cement nala bunds and 24 earthen nala bunds were repaired with the people's participation. The other soil and water conservation works include compartment bunding, continuous contour trenches, countour bunds, recharging of wells, loose boulder structures and gabion structures. Approximately 17 lakh cubic meters of excavation work was carried out by stake holders and 2.52 crore cubic meter excavation work was done with machine. The storage capacity of 30 cr Liters was made with this excavation works. The people in watershed were participated in each and every development activity. 607 families out of 757 families have excavated recharge pits at their residences. The plantation drive was carried out with successful plantation of 1900 plants. 804 farmers have analysed the soil samples from their fields and they were given the soil health cards by the government agencies.

Review of Research and Development in the Subject: According to FAO (2002) the access to reliable groundwater supplies can ensure the income flow need to purchase food; and it plays a key role in food production. As a result, there can be a direct link between water access and its efficient use and food security. While access to water is important in many situations, in others irrigated agriculture is one the many income sources or available livelihood strategies. Consequently, rapid decline in groundwater levels, irrigation system deterioration, droughts and other direct indicators of water scarcity can serve as signals that food security may be threatened. Water scarcity measures are warning signals, but they do not on their own indicate the emergence of food security. Wani et.al. (2003) studied the impact of integrated watershed management activities on poverty and livelihoods of rural communities at on-farm watersheds in Adarsha watershed, Kothapally, India. It clearly showed that average net returns per hectare for dry land cereals, pulse and other crops have almost doubled. Average household income from crop production activities within and outside watershed was INR 15400 and INR 12700 respectively. The average per capita income was INR 3400 in Adarsha watershed and INR 1900 outside the watershed. The increased availability of water (and hence supplementary irrigation) and better employment opportunities in watershed development related activities have contributed to diversification of income opportunities and reduced vulnerability to drought and other shocks. The successful watershed development programmes implemented at Ralegan Siddhi in Maharashtra, Alwar in Rajasthan, Thunthi Kankasiyain Gujrath, Gauraiya in Madhya Pradesh

revealed that all the soil and water conservation structures were built through community participation. The villagers have stopped grazing their animals on common lands. To take care of equitable distribution of water, they have formed associations. It is the people's participation that gave the Ralegan Siddhi watershed the element of sustainability. She also observed that the people in Alwar acted jointly to revive a traditional technology to restore the ecological balance of the region. The village community came together to build 2500 johads in 500 villages in 8 blocks of Alwar district. Johad was constructed in a place that receives maximum run-off for water harvesting. The johad initiative has fulfilled the need for water to drink and for irrigation purposes, and restored ecological stability by increased recharge of ground water. It has increased the level of water in wells, increased biomass productivity and even converted two seasonal streams Aravati and Ruparel into perennial rivers. Now, women in the village, no longer have to go through the drudgery of long, long walk, pots on their head, to fetch scarce water (Nayyar,2005). The impact of Watershed management programme in Apsinga village of Osmanabad district was studied by Patil et.al. (2021) . He observed the increase in livestock population, yield of milk and productivity of crops in the watershed area. He also observed the increase in children enrolled in schools, persons engaged in ancillary activities and increase in employment opportunities. Besides this, the project was found to be helpful in arresting degradation of arable and non-arable lands. Srivastava et.al. (2005) documented the impact of watershed management measures on water availability. The impact varied in different agro-ecological regions. In Aravali hills, the groundwater table rose by an average of 7.97m after six years of watershed development programme. Due to the increased availability of water for irrigation, there was an increase of 83% in post monsoon cropped area. In Yamuna ravines of Uttar Pradesh, watershed development activities resulted in rise of groundwater ranging from 1.53m to 6.05m depending upon monsoon rainfall. In Malwa region of Madhya Pradesh, the average annual post-monsoon increase in groundwater was 6.79m due to implementation of watershed development measures compared to just 1.5-2m in pre-project phase. Wani et.al. (2005) stated that rainwater is the main source of water for agriculture but its current use efficiency for crop production ranges only between 30-45%. Integrated watershed management (IWM) is the strategy adopted to enhance the water use efficiency for sustainable development for dry land areas. The (IWM) strategy demonstrated that dry land areas with good quality soils could support double cropping, while the surplus rainwater could recharge the groundwater. In IWM, the emphasis is on in-situ conservation of rainwater at farm level with excess water taken out from the fields safely through community drainage channels and stored in suitable low-cost water harvesting structures (WHS). The stored water is used as surface irrigation or for recharging the groundwater. Main components of IWM in addition to rainwater conservation and harvesting include use of appropriate crops, improved crop varieties, cropping systems and nutrient and pest management for increased productivity and water use efficiency. Government of India (2007) reported that 38.5 % of the available water resources of the country are contributed by groundwater which plays a major role in irrigation, rural and urban drinking water supply and industrial development. Groundwater meets nearly 55% irrigation, 85% rural and 50% of urban and industrial needs. It further reported that the use of groundwater in the agriculture sector has expanded rapidly because of the short gestation lags with which it can be developed, control over irrigation that it provides, free or subsidized availability of

power in some states, water requirements for the crop production during critical growth stages caused due to erratic rainfall in dry land agriculture and paucity of surface irrigation. Osman et.al. (2013) have evaluated the Kadwanchi watershed in Maharashtra and observed that area under rainfed, grazing land , permanent pastures, current and other fallows, and culturable wastelands registered decline in post project scenario and got converted into supplemental irrigated area to the extent of 115% in post watershed project compared to pre-project period. The major impact of watershed was on bringing back of fallows and culturable wastelands under cultivation. It was also assessed that among the various fruit crops grown, the area under cultivation of grapes registered 20 times increase (from 3 to 62 ha) in the post watershed scenario, which is attributed to the conversion of culturable and fallow lands. The other fruit crops such as pomegranate, aonla, tamarind and custard apple were the new introduction during the project period. In total, the change in overall area under cultivation of fruit plants recorded an increase of 65 times.

MATERIAL AND METHODS

The primary data was collected through Planned (Structured) questionnaire development. In this research while doing survey the questionnaire was used to collect the data from respondents. While preparing the questionnaire the questions were set related to the objective and hypothesis. These questionnaires were distributed to the beneficiaries of the watershed development programme and taken back once filled. Questionnaire has the open ended and close ended questions. It is prepared for collecting the information regarding water, land, forests, livestock and human resources availability in the watershed. The data was collected regarding the crops cultivated in different seasons before and after the implementation of the programme. The data was analysed to observe the impact of watershed development programme on change in area under irrigation, change in water resources, change in number of animals as well as change in area under different crops in different seasons.

RESULT AND DISCUSSIONS

During the study 100 farmers/beneficiaries within the watershed boundaries were surveyed. The total land holding of the surveyed farmers was 334.4 ha. The average land holding was found to be 3.344 ha. It is revealed from the Table.1., that the area under irrigation was only 157.2 ha before implementation of the WDP, which was increased to 282.5 ha after implementation of the WDP resulting into an increase of 51.96% in irrigated area as compared to that of in the pre-implementation phase. On the other side, the rainfed area was decreased to 51.8 ha from 147.2 ha showing the decrease of 64.80 %.

Table 1: Comparative change in Area under irrigation in the watershed:

Type	Area before implementation	Area after implementation	% Change
Irrigated	187.2	282.6	51.96
Rain fed	147.2	51.8	-64.80
Total	334.4	334.4	0

It can be concluded that the change in area under irrigation and rain fed area was due to the increased surface water and groundwater availability in the watershed area. Table.2 showed that the number of water resources in the watershed area was increased from 133 to 149 in the post implementation phase resulting into 12% increase in the number of water resources. Negligible increase in number of wells and tube wells was observed but, the number of farm ponds was increased from 0 to 15. The success of this WDP is that 13 percolation tanks, 11 cement nala bunds and 24 earthen nala bunds were repaired with people's participation. The storage capacity of 30 Cr litres was made with the excavation works. This has resulted into the increased storage capacity of water in the watershed area and increased recharge to the groundwater in the watershed area.

Though the number of wells was unchanged after the implementation, the groundwater water availability was increased due to increase in yield and specific yield of the wells. The increase in groundwater availability was the result of erection of the compartment bunding, continuous contour trenches, contour bunds, loose boulder structures and gabion structures by the beneficiaries in the watershed. Apart from this excavation works, the plantation drive was carried out with successful plantation of 1900 plants in the watershed area. This has an importance of groundwater recharging, soil building and increased soil moisture in the agricultural lands. The people in watershed participated in each and every developmental activity.

Table 2. Comparative change in Water resources in the watershed

Water Resources	Before Implementation	After Implementation	% Change
Wells	98	99	1.02
Tube wells	35	35	0
Farm Ponds	0	15	1600
Total	133	149	12.03

It was observed that the milch animals, meat animals and poultry birds were increased by 14.13, 31.71 and 21.25 % respectively after implementation of watershed development programme. The number of farmers cultivating vegetables, annual and perennial crops like sugarcane, lemon, and grapes were increased from 3 to 15 among the surveyed farmers. This increase in the area under the annual and perennial crops was observed due to the assured and ample water availability throughout the year. The successful implementation of watershed development programme has a positive impact on the cropping pattern in the watershed. In the post implementation phase, the area under Soybean remained constant while area under red gram changed from 49 to 81 ha with an increase of 65% over the area in the pre-implementation phase. The area under black gram and green gram decreased by 8.33 and 90 % respectively. Due to the increased water availability and soil moisture in the rabi season, the area under wheat and gram was increased from 58 to 67 ha and 68 to 72 ha respectively with an increase of 15.52 and 5.88 % as compared to that of the area in the pre implementation phase. The biggest success is that the area under groundnut in summer was observed to be increased from 4 ha to 36 ha in the post implementation phase resulting into an increase of 800% over the pre-implementation phase.

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