

Integrated Watershed Impact Assessment: Concepts and Empirics from Jalyukt Shivar Abhiyan, Micro-Watershed Project of Maharashtra State of India

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Abstract:

The availability of irrigation facilities is highly inadequate in India. Watershed Development (WSD) has been a part of India's national strategy to increase agricultural productivity and alleviate poverty in rainfed areas. Maharashtra, one of India's richest states, witnessed the highest number of farmer suicides attributed towards monsoon failure, water scarcity, and drought. To reduce the dependency of agriculture on rainfall, the Maharashtra government had launched a new program named 'Jalyukt Shivar Abhiyan' (water full village) on January 26, 2015. The program aims to make 5000 villages free of water scarcity every year. Under the program, micro irrigation systems were encouraged for proficient use of water for increasing the irrigated area. Economic Survey report of the state claim the scheme has created additional water storage capacity that led to making 19,655 villages permanently drought-free in the last five years. Besides, the scheme was criticized for its unscientific implementation. However, there is insufficient academic writing on the implementation and impact of the scheme. This paper has developed a conceptual framework of parameters and key indicators to be used for assessing the impact of the scheme. The study is based on an extensive literature review and focus interviews of beneficiary farmers & stakeholders of the scheme.

Watershed impact is a multifaceted concept that needs a holistic view for its assessment. Effectiveness of the intervention is to be assessed through measuring the change in socio-economic indicators, availability of drinking water, impact on village women, change in agriculture & cropping pattern, environmental benefits, and operational guidelines & community participation. The framework of parameters and indicators developed in this study will be useful for researchers, NGOs, and agencies involved in the implementation and evaluation of Jalyukt Shivar as well as other watershed projects.

Key words: Watershed Project, Jalyukt Shivar Abhiyan, Conceptual framework and Impact assessment.

1. Introduction

An increase in agricultural production and productivity largely depends on the availability of irrigation (Mitra, 1997). However, the availability of irrigation facilities is highly inadequate in India. More than 53 percent of the gross cropped area depends on rain, that's why the Indian agriculture is called a gamble in the monsoons (Puri & Misra, 2017). Consequently, Watershed Development (WSD) has been a part of India's national strategy to increase agricultural productivity and alleviate poverty in rainfed areas (Gray & Srinidhi, 2013). Watershed development programs (WDPs) were started in a big way from 1983-84 as a major initiative to conserve natural resources for increased production and socio-economic status (Shah Amita, 1998). In 2008 Integrated Watershed Management Program (IWMP) was launched to have a comprehensive approach to sustainable development (Singh et al., 2010). Therefore, beyond creating irrigation facility watershed development is a part of national objectives to alleviate rural poverty and stimulate economic growth of the agricultural sector (Shah Amita, 2000). For achieving these objectives, it is imperative to understand the nature, scope, and priorities of the development program, the responsiveness of target beneficiaries of the program (Palanisami et al., 2011). Impact assessment of the program enhances the understanding of the extent to which program, interventions affect the target population and the magnitude of these intervention effects on the welfare of the intended beneficiaries (Shiferaw et al., 2005).

Maharashtra's Jalyukt Shivar Abhiyan

Despite Maharashtra being one of India's richest and developed states, the Marathwada and Vidarbha regions of the state witnessed highest numbers of farmer suicides. The data reveals the relationship between farmer suicides and concerns like monsoon failure, water scarcity, drought, and a lack of social security (Talule, 2020). To offer a sustainable solution against water crises in the state, Maharashtra government had launched the project "Jalyukt Shivar Abhiyan" from January 26, 2015. The Jalyukt Shivar Abhiyan was an ambitious program bid to make Maharashtra a drought-free state. Jalyukta Shivar was the flagship program of the Bharatiya Janta Party government in Maharashtra from 2014-2019. The program was the brainchild of Chief Minister Devendra Fadnavis and was proclaimed that the program is a revolutionary approach to solve the water crises in Maharashtra. The program aims to make 5000 villages free of water scarcity every year (Potekar & Pawar, 2017). This Abhiyan aims at initiating permanent measures to make the state drought free by 2019 (Jalyukt-Shivar, 2017). The program intends to harvest rain water within the village boundary thereby increasing ground water levels. Under the program, micro-irrigation systems were encouraged for proficient use of water to increase the irrigated area. Jalyukt Shivar was a demand-driven program as its implementation was to be initiated through people's participation and institutional participation through CSR, NGO's, pulling resources from integration and Convergence of all rural development schemes of Central and State Government (Water for All -Drought-Free Maharashtra 2019 Regarding Implementation of Jalyukta Shivar Campaign to Permanently Overcome Internal Drought Situation. Government of Maharashtra, 2014).

Economic Survey report 2019-20 of the state claims that in the last five years total 6.28 lakh works with an expenditure of Rs 9,488 crore are completed under the scheme. This resulted in making as many as 19,655 villages permanently drought-free in the last five years through creating water storage capacity of 26.52 TMC (thousand million cubic feet) in the state (Economic Survey of Maharashtra, 2019). It is argued that besides augmenting irrigation resources, it has helped to resolve the drinking water shortage and get rid of tankers for water supply.

Although the tall claims by the Government, there are a group of individuals and organizations that raised questions against the success and scientificness of the scheme. In 2019, after the state assembly elections,

the new Government, Maharashtra Vikas Aghadi (Maharashtra Development Front) came in power and decided to discontinue the implementation of the scheme. Since the majority of the state's land is rainfed there is a need to see water crises beyond political obsession and any watershed program and its outcome to be studied more scientifically. Moreover, there is insufficient academic writing on the implementation and outcome of the scheme. Few researchers have studied the scheme, however, the studies were limited to small geographical areas or lack the rigor that they were assessing either stipulated guidelines were followed in implementation or change in water availability. There is a dire need to study the implementation and impact of the scheme, which are likely to shape the policy design and implementation of the watershed project in the future.

2. Challenges in Watershed impact assessment:

Watershed impact assessment is a multifaceted concept and there is a need to adopt the holistic view for impact assessment of the scheme. Wherein the impact of the scheme is to be assessed through measuring the change in socio-economic indicators, impact on the availability of drinking water, impact on village women, change in agriculture & cropping pattern, environmental benefits, and operational guidelines & community participation (Palanisami et al., 2009).

Beyond its direct benefits, the watershed program generates various externalities, thus impact assessment is complex and challenging (Joshi et al., 2004). The first challenge is developing an inclusive framework that addresses and captures all positive and negative outcome of the program. Second, the challenge is to identify the appropriate indicators for impact assessment. Along with tangible outcomes, the watershed program could generate some intangible benefits, which are not measurable or too expensive to measure accurately. Third, an important challenge is to adopt the scientific methodology. The researcher has to decide on the sampling techniques to be used for impact evaluation. The choice of sampling techniques depends on the approach used for impact evaluation. The approach could be before-after evaluation or with-without comparison. In Before After evaluation, the project impact assessment indicators are compared with the pre-project situation. However, this method suffers from two important limitations. One, not the availability of pre-project baseline data, because many projects are implemented without collecting any baseline data. Second, it would overestimate the project benefits if the changes have accrued due to some external factors beyond the watershed intervention. To overcome this effect, with-without project, evaluation could be used. Here, the project evaluation indicators are compared with the non-project region. The non-project region is also called a control region. This approach overcomes the constraint of the unavailability of baseline data. However, the approach is useful only when the hydro-geological profile is similar in both the control and uncontrolled group. If the researcher does not have a resource constraints, a combination of both the pre-post approach and with without approach could be used to draw more insight on the project benefits (Palanisami et al., 2011; A. Shah, 2004).

3. Objective of the study

This paper intends to develop a conceptual framework of parameters and key indicators to be used for assessing the impact of the Jalyukta Shivar Scheme. The framework would be useful for other researchers, NGOs, and agencies involved in the implementation and evaluation of Jalyukt Shivar and other watershed projects.

4. Methodology:

To develop the conceptual framework of parameters and indicators for assessing the impact of the scheme, two approaches are used. An extensive review of the literature and focus interview of beneficiary farmers & other stakeholders.

4.1 Literature review: A thorough literature review of Jalyukt Shivar's operational guideline and its objectives was conducted. It is a detailed review of research studies conducted on Jalyukt Shivar that helped to identify the key outcome of the scheme. Additionally, studies conducted to assess the impact of other watershed programs were evaluated to develop the conceptual framework of parameters and indicators for assessing the impact of the scheme, here two approaches are used. They are an extensive review of the literature and focus interview of beneficiary farmers & other stakeholders.

4.2 Focus Interviews of stakeholders: The conceptual framework developed through the literature review was validated with various stakeholders of the scheme. It includes farmers, rural women, Gram Panchayat members, Village leaders, and government officers involved in the implementation of the scheme. For this purpose, the scheme implemented villages from Kolhapur, Sangli, Satara, Bid, Solapur, and Latur were visited.

5. Review Of Literature:

There are a limited number of studies undertaken on the implementation and impact of the scheme. Few researchers have studied the scheme. This section of the paper presents the review of various studies conducted on the implementation of the scheme to identify its outcome.

Table: No.1 Overview of Studies on Jalyukta Shivar Abhiyan

Authors & Title of the study	Study area	Variable studied & Research methodology	Major Findings
Ahmed & Pachkor, (2015) “Jalyukta Shivar” - A Combat to Water Stresses In Maharashtra	Karveer, Khed, Ambegaon and Junnar talukas	<ul style="list-style-type: none"> • Technical feasibility of the selected areas, Techno-social impact of work, visit to scheme implemented villages 	<ul style="list-style-type: none"> • Rivers Deepened, Water Level In The Wells Enhanced • Water-Filled Dams, Healthy Crops • Efficient Management Of Rainwater
Potekar & Pawar (2017) Overview On " Jalyukta Shivar Abhiyan" And Micro Irrigation In Maharashtra State	-----	<ul style="list-style-type: none"> • Review of reports submitted by various agencies, on implementation of the scheme 	<ul style="list-style-type: none"> • Environment Impact: Increase in ground water level, soil erosion reduction, run-off reduction, and tree plantation • Agriculture Impact: land-use pattern, cropping pattern and increasing in agriculture productivity, cropping intensity, • Economic Impact: employment generation improve Socio-Economic status ,
Pachkor & Parbat (2017) Assessment of Works under Jalyukta Shivar Campaign – A Case Study of Pusad Region	Eight villages in Pusad Tehsil of the Yavatmal district	<ul style="list-style-type: none"> • Exploratory visits to sites and observation, and discussion with farmers 	<ul style="list-style-type: none"> • Water Level in the Wells Enhanced • Water-Filled Dams, • Healthy Crops • moisture in the soil has been maintained • Efficient Management of Rainwater
Khillare, (2017) Analysis of Delays in Works under Jalyukt Shivar Campaign	Ghansawangi Taluka in Jalna District	<ul style="list-style-type: none"> • Comparative study to identify areas where substantial delays occurred than specified standards time 	<ul style="list-style-type: none"> • Project initiation, formulation, and approval phase are the major time consumer than actual construction. • Cycle time optimisation through performing concurrent activities. • Recruitment of required staff at division and subdivision offices, • Use of computer-based technology • Fixing time bound responsibilities

Thakare et al., (2018) Knowledge of Beneficiary Farmers about Jalyukta Shivar Abhiyan	Nagpur district Hingna and Katol talukas total 17 villages	<ul style="list-style-type: none"> • Exploratory research, Hingna and Kato talukas Five and twelve village respectively 	<ul style="list-style-type: none"> • High awareness of the scheme, • But not aware of water budgeting • Procedural delays in approvals, sanctions and fund disbursal and non-completion of activities in time were other constraints
Kudale et al., (2018) Impact and Assessment of Jalyukt Shivar Abhiyaan, Water Conservation Scheme in Maharashtra State of India	----	<ul style="list-style-type: none"> • Analysis of secondary data from Government of Maharashtra publication portal and economic survey of Maharashtra 	<ul style="list-style-type: none"> • District wise work completed was presented. • The study proposed that if the stated objectives accomplished then the scheme would assist to achieve crop diversification, boost employment and beneficial in the suicide belt of the state.
Verma & Shah, (2019) Drought-Proofing through Groundwater Recharge Lessons from Chief Ministers ' Initiatives in Four Indian States	----	<ul style="list-style-type: none"> • Evidences from field studies to draw conclusion 	<ul style="list-style-type: none"> • Positive outcome: Expanded irrigated area, improved cropping intensity and month-wise irrigation availability, and reduced village dependence on drinking water tankers. • The quality of implementation and impact differs by villages. • Other Issues: Unrealistic goals, as drought proofing is not a one-time intervention, but a continuous process.
Vedpathak, (2019) Impact Assessment of Jalyukt Shivar Structures on Five Villages in Ambajogai	Five villages from Beed district	<ul style="list-style-type: none"> • Assess the change in ground water table, land use pattern, irrigation potential, and Agriculture productivity, Pre-Post study design. 	<ul style="list-style-type: none"> • Positive impact of the scheme • Improved availability of drinking water. • Increase in level of groundwater. • Increase in Area under irrigation • Increase in greenery and vegetation cover • Improvement in Social and economic living standards • Reduction in migration for employment

<p>Sanade et al.,(2019) A Research Paper on Jalyukt Shivar Abhiyan Assessment (Sonavade) and Design of Water-Efficient Village(Save)</p>	<p>Village Sonavade from Panhala Taluka of Kolhapur District</p>	<ul style="list-style-type: none"> • Site visit, physical assessment of work and farmers and official interviews. 	<ul style="list-style-type: none"> • Structural Soundness: Works done were of good quality and matching estimates • Farmers reported positive impact Increased water levels of well. • Scarcity of water in dry period is resolved • Increased soil moisture retention due to CNB structure. • Positive change in cropping pattern • Lack of active participation of the villagers
<p>Nanaware & Khadake, (2019) Assessment on Jalyukt Shivar - A Case Study Ranzani Village Tal-Pandharpur</p>	<p>Ranzani Village from Solapur District</p>	<ul style="list-style-type: none"> • Assessing Change in ground water level, soil erosion & crop yield. Pre-Post study design 	<ul style="list-style-type: none"> • The scheme has increased the yield of both kharif and rabi crops. • Ground water level has improved. In less rainfall, the water table not dropped at large depth.
<p>Inamdar, (2019) A Success Story of Jalyukta Shivar Campaign at Darphal TQ. & Dist. Osmanabad</p>	<p>Darphal village of Osmanabad district</p>	<ul style="list-style-type: none"> • Change in ground water level, soil erosion reduction, cropping patterns, agriculture productivity, and employment generation, through empirical evidence from field visit. 	<ul style="list-style-type: none"> • Public participation and adhering to the guidelines are the determining factors for success of the scheme. • The scheme resulted in improvement in ground water level, reduced soil erosion, and employment generation.
<p>Inamdar, (2019) A Strategy to overcome drought in Maharashtra.</p>	<p>Shingoli village of Osmanabad. District</p>	<ul style="list-style-type: none"> • Observation of the work done in the village 	<ul style="list-style-type: none"> • Efficient storage of rain water that avoids run of water in large quantity. • Enrichment of water table in the nearby wells was evident.
<p>Bhadbhade et al., (2019) Can Jalyukt Shivar Abhiyan Prevent Drought in Maharashtra?</p>	<p>----</p>	<ul style="list-style-type: none"> • Village observations and review of report. 	<ul style="list-style-type: none"> • The scheme is not able to mitigate the drought crises, so it cannot be a strategy for drought-free Maharashtra. • Work done through machinery, which resulted in no work available under MGNREGA. That forced villagers to migrate to towns/cities. • Those who can't migrate forced to sale their livestock or borrow a loan for survival.

			<ul style="list-style-type: none"> • Recommendations: emphasize the role of empowered Gram Sabha and community-led water use regulations. • Setup a village level a water regulating body to monitor the extraction of water from wells. • Revisiting the current cropping practices, from water intensive crop to less water intensive crops
Patil & Lad, (2020)	Purandar Dhule Taluka three villages each	<ul style="list-style-type: none"> • Comparative study: comparison against set guidelines 	<ul style="list-style-type: none"> • The scheme is a well-designed scheme with departmental co-ordination. • Lack of proper prefeasibility study for location selection. • The scheme is not executed in a scientific manner • In some villages good community participation and less in other parts • Excessive or unrequired excavation, improper disposal of the excavated stuff, backfilling of nallas due to fall of excavated stuff back in nalla
Nanaware & Warudkar, (2020) Real-Time Assessment of Jalyukt Shivar Campaign for Drought Problem in Anpatwadi (Koregaon Taluka)	Anpatwadi Village (Koregaon Taluka) Satara	<ul style="list-style-type: none"> • Technical assessment: Accuracy of location and structural soundness of interventions. • Beneficiary impact assessment through empirical evidences 	<ul style="list-style-type: none"> • Scheme running behind the schedule • The work structure had leakages, loose foundation • Excavated material was dumped along the banks • Increase in ground water level • Reduction in runoff and change in cropping pattern
Kolekar et al., (2020) Impact Analysis of Soil and Water Conservation Structures- Jalyukt Shivar Abhiyan- A Case Study	-----	<ul style="list-style-type: none"> • Funds spend on the scheme and assessment of the quality of water conservation work, through field survey 	<ul style="list-style-type: none"> • Water level in the well enhanced. • Water-filled dams, availability of water in non-rainy season • For effective implementation, the author suggests interaction and coordination departments • To assess the impact Groundwater Modelling and Simulations is recommended

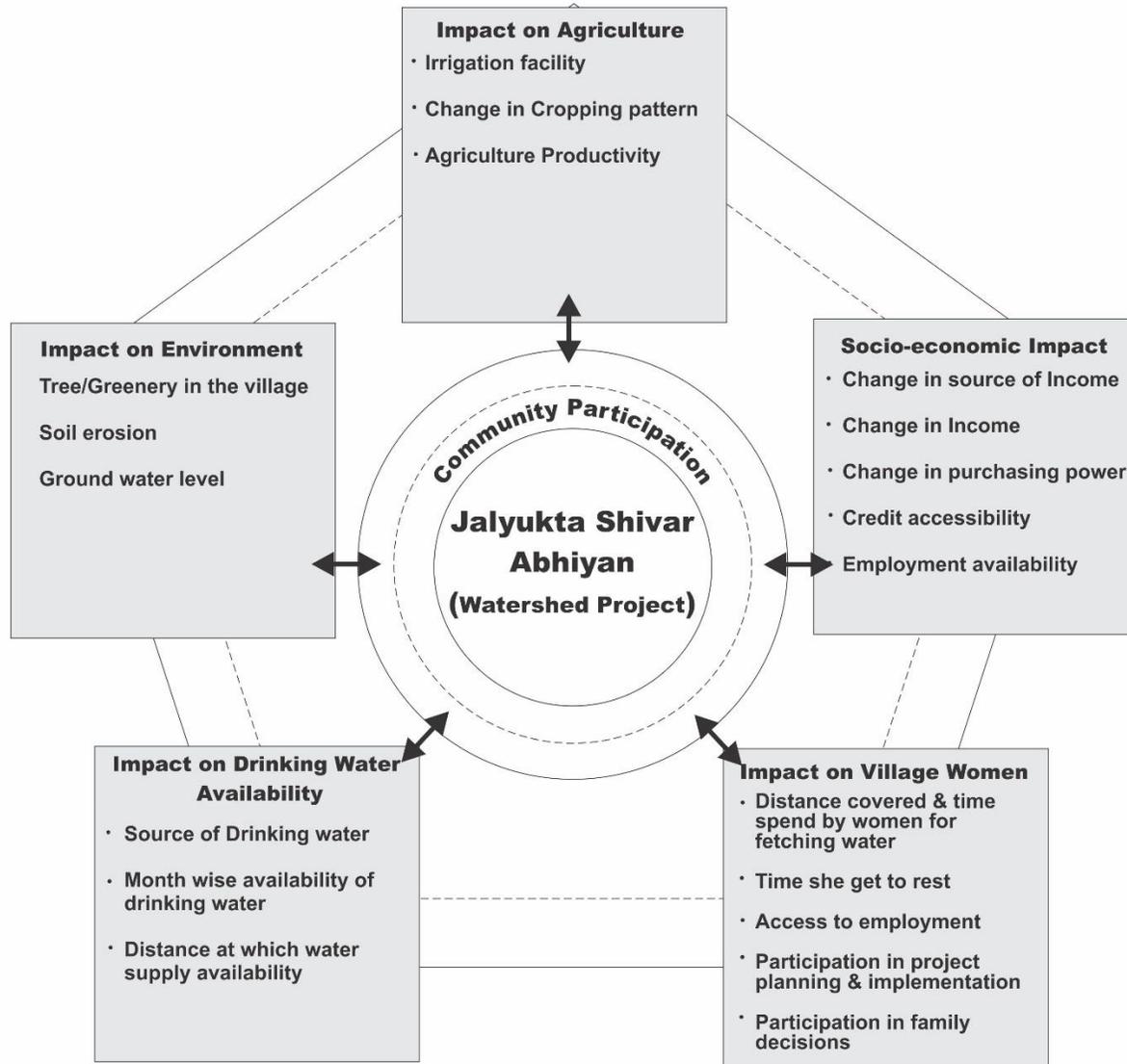
<p>(Gayki et al., 2020) Knowledge of Beneficiary Farmers about Jalyukta Shivar Abhiyan</p>	<p>Latur district Latur, AUSA and Renapur, talukas</p>	<ul style="list-style-type: none"> • Exploratory study to assess the awareness and constraints in its implementation 	<ul style="list-style-type: none"> • The beneficiary farmers were well known about the scheme activities • Farmers witnessed unscientific implementation and lack of transparency, procedural delay in approval and sanctioning of project • No significant recharge in ground water level
<p>(Narule & Hangargekar, 2020) Impact Assessment of Jalyukt Shivar Abhiyan for Three Villages</p>	<p>Yenegur, Kaddora and kalnimbala villages</p>	<ul style="list-style-type: none"> • To assess the effectiveness and impact of the scheme 	<ul style="list-style-type: none"> • Increase in water level • Farmers reported an increase in yield • Positive change in cropping pattern is evident
<p>CAG 2020 Report of the Comptroller and Auditor General of India on General & Social Sector and Public Sector Undertakings for the year ended 31 March 2019</p>	<p>Six districts (Ahmednagar, Beed, Buldhana, Palghar, Nagpur and Solapur)</p>	<ul style="list-style-type: none"> • To assess and monitor the planning, implementation, and outcome of the scheme. 	<ol style="list-style-type: none"> 1. Improper preparation of village plan: <ul style="list-style-type: none"> • Water storage planned was less than the estimated water runoff 2. Implementation of the Abhiyan <ul style="list-style-type: none"> • Storage created was not sufficient to meet the drinking and cultivation water requirement as indicated in the village plan • Poor maintenance of works executed under the Abhiyan • Non-implementation of Maharashtra Groundwater (Development and Management) Act, 2009 • Increase in cultivation of water intensive cash crops 3. Impact Assessment <ul style="list-style-type: none"> • Non-attainment of water neutrality • Decline in groundwater level • Inadequate third party evaluation of works: such as improper site selection, structural deficiencies • Shortfall in uploading of photographs of works on website

<p>Shah et al. (2021)</p> <p>A ' Drought-Free ' Maharashtra? Politicising Water Conservation for Rain-Dependent Agriculture</p>	<p>Three villages from Pune district, one each from Purandar, Mawal and Indapur blocks</p>	<ul style="list-style-type: none"> • Combined surveys and semistructured interviews with households, government officials, key informants, including watershed experts, journalists, and historians. 	<ul style="list-style-type: none"> • Initiatives were more concentrated on public land than agricultural plots • Increasing overall village water availability was conflated with water access improvements, resulting in limiting the potential impact of water conservation; excluding disadvantaged groups, and fuelled additional groundwater extraction.
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6. Conceptual Framework for Impact Assessment of Jalyukt Shivar Scheme:

Based on the literature review and focus interviews of beneficiary farmers of the Jalyukt Shivar scheme, the conceptual frame is developed and its parameters are presented in the figure No.1.

Figure-1: Conceptual Framework for Impact Assessment of Jalyukt Shivar Scheme



Source: Author

7.1 Impact of watershed project on agriculture:

Agriculture sector is one of the most important beneficiaries of watershed projects. Many watershed projects are initiated to resolve the irrigation crisis (Kerr, 2002). Agriculture impact is a centrifugal test to assess the effectiveness of any watershed project. Following indicators can be used to assess the impact of the intervention on agriculture.

7.1.1 Irrigation Facilities: The most important objective of any watershed program is to reduce the agriculture dependence on rainfall through developing new and augmenting existing water resources. Works like river deepening, construction of check dams, contour trenching increase surface water, and ground water

level as well (Vedpathak, 2019). Jalyukt Shivar has an objective to increase irrigation facilities in the rainfed area. The impact of the scheme is to be assessed through irrigation facilities. Whether any new sources of irrigation are generated, the water level of existing source increased for different crops season wise. Effect of the scheme on ground water level to be assessed to measure the impact of the scheme on irrigation facilities.

7.1.2 Change in cropping pattern: Another important objective of the watershed project is to bring positive changes in cropping patterns. The watershed project shall help farmers to grow more cash crops that enhance the income of the farmers and help them to break their vicious cycle of poverty (Kapur et al., 2016). During the survey, beneficiary farmers said that the scheme has created a significant impact on the groundwater level which is visible through the water level in wells near the site. An increase in water level and improvement in soil moisture have also encouraging the farmers to change their cropping pattern and adopting mix crop system which has surged the production per hector. Here it is to be assessed what crop farmers were taking before implementation of the scheme and what crops farmers can take after implementation of the scheme. Whether, the implementation of the scheme has facilitated farmers to take cash crops and multiple crops (Nanaware & Warudkar, 2020). It is to be tested whether water availability for the various season has improved as an implementation of the scheme.

7.1.3 Impact on Agriculture Productivity: Further, it is to be assessed whether watershed projects improved agriculture productivity. Impact on agriculture productivity is to be assessed through evaluating the change in agriculture output, reduction in the cost of agriculture production, and changes in fodder availability.

7.1.3.1 Increase in agriculture income of the farmers: Successful watershed projects are expected to increase irrigation facilities. Furthermore, a reduction in soil erosion, increase in soil moisture and carbon content is also evident (Ahmed & Pachkor, 2015). It is expected that the intervention shall augment the overall agriculture. Increased irrigation facility enables farmers to take cash crops, multiple crops, which eventually leads to an increase in agriculture income of the farmers. Farmers of village Sawarde (district Kolhapur) who have agricultural land near to constructed dams under watershed project scheme have experienced significant improvement in soil moisture and groundwater level. This has encouraged farmers to take multiple crops, cash crops which have surged their income. To evaluate the effectiveness of the intervention, its impact on agriculture output has to be assessed.

7.1.3.2 Reduction in the cost of agriculture production: In drought-prone areas, agriculture productivity is less. Hence, farmers are expected to use more fertilizers (Samuel et al., 2007). Besides, they are forced to purchase water at a higher rate. Whereas, as a result of the availability of irrigation facilities, it is expected that cost of agriculture activities shall come down.

7.1.3.3 Change in Fodder Availability: Water availability in the region increases the tree plantation, greenery, and fodder availability in the village. During survey, it has been observed that water availability has also increased the greenery, and the availability of fodder in the village. This supports livestock farming resulting in additional income sources for the farmers.

7.2 Socio-Economic impact on villages:

Watershed development programs influence people's socioeconomic circumstances, such as income, employment, property, health, education, and energy consumption (Palanisami et al., 2011). Farmers are most vulnerable to climate change and victim to drought conditions (Yazd et al., 2019). Watersheds shall economically empower them and their income level shall upgrade (Gray & Srinidhi, 2013). The survey

was conducted in the villages where the scheme is implemented to validate the proposed framework. Selected villages are from Kolhapur, Sangali, Satara, Bid, Solapur, and Latur districts.

7.2.1 Change in source of income: The implementation of the watershed project augments agriculture productivity. Enable farmers to take cash crops, change the cropping pattern to multiple cropping. Enhancement in fodder availability positively affects livestock farming. It creates an additional source of income for the farmers (Joshi et al., 2004). Beyond agriculture labour, they start cultivating their land, and the overall watershed intervention is expected to create additional income earning sources for the farmers (Gray & Srinidhi, 2013). It is to be assessed whether the scheme has created an additional source of income for the farmers.

7.2.2 Change in income: Improved agriculture productivity, change in cropping pattern, and multiple crops in a year are expected to increase the income of the farmers (Singh et al., 2010). During the visit to the village in district Solapur, the researcher has observed that beneficiary farmers can shift from seasonal crops to cash crops, and also able to cultivate during the summer season. This is possibly due to the availability of stored water in a dam for a longer period. It has surged the income of the farmers. It is to be assessed whether the watershed scheme has positively influenced the income of the farmers.

7.2.3 Change in purchasing power: The positive effects of watershed development programs are expected to result in a higher standard of living for households. Increased income allows for a better life in terms of food, clothing, schooling, health, more spending during festivals and weddings, and the acquisition of physical assets and facilities (Joshi et al., 2004; Palanisami et al., 2011). Here, it is to be assessed whether the scheme has created additional purchasing power. The impact on purchasing power is to be assessed from broadly two aspects: For farm business and household consumption. After implementation of the scheme, whether farmers can purchase farm inputs such as fertilizers & pesticides, mechanization of agriculture through using tractors and trailers, and increase in livestock farming (Garbero & Songsermsawas, 2018; Kulshrestha et al., 2015).

The Nashik district is known for the cultivation of grapes, whereas several villages in the district were facing scarcity of water which also affected the productivity of their agricultural land. In the field visit it was observed that the implementation of the scheme benefitted the farmers. Availability of the water throughout the year has improved the productivity of their land. This has boosted the confidence in the farmers to invest in their land through agriculture machinery, pumping equipment, fertilizers, etc., and this has created a positive impact on their agriculture income and ultimately their purchasing power. In terms of change in nonfarm inputs, it is to be assessed whether beneficiaries were able to purchase land for residential buildings, construction of houses, purchase of vehicle, household appliances such as television, freeze etc.(Palanisami & Suresh Kumar, 2009).

7.2.4 Credit Accessibility: Along with water crises lack of social security and increasing debt burdens are other important reasons for the farmer's suicide (Talule, 2020). Low agriculture productivity limits the farmer's ability to get institutional credit. Consequently, farmers rely on indigenous money lenders to suffice credit needs (D'Souza, 2020). Improved agriculture productivity as a result of watershed interventions results in creditworthiness of the farmers for access to institutional credit. (Agidew & Singh, 2018).

During a field visit to Sawarde village of Kagal block of Kolhapur district, farmers stated that the scheme has brought positive change in the cropping pattern, they could to go for multiple cropping and cash crops, which resulted in creditworthiness of the farmers. Farmer's access to affordable institutional

credit is crucial for a good crop cycle, it ensures quality inputs such as seeds, fertilisers, machinery, equipment, and sufficient supply of water and power (D'Souza, 2020).

7.2.5 Employment availability: Beyond assessing the impact of the scheme on the beneficiary farmers, the overall socio-economic impact of the scheme has to be assessed on the village. Overall village impact of the scheme is to be assessed in terms of what extent it has helped to increase employment availability in the village. Impact of the scheme on distressed migration to search employment, whether the scheme has improved the resource base of the village and created sustainable water resources (Cathryn Turton, 2000; Garbero & Songsermsawas, 2018).

7.3 Impact of the watershed program on the availability of drinking water:

In Maharashtra drought-prone area is exposed for acute drinking water crisis. In summer, the drinking water crisis increases and the water table level of villages goes deeper and deeper (Vedpathak, 2019). Many villages in Marathwada and Vidarbha are dependent on tankers for drinking water. It was expected that Jalyukt Shivar would be a permanent solution for the looming water crisis and get rid of water tankers. The impact assessment scale shall evaluate the role played by the scheme to increase drinking water availability (Kumar, 2002). Here, the before-after approach of impact assessed is to be used.

7.3.1 Source of Drinking Water: It is to be assessed whether the additional source of drinking water is created or whether the present source of drinking water is augmented to ensure the availability of drinking water.

7.3.2 Month wise availability of drinking water: The level of boar wells and wells goes down from March. Villages start facing an acute water crisis in summer. It needs to be assessed up to which month water supply was available from the existing source before implementation of the scheme and whether any positive change has come after implementation of the scheme.

7.3.3 Distance at which water supply availability: Unavailability of drinking water enforce family members to walk for a long distance to fetch water and this responsibility is always put on the shoulders of women and children of the family. Village water resources in the village are to be augmented after the implementation of the scheme. Whether any positive change has occurred in terms of the distance at which drinking water availability is needed to be assessed.

7.4 Impact of the Scheme on Village Women:

Women are most vulnerable to the water crisis. Traditionally, it is considered her responsibility to look after household work and fetch water for family members. Every day she has to cover a long distance in search of water. Availability of drinking water positively affects her health and also possibility to participate in productive work (Bulajich, 1992). Henceforth, women are one of the most important stakeholders under the scheme.

Several families living outside the village Shirasi (District Sangali) were facing problem of drinking water. This has been resolved by constructing a small reservoir with a water stream near the village. This has greatly helped the women as they were spending most of their time fetching water for their households. Construction reservoir has resolved this problem.

It is expected that after implementation of the watershed project, women's efforts to fetch water shall reduce and they may get some extra time to rest and look after their health. Next, as an opportunity benefit from the additional time, she could get involved in remunerative work or employment and improve her family and social status. Furthermore, as an important stakeholder, it is imperative to see to what extent village women were involved in project planning and implementation decisions (Arya et al., 2011).

7.5 Environmental Impact:

Another important objective of the watershed project is to neutralize the impact of climate change. However, assessing environmental impact is a very complex and technical procedure. One needs to have the technical know-how and scientific knowledge. The availability of instruments is another constraint. To overcome these limitations social science researchers can conduct perception assessments of farmers.

7.5.1 Increase in trees/Greenery: Availability of water increases and stimulate the growth of trees in the area. Tree plantation was also undertaken in private and common lands as part of the watershed development. This creates increased greenery, vegetation cover, and increase in the number of trees and eventually result in improving the environment in the village (Palanisami et al., 2009; Ramakrishna et al., 2006). Tree plantation was one of the objectives under Jalyukt Shivar. Along with tree plantations, it is important to assess whether trees are properly maintained.

7.5.2 Reduction in soil erosion: The watershed development activity leads to significant positive impacts on various biophysical variables such as soil and water conservation measures, soil loss, soil fertility status, soil and water erosion, organic carbon it also includes improved conservation of soil and moisture, improvement and maintenance of fertility status of the soil (Palanisami et al., 2009; Ramakrishna et al., 2006). The impact of the program on soil erosion has to be assessed.

7.5.3 Groundwater level: Maharashtra shows steep decline in groundwater level. The groundwater level was a decline by more than 4 meters (CGWB, 2016). One of the main goals of the watershed intervention is to preserve rainwater by building check dams and water storage systems to reduce outflows from the watershed. It is expected that additional water storage capacity helps to improve the groundwater recharge, which resulted in recuperation in the nearby wells. (Palanisami et al., 2011; Vedpathak, 2019). Jalyukt Shivar has an objective to recharge the groundwater level of program implementation villages. It is imperative to assess to what extent the program has achieved the objective.

7.6 Community Participation & Operational Guidelines:

The approach to implementing the watershed project is shifting from supply-driven to demand-driven here people's participation is most important (Smyle et al., 2014). In demand-driven programs, people's demands play an imperative role. Further, projects that promoted participation by villages were more successful than mere technical interventions (Kerr, 2002; O'Garra & Alfredo, 2019; Patil & Lad, 2020). In several villages, the researcher has observed the unawareness in the villagers regarding scheme implementation and its benefits. Public participation in project planning, implementation, and maintenance of assets created under the project was very low. This has created an adverse impact on the quality of work. It is to be assessed the extent to which operational guidelines are followed and the level of community participation in the project planning, implementation, and maintenance of assets created under the project.

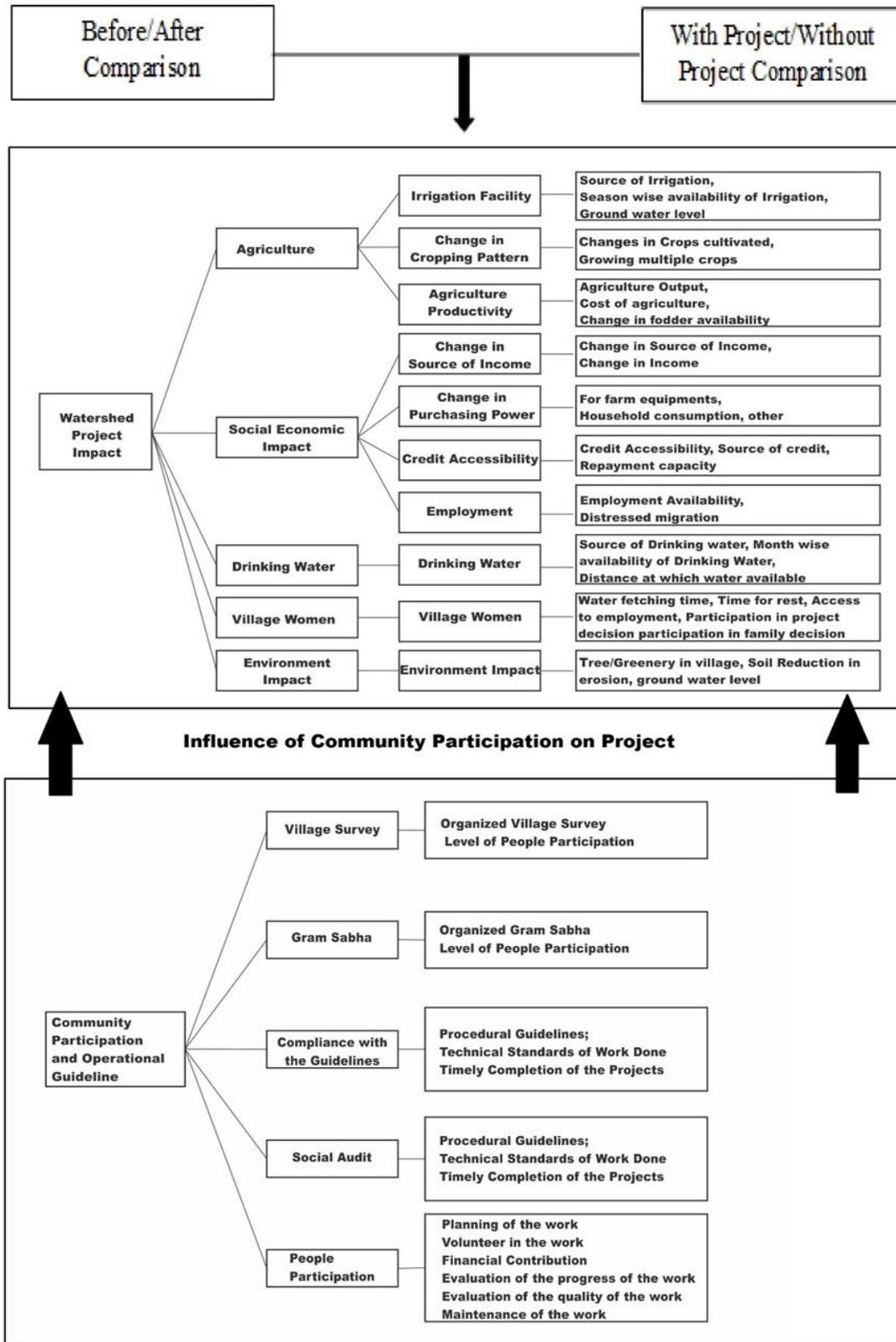
7.6.1 Village survey: For effective project implementation, an appropriate site selection is a prerequisite. For site selection, an extensive survey of the village is required. The survey identifies possible opportunities where watershed work can be executed. To ensure the maximum people participation, the date and timing of the survey shall be planned with maximum publicity in the village.

7.6.2 Gram Sabha: Gram Sabha plays a very important role in the planning of any demand-driven program. Gram Sabha is the supreme authority that takes decisions on the planning and implementation of the scheme. Site selection for the execution of work, the priority of work to be done, monitoring progress, and quality of work are the responsibilities and authority of Gram sabha.

To ensure maximum participation in the Gram Sabha, the date and timing of the Gram Sabha shall be given wide publicity.

- 7.6.3 Water budgeting:** The effective implementation of the scheme depends on the outcome of accurate water budgeting (Thakare et al., 2018). Based on village survey and people participation, annual water requirement, total water runoff and water storage capacity are to be assessed (Inamdar, 2019b; Nanaware & Khadake, 2019; Patil & Lad, 2020). Water budgeting is a guiding tool for planning and implementation of the scheme. Here, the effectiveness of water budgeting under the scheme is to be assessed using the indicators as whether water budgeting is done in the village, whether people participation was insured in preparation of water budgeting and whether water budget was displayed in the village.
- 7.6.4 Compliance with the guidelines:** The works initiated under the scheme mainly includes compartment bunding, continuous contour trenches, sediment extraction, Nala extension and deepening work, loose boulder structure, percolation tank, gabion structure, Kolhapur type Bandara (KT weir), cement Nala Bund and Farm pond. For creating these work structures, Government has suggested certain guidelines. The studies have evidence of a violation of basic engineering principles and delays in the completion of the work structures (Nanaware & Warudkar, 2020; Patil & Lad, 2020; Thakare et al., 2018; Vedpathak, 2019). Farmers from Ubharandi village of Dhule district stated that the work done was only a quick fix that does not tackle the water scarcity problem. It was observed that there were mass negligence in the maintenance of the work structure. It is imperative to assess whether stipulated guidelines were followed while creating the work structure.
- 7.6.5 Social Audit:** Jalyukt Shivar has a provision of a third-party audit of work completed in the village. Besides, every Gram panchayat has to formulate the social audit committee. Beyond auditing the financial accountability, the committee has a right to evaluate the quality of the work. Social auditing ensures social monitoring of the scheme. However, it was evident that there were lapses in terms of the third-party evaluation of the scheme in many villages (Patil & Lad, 2020). While evaluating people's participation, it is to be assessed whether the social audit committee is established in the village and the committee conducted a social audit of the scheme.
- 7.6.6 Community participation:** In bottom-up, demand-driven watershed projects, community participation is most important. As Jalyukt Shivar was a flagship program of the Maharashtra Government, the program was given mass publicity in the state. The looming water crises even created sensitization about the scheme. Farmers were aware of the scheme and its importance to resolving water crises (Inamdar, 2019a). For the effectiveness of the scheme beyond awareness, their active participation is essential. The studies have established the association between the extent of people's participation and the success of the scheme. There is evidence of a lack of people participation in many villages while the implementation of the scheme (Patil & Lad, 2020)

7.6.7 Figure No:2- Conceptual Framework of Parameters & Indicators for Impact assessment



Source: Author

During the visit to the villages in the Nandurbar district, farmer's unawareness of the scheme was observed and their misconceptions make them reluctant to implement the schemes in their agricultural land or nearby areas. In one of the villages of Jalgaon district, farmers from backward communities revealed that they were departed from the benefits of watershed schemes. Another evidence was from Dhanora village of Nanded District, where Nala bunding work blocked the farmer's access to their farm. While the construction of the canal farms was promised of building a small bridge, however, the promise was not fulfilled. This results in low farmers' participation in the implementation of the scheme. The effective dissemination of watershed benefits depends on quality and community participation in the scheme. Community participation is to be assessed in terms of participation in project planning, site selection, volunteer work, financial contribution, evaluation of Progress of the work, evaluation of quality of the work, and maintenance of the work.

7. Conclusion:

In rainfed areas, watershed development is imperative to mitigate the adversities of drought. The objectives of the watershed program are not limited to generate water facilities but alleviate rural poverty, ensure livelihood security, and foster socio-economic development of the region. Thus to achieve its objectives, a scientific assessment of the outcome of the program is imperative. Project evaluation and monitoring studies gather vital information for implementing agencies that could be used to augment its benefits. However, assessing the impact of the watershed project is difficult and complex, as the beneficiaries are not only immediate farmers but the community at large.

Watershed impact assessment is a multifaceted concept. It has the potential to create a multidirectional spill-over effect that influences a larger section of society. Firstly it influences agriculture, through an improvement in irrigation facility. It brings a change in the cropping pattern and enables farmers to go for farm mechanization that results in enhanced agriculture production and productivity. An increase in greenery and fodder availability increases total milk production and eventually, increment in farmers' income. Secondly, beyond income employment generation, education, energy, rural asset augmentation are the other Socio-economic benefits of the program. Thirdly, the impact of the watershed project on access to drinking water availability. Fourth, the drinking water availability would significantly benefit women, wherein they can get rid of the water fetching workload. She would get extra time for rest and healthy life. It creates an opportunity for her to get employed in productive activity and eventually a role in family decision making. Fifth, environmental impact, watershed development activities also a solution for marginalizing the impact of climate change. It improves groundwater level, increases greenery & tree plantations, and reduces soil erosion. Last but not least, watershed projects are a playground to teach democratic values. For the implementation of watershed projects, government has shifted from a top-down to a more demand-driven bottom-up approach. It bypasses the bureaucratic hurdles and the village gets unprecedented autonomy for the implementation of the projects. Decisions of project site selection, resource mobilization, implementation, and monitoring all these activities are performed through community participation. Villages could seek NGO assistance than relying on Government machinery where Gram Sabha is the supreme decision-making body. Several studies have evidenced that the bottom-up approach not only upscales the project quality but it paly an instrumental role in embedding democratic values and cooperation that would pave the way for achieving social harmony.

The present research paper has developed an integrated conceptual framework of parameters and indicators that would be used for not only the evaluation of Jalyukt Shivar of Maharashtra but other watershed interventions. The framework is developed through an extensive literature review of the studies conducted

on Jalyukt Shivar and other watershed initiatives. Most importantly the validity of the framework was cross-checked through field visits to the program implemented villages and focus interview with stakeholders of the scheme, such as beneficiary farmers, village women, Gram panchayat Sarpanch, Members of Gram Sabha, Government officials involved in the implementation of the scheme, and village opinion leaders. The framework would be useful for other researchers, NGOs, and agencies involved in the implementation and evaluation of Jalyukt Shivar and other watershed projects initiatives.

Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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