International Journal of Law, Management and Social Science **ISSN: 2581-3498**

Vol. 5, Issue III, Jul-Sep, 2021 http://bharatpublication.com/journal-detail.php?jID=35/IJLML

A STUDY OF SOCIO-ECONOMIC BENEFITS OF WATER SAFEGUARDING SKILLS IN INDIA

Dr. Darekar Genu Ramkisan

D.Litt. Scholar, OPJS University,

Churu, Rajasthan.

ABSTRACT

One of the most important threats to the long-term viability of agriculture has been recognised as land degradation. SWC measures are seen as critical to resolving the issues of poor agricultural output and soil degradation in India and the rest of the globe. As the requirement to show the results of NRM interventions, development initiatives, and programmes grows, impact evaluation is receiving greater attention. In this research, the bio-physical, socioeconomic, and environmental implications of SWC measures were evaluated in India in order to better understand the efficacy of these interventions. These measures conserved soil and water and also helped to improve water use efficiency, reduce soil erosion and nutrient loss, maintain soil temperature and structure, soil fertility and biological regime and maintain surface and subsurface and groundwater levels, according to the impact results of SWC measures. In order to ensure that suitable SWC measures are implemented, it is necessary to monitor and analyse the effects of SWC measures on soil and water quality. We came to the conclusion that local factors must be taken into consideration while promoting SWC initiatives.

KEYWORDS: *Socio-Economic, Water Safeguarding, Land degradation, agricultural*

INTRODUCTION

As a result of land degradation, which is caused by a variety of interrelated variables, soil productivity has been adversely damaged, and agricultural output has fallen short of meeting the rising population's basic food needs (Anonymous, 2013). Around 270 million people in the nation go hungry every year as a result of land degradation, and this number rises every year. More than 120.72 million hectares of the country's total land area is susceptible to land degradation, which includes both cultivated and non-cultivated land, according to the most recent harmonised database on land degradation. Land degradation owing to water erosion, chemical degradation (salinization/alkalization/acidification) and wind erosion account for a total of 82.5 million hectares, followed by waterlogging, mining and industrial waste (12.4 million ha) (Anonymous, 2010). Soil and water depletion is still a big threat to India's future. Evaporation of 5334 million tonnes of soil occurs yearly, with 29 percent being permanently lost to the sea, 10 percent being deposited in reservoirs, and the remaining 61 percent being transferred from one area to another. As a result of soil erosion and land degradation, arable land is diminishing by an estimated 6000 million tonnes of top soil with important plant nutrients NPK ranging from 5.37 to 8.4 million tonnes each year (Singh and Singh, 2004). It is essential to agricultural growth and sustainability that natural resources be managed in the most efficient and effective manner. India's scarce natural resources are being put to the test by a rapidly growing human and animal population. SWC measures have been adopted throughout the nation via a variety of plans, programmes, and watersheds in order to address these issues. A variety of ecosystem services may be produced as a result of these actions, which have both upstream and downstream advantages. In order to preserve the supply of food, fodder, and fuel wood and to provide income and employment for farmers and landless workers, it is necessary to put measures in place that maintain or restore the soil's ability to absorb water, nutrients, and organic matter. Aiming to better understand the socioeconomic and environmental effects of SWC measures, we reviewed and synthesised previous studies to get a sense of where we are today in terms of what we know.

BRIEF HISTORY OF SOIL AND WATER CONSERVATION (SWC) PROGRAMME

SWC invention in India dates back to the time when humans began to cultivate their land rather than hunt it for food. The first SWC measure used by civilization was field bundling as it advanced as a farmer. SWC was not a prominent initiative during the pro-independence era since it was typically tied to other programmes, such as dry land farming or famine alleviation.. It was during this post-independence era that the Indian government established a network of Soil Conservation Research, Demonstration and Training Centres (SCRDTC) throughout the country in 1954 to serve as a source of research support and well-trained labour. Fakot (Uttar Pradesh), Sukhomajri & Nada (Haryana) and G.R. Halli (Karnataka) in 1974-75 verified the usefulness of different SWC methods in reducing erosion on farmers' fields with greater benefit-to-cost ratios.. ORPs under India's Watershed Development Program (WDP) become a defining feature. Table 1 provides an overview of the history of the SWC programme in India.

Table.1 Brief historical background of SWC programme in India

Year	Soil and Water Conservation Programme
Pre-Independence Period	
1900	First soil and water conservation Act by Punjab state
1928	Recognition of soil erosion problem by Royal Commission on Agriculture
1930	Establishment of dry land research Centre (Bombay dry farming practices)
1938	Scheme for dry farming development: Emphasis on contour bunding
1945	Famine Commission: SWC was considered as a component of relief measures
Post-Independence Period	
1950-60	Enactment of soil and water conservation acts by several states in India All India Soil Survey and Land use organization
1954	Establishment of Soil Conservation Research, Demonstration and Training Centres (SCRDTC)
1961-62	Launching of River Valley Projects (RVPs)
1973-74	Drought Prone Areas Programme (DPAP) Command Area Development Programme (CAD)
1975	Implementation of Operations Research Projects (ORP)
1977-78	Desert Development Programme (DDP)
Watershed Development Programme Era	
1980-81	Watershed programme were initiated under flood prone rivers project
1983	Launching of 47 model of Watershed Development Project (WDP) for the development of dry-lands
1984	World Bank Assisted WDP in four states
1986-87	National Watershed Development Programme for Rain-fed Areas (NWDPRA) in 16 states
1989	Integrated Waste Land Development Programme (National Wasteland Development Board) Integrated Afforestation and Eco-Development Scheme (IAEPS)
1992	Indo-German Watershed Development Programme (IGWDP)
1994	Common Guidelines for Watershed Projects
1999-00	Watershed Development Fund
2001	Common Guidelines for Watershed Development (Revised)
2002	National Afforestation Programme (NAP)
2003	Hariyali Guidelines
2004	Command Area Development and Water Management (CADWM),
2005	MGNREGS (56 % of total fund on NRM)
2006	Parthasarathy Committee Report, National Rainfed Area Authority (NRAA)
2008	Common Guidelines for Watershed Development (Neeranchal Guideline)
2009	Integrated Watershed Management Programme (IWMP)
2011	Revised Common Guidelines for Watershed Development
2013	Revision added to 2008 Common Guideline
2015	PMKSY

IMPACT OF SOIL AND WATER CONSERVATION MEASURES

Methods to prevent soil loss and water runoff, preserve soil moisture, and boost agricultural productivity are the primary goals of SWC measures. It is also beneficial to ground water levels, surface water resources, runoff, and soil loss; afforestation; cropping intensity; crop production; employment and income creation; and watershed development programmes. A total of 13.4 million tonne @ 16 percent was estimated for annual production losses in rainfed areas of various agro-climatic regions of the country through experimental studies in 2005/06 and 2008/09, valued at Rs 111.7 billion considering minimum support prices and at Rs 162.8 billion in 2008/09. In addition, the average loss in output per hectare was calculated. Rainfed agricultural production in India is lost at a rate of Rs 2484 per hectare at a loss of 1.63 q/ha. According to the minimum support price of Rs 205.32 billion in 2011/12, the monetary losses are Rs 205.32 billion in total (Sharda et al., 2013). Joshi et al. used metaanalysis to conduct a macro-level assessment of India's 636 micro watersheds (2008). It was found in the meta-analysis that watershed programmes have numerous advantages in terms of increasing income, creating rural employment (151 mandays/ha), increasing yields, increasing crop intensity (35.5 percent), reducing run-off (45 percent), and soil loss (1.1 t per ha per year), augmenting groundwater, and reducing poverty. More over a third of watersheds had a benefit-cost ratio (BCR) of more than 2 and 27 percent of watersheds had an IRR of more than 30 percent, which indicated that the country's watershed programme might be significantly improved. In the following subheadings, we describe in depth the effects of SWC measures.

IMPACT OF SOIL AND WATER CONSERVATION MEASURES ON ENVIRONMENT

The environmental advantages of soil conservation techniques have traditionally been measured in terms of the decrease in soil erosion or the quantity of silt that is trapped on a field. Another indirect ecosystem service provided by watershed intervention and SWC methods is groundwater recharge and runoff reduction. Functioning wells, pumping hours, and water levels in wells all help to clarify the groundwater recharge situation. Water collecting structures have a substantial impact on both the security of people's livelihoods and the health of the environment by increasing the area under irrigation and increasing production. According to Wani and colleagues (2009), numerous environmental advantages are also reflected in the cropping patterns and income levels of the farmers. Improved micro-climate is a consequence of increased plant cover after deployment of various SWC interventions, such as check dams in gullies and bunds in steep streams. In the next subheadings, we'll go through each of these environmental effect parameters in further depth.

IMPACT OF SOIL AND WATER CONSERVATION MEASURES ON SOIL

Drainage networks (both brick-lined and grass-lined), land levelling, terraces and contour bunds, contour trenches, contour furrows, bench terraces, raised and sunken beds and graded terraces were all part of the

SWC measures. These measures all helped to reduce runoff and soil loss significantly. The different SWC measures, like contour and stone bunds, trench-cum-bunds with vegetation barriers and hedge rows, sunken ponds, and loose boulder check dams, were put in place from the ridge to the valley in the Kokriguda watershed in the Eastern Ghats of India. This led to a big drop in soil loss from 38.2 to 6.64 t.ha-1.yr-1 and runoff from 37 to 12 percent in a four-year period (Sudhishri and Dass, 2012). It was very important to put in contour bunds in the arable land and nala bunds and gully checks/check dams in the non-arable land to cut down on the amount of sediment that washed away from the land and the amount that washed away from the land. In Southern Karnataka, these things worked very well (Adhikari and Rao, 2003). Nalatwadmath et al., (2008) found that compartmental bundling, surface mulching, and graded border strips significantly increased the amount of N, P, and K available in top soil. This was compared to up and down cultivating. In Western Maharashtra, India, the continuous contour trenches (0.50 m x 0.60 m) were found to be better than the staggered trenches, half-moon terraces, and stone bund. They were found to be the best soil conservation practise on land with a 7 to 8 percent slope in the Konkan region of Western Maharashtra, India (Mane et al., 2009). The bioengineering measures have a big impact on the loss of organic C and available N, P, and K. This is because there is less runoff and soil loss from the plots (Dass et al., 2011). A continuous contour trench with Vetiveria zizanioides and Stylosanthes scabra also led to low runoff, soil loss, Nitrogen (13.95 kgha-1) and phosphorous (16.53 kgha-1) losses in the Western Ghats region, as did Vetiveria zizanioides and Stylosanthes scabra (Manivannan et al., 2007). Eragrostis curvula, Cymbopogon flexuousus, Tripsacum laxum, and Veteveria zizanoides were the plants that saw the biggest drop in runoff when they were treated with CST. There was less soil loss in the vegetative barriers with CST than there was in the control (16.95 t ha-1 year-1) and there was a higher SWCE in the Cymbopogon flexuosus and Eragrostis curvula with CST than there was in the control (16.95 t ha-1 year-1) (Madhu, et al., 2011). The contour furrow, conservation bench terracing, raised and sunken beds, and sorghum + pigeon pea or soybean cropping were all good ways to keep water from running off. The contour furrow was the best, especially for the gentle slopes of medium deep black soils in the rainfed hot and semi-arid region of South-Eastern Rajasthan (Singh et al., 2011). It was because of a drainage network that included an 800 m-long brick-lined drain that brought water to the structures that used it (Bhattacharyya et al., 2008). With dolichos in the soil at 45 DAS, the highest yield of sorghum grain was found (2301 kg ha-1) followed by sorghum + dolichos as mulch (2121 kg ha-1). Using strip cropping of maize and blackgram (4:8) with summer deep tillage and ridging after the first inter-crop operation was found to be an effective way to keep runoff low and soil loss to a minimum. It also produced more maize equivalent yield (22.62 q ha-1) and B: C ratio (2.71) than the control, which was 11.40 q ha-1. Stripping and intercropping cereal crops with pulses and oilseeds are the best ways to break long slopes. This keeps soil from being lost, reduces runoff, and increases productivity. In the Eastern Ghats of Orisaa, the inter cropping of groundnut with pigeonpea planted along contour yielded the highest rice equivalent yield (59 q ha-1) and the lowest soil loss (6.27t ha-1) and the lowest runoff of 230 mm. Then, pigeon pea and groundnut strip cropping planted along the contour yielded rice equivalent yield of 54.43 q ha-1 (Subudhi, 2011). Different crop residues and mulches (Bhushan et al. 2009; Vashishta et al. 2013), rainwater conservation practises, and in-situ moisture conservation practises like paired and strip cropping, contour and ridging (Jat et al., 2010) are also important for reducing runoff and soil loss. They also help to improve the quality of the soil. Moisture conservation techniques should be used in addition to large-scale soil and water conservations, as well as water harvesting structures in watersheds, according to Muthamilselvan et al. (2006). This will help agricultural crops get more water as well as allow more rain water to get into the root system. It was important to him that subsoiling, mould board ploughing, and deep digging led to 80-100 percent more stover yield and 70-350 percent more grain yield of maize when dry farming. As a mulch, maize stalks boost the yield of wheat that grows in the rain by 19.97% when used as a cover crop. The basin lister also increased crop yield by 11.0% when compared to the traditional method of summer ploughing, which was done with a horse. Over the flat bed method of sowing, there was an 11.67–13.45% increase in ragi yield in the ridge and furrow method. The SWC measures were found to be much better at preserving moisture than the control treatments. They found that preventing water from getting into the soil made a big difference in the density, porosity, moisture content and growth of roots, as well as the yields of seeds and stalks. Soil moisture content was highest (range 17.1–19.1 percent) near vegetative barriers in the city of Junagadh, in the state of Gujarat. The closer you were to barriers or bunds/trenches, the less moisture there was in the soil. Another study found that different crop residues and mulches kept soil moisture in the soil (Sharma et al., 2010), as well as the water holding capacity, infiltration rate, and fertility of the soil (Nalatwadmath et al., 2006). Paddy straw mulch at 1 kg/m2 led to the highest turmeric plant height, stem girth, leaf size, dry biomass, and dry root weight. Kumar et al. (2008) found that the paddy straw mulch at 1 kg/m2 led to the highest turmeric plant height, stem girth, leaf size, dry biomass, and dry root weight. The soil in the Bhubaneswar mango orchard where turmeric was grown in a rainfed way had more moisture during the rhizome-forming, growing, and maturing stages when paddy straw was used at 1 kg/m2. Phosphorus and potassium's Nutrient Value Index (NVI) went up after SWC measures were put in place. This is because P fixation and nutrient-rich sediment deposition in low-lying, undulating land caused the NVI to rise from 1.57 to 2.27 and 2.08 to 2.12, respectively. In the same way, Behera et al., (2007) and Tamboli et al., (2011) said that mulching made EC, total N, available P, and available K better than without mulching.

IMPACT OF SOIL AND WATER CONSERVATION ON WATER

Using SWC methods such as farm ponds, sunken ponds, percolation tanks, earthen nala bunds, irrigation system inlet structures for underground pipelines (UGPLs), bunds, and check dams, water table depths and water availability for irrigation and other applications have risen significantly.. An rise in water levels of 2.90 metres was discovered in wells downstream of SWC structures, such as the earthen nala bund, the composite cement nala bund, and the cement check dam and percolation tank in the Aurangabad region of Maharashtra (Abuj et al., 2010). As a result, the water table in open wells rose by 0.32 metres, crop yields increased by 15 percent in little millet and 38 percent for upland paddy, the area under remunerative crops like vegetables increased from 2 to 35 hectares, and the conveyance efficiency increased from 23 to 95 per cent, as a result of various cost effective SWC measures (contour and stone bunds, trench-cum-bunds with vegetative barriers and hedge rows, sun-bunds, etc.). In addition to increasing the number of open and tube wells and irrigation water availability, the advantages of SWC techniques include greater ground water recharge, resulting in an increase in irrigated area throughout the rabi and summer seasons (Rana and Gupta, 2010). In Madhya Pradesh, the watershed program's execution boosted the basal flow from 181 to 336 cumecs. An increase in irrigated area was seen in all three seasons of the year, as well as an increase in fodder output by 121% and planting by 82.77%. Fuel wood availability was also boosted by 58%. Some SWC buildings caused an increase in groundwater levels of 0.30 to 0.45 metres. During the rabi season, pumping hours were raised to 2-6 hours; during the summer, pumping hours were reduced to 0.75-1.5 hours. The installation of the Sulki watershed in Maharashtra resulted in an extra 144 hectares of land under ground water irrigation during the rabi season and a 25-40 percent boost in agricultural output (Naik, 2009). Seasonal wells increased by 51%, while permanent wells increased by 2233% and 1288% in the Shekta watershed Ahmednagar district, Maharashtra.. Several studies found that mulches (FYM, green, and straw) reduced soil evaporation and increased plant respiration, hence lowering water usage efficiency. In dry western Rajasthan, Singh et al. (2011) found that mulching treatments boosted water usage efficiency from 24.16 to 34.79 kg ha-1 mm-1 compared to the control. Higher water consumption was also a consequence of in-situ rainwater conservation measures. Additionally, the bioengineering approaches were shown to be much more effective than the control plot in terms of SWC efficiency. Continuous contour trenches with Stylosanthes scabra and Vetiveria zizanioides had a better water conservation efficiency (WCE) of 67 percent because the continuous contour trenches had saved more water than other treatments.

IMPACT OF SOIL AND WATER CONSERVATION ON CROP

There was a beneficial influence on cropping patterns and crop yields from the various SWC engineering techniques, such as the continuous contours, ditches loose boulder constructions, earthen bund and farm ponds. According to Karegoudar et al. (2004), agricultural production in the Bellary district of Karnataka's watershed rose from 12.5% to 40% as a result of check dams, nalabunding, boulder checks, and contour bunding. Watershed improvement in Maharashtra's Hingoli district has resulted in an increase in cultivated area of 56.41, 284.44 and 221.18 percent, respectively, for kharif, rabi and horticulture. Increased water availability and soil fertility restore crop productivity, biomass, and variety for both irrigated and rainfed crops after SWC methods. Dugout ponds developed under the Peoples Participatory Watershed Development Program (PaniRokoAbhiyaan Scheme) in Madhya Pradesh boosted the output of rice, soyabean, wheat, chickpea, safflower, and linseed by 90, 42, 78, 90, 51, and 56 percent, respectively (Reddy et al., 2004). SWC techniques employed in the Ratlam district of Madhya Pradesh's SunehraKal project enhanced soybean output per family by 2.92 quintals while increasing wheat production per home by 0.24 acres and 0.73 acres, respectively (Koul et al., 2013). Increases in chickpea grain and biological yield of 18 percent, sorghum of 10.5 percent, and stover of 10.7 percent were achieved by field bunding implementation, while water usage efficiency rose from 8.5 kg ha-1 mm-1 to 9.1 kg ha-1 mm-1 in the states of Madhya Pradesh and Rajasthan. Bioengineering has been shown to increase agricultural production and growth in a number of studies. It was observed that continuous contour trenches with Stylosanthes scabra and Vetiveria zizanioides outperformed all other conservation strategies in the hill slope area of Goa state, with highest nut yields of 1.24 and 2.27 kg/cashew tree, respectively.

CONCLUSION

Water conservation, groundwater recharge, groundwater availability, and hence an increase in irrigated area are all positively impacted by SWC techniques. Water harvesting features such as ponds, check dams, and bunds should thus be the primary emphasis of our strategy. Increased agricultural yields and crop diversity, as well as increased farm revenue, have been reported to result from SWC interventions. The development and demonstration of more efficient farming methods that include agricultural products, plants, and animals should be a priority. Soil and water conservation is the primary goal of most SWC recommendations, but farmers have a broader range of goals, including both economic and noneconomic ones. There are a number of ways to encourage farmers to take advantage of SWC measures, including: I providing farmers with subsidies for the maintenance of SWC structures; (ii) educating farmers about the benefits of SWC measures; and (iii) providing farmers with education, training, and technical assistance if they are unaware of the benefits of SWC measures or lack the skills to implement them. In addition, it is critical to explain the costs of not adopting SWC initiatives.

REFERENCES

1. Abuj, M.D., Magar, A.P., Bombale, V.T., Bhutada, S.H. and Bhandari, P.H. (2010). Impact of soil and water conservation structures on ground water recharge in Darakwadi watershed. Int. J. Agric. Eng., 3(1): 121-124.
2. Adhikari, R.N. and Rao, R.M.S.(2003). Effect and feasibility of soil and water conservation measures in Tungabhadra river valley Catchments of southern Karnataka. Agri. Sci. Dig. 23(3) 179-182.
3. Anonymous. (2010). Degraded and Wastelands of India: Status and Spatial Distribution. Indian Council of Agricultural Research, New Delhi and National Academy of Agricultural Sciences, New Delhi pp 158
4. Anonymous. (2013). Planning Commission, Government of India, Press Note on Poverty Estimates, 2011-12, pp3
5. Arya, S.L., Tiwari, A.K., Yadav, R.P. (2006). Economic Viability of Rainwater Harvesting by Renovating Village Ponds in Small Agricultural Watershed of Johranpur (HP). Agric. Econ. Res. Rev. 19(1) 71-82
6. Arya, S.L., Tiwari, A.K., Yadav, R.P. and Bagdi, G.L. (2018). Post-adoption behaviour of farmers towards soil and water conservation technologies of watershed management in Northern Shivalik foothills.Ind. J. Soil Cons.46(1) 118-124
7. Bagdi, G.L., Mishra, P.K., Kurothe, R.S., Arya, S.L., Patil, S.L., Singh, A.K., Bihari, B., OmPrakash, K.A. and Sundarambal, P. (2015). Post-adoption behaviour of farmers towards soil and water conservation technologies of watershed management in India. Int. Soil &Wat. Cons. Res.3 161–169

8. Behera, B., Mohanty, S.K., and Behura, A.K. (2007). Effect of mulches on production potential, economics and soil fertility status of Maize + Pigeonpea intercropping under rainfed conditions of Eastern Ghats, Orissa. Ind. J.Dryland Agric. Res. Dev. 22(1) 37-40
9. Bhattacharyya, P., Yadev, R.P., Aryam S.L., Aggarwal, R.K. and Tiwari, A.K. (2008). Impact of soil and water conservation measures on soil degradation status of an agricultural watershed in Shivalik region. Ind. J. Agric. Sci. 78(5) 328-431
10. Bhushan, B., Khera, K.L. and Sidhu, B.S. (2009). Effect of mulches on maize crop yield, soil loss and water transmission properties under rainfed Shivaliks of Punjab. Ind. J. Soil Cons. 37(2) 126-128