Analysis and Evaluation of Best Management Practices (BMPs) for WES Conservation in an Agricultural Watershed

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INTRODUCTION

Due to lack of conservation practices, there is increase in runoff soil erosion and nutrient losses

The main off-site effect of soil erosion is transport of sediment and agricultural pollutants into streams and reservoirs

Scientists predict that water demand will exceed supply by 40% by 2030, due to combined climate change and population growth

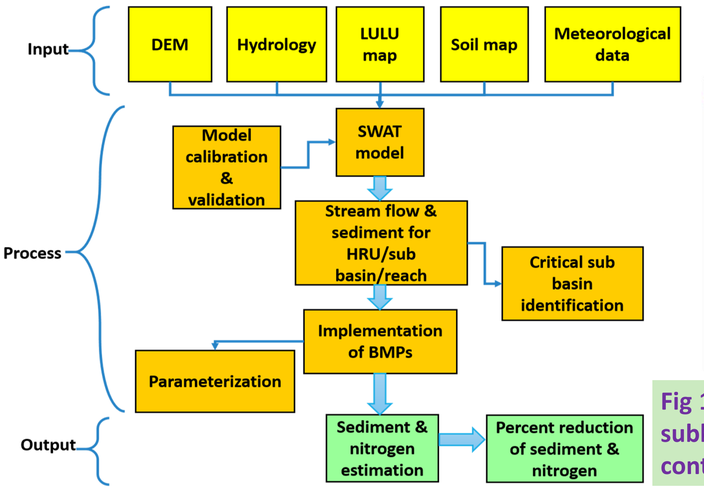
Meeting food demand with decreasing top soil quality is a challenge

Watershed Management integrate the planning of land and water to balance healthy, ecological, economic conditions

Best management practices(BMPs) decrease runoff velocity by trapping and lowering it

The study targeted spatial assessment of vulnerability of an agricultural watershed (Jambhira) located in India to erosion and sediment loading using SWAT model, and comparison of effectiveness of BMPs in reducing sediment output and loss of nutrients such as nitrogen, that will improve overall quality of WES

METHODOLOGY



METHODOLOGY

Table 1. Different ways to simulate BMPs representation in SWAT Hydro. Model

Sl. No.	BMP	SWAT parameter (Input files)	Parameter modified value	Sl. No.	BMP	SWAT parameter (Input files)	Parameter modified value
1	CONTOUR FARMING	CN2 (.mgt)	Reduction of calibrated value by 3 units	3	BUFFER FILTER STRIPS	VFSI (.ops)	1
		USLE_P (.mgt)	0.6 for slope 1 – 6%			VFSRATIO (.ops)	40
			0.7 for slope 6 – 18%			VFSCON (.ops)	0.5
			0.8 for slope >18%			VFSCH (.ops)	0
2	STRIP CONTOUR CROPPING	CN2 (.mgt)	Reduction of calibrated value by 3 units	4	GRASSED WATERWAYS	GWATI (.ops)	1
		USLE_P (.mgt)	0.3 for slope 1 – 6%			GWATN (.ops)	0.35
			0.35 for slope 6 – 18%			GWATSPCON (.ops)	0.005
			0.4 for slope >18%			GWATW (.ops)	5 m
						GWATD (.ops)	3/64 × GWATW (m)
						GWATL (.ops)	HRU length (km)
						GWATS (.ops)	0.75 × HRU slope

RESULTS OF THE STUDY

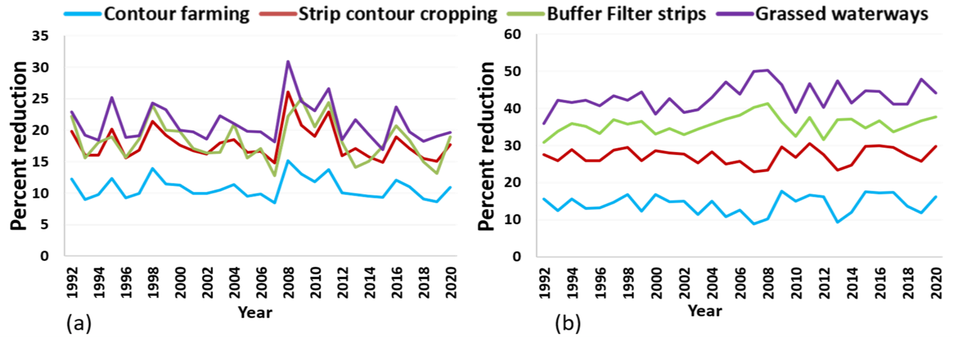


Fig 3. Comparison of reduction (in %) of (a) annual sediment yield and (b) annual nitrogen loss in the most critical subbasin #12 after simulation of different BMPs in the watershed

RESULTS OF THE STUDY

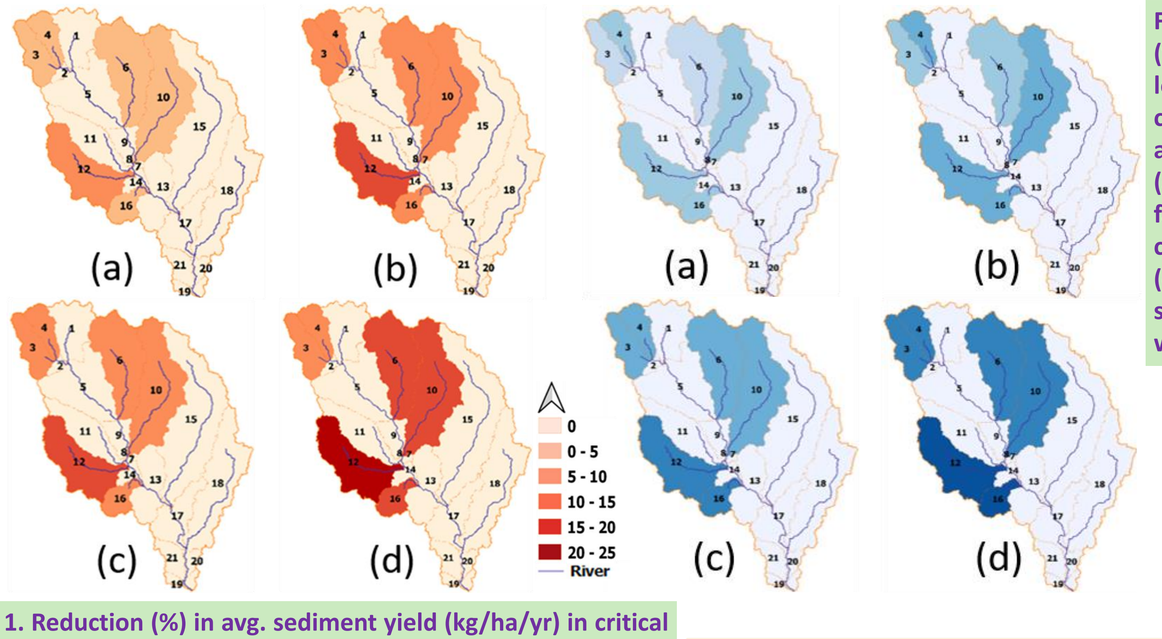


Fig 1. Reduction (%) in avg. sediment yield (kg/ha/yr) in critical subbasins after simulation of (a) Contour farming (b) Strip contour cropping (c) Buffer filter strips (d) Grassed waterways

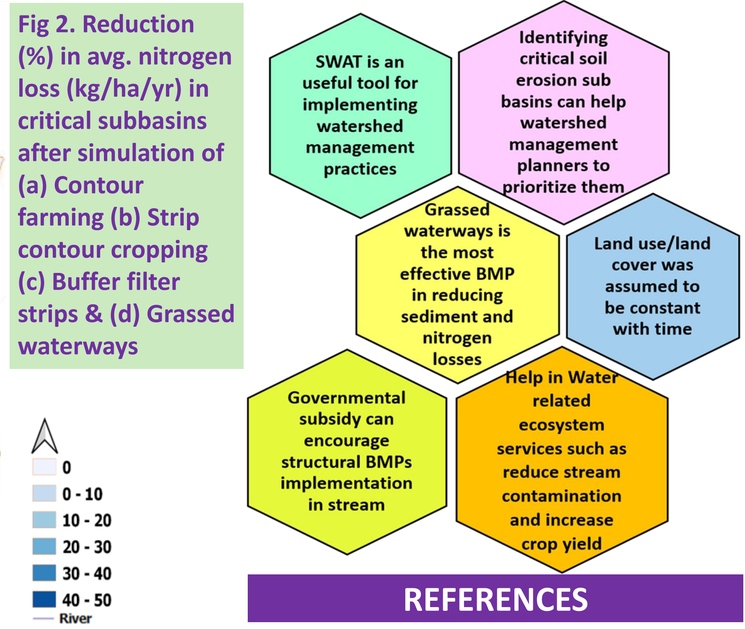


Fig 2. Reduction (%) in avg. nitrogen loss (kg/ha/yr) in critical subbasins after simulation of (a) Contour farming (b) Strip contour cropping (c) Buffer filter strips & (d) Grassed waterways

CONCLUSIONS

- SWAT is an useful tool for implementing watershed management practices
- Identifying critical soil erosion sub basins can help watershed management planners to prioritize them
- Grassed waterways is the most effective BMP in reducing sediment and nitrogen losses
- Land use/land cover was assumed to be constant with time
- Governmental subsidy can encourage structural BMPs implementation in stream
- Help in Water related ecosystem services such as reduce stream contamination and increase crop yield

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