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Evaluating Management Practices to reduce sediment yield in the Fincha Watershed, Ethiopia

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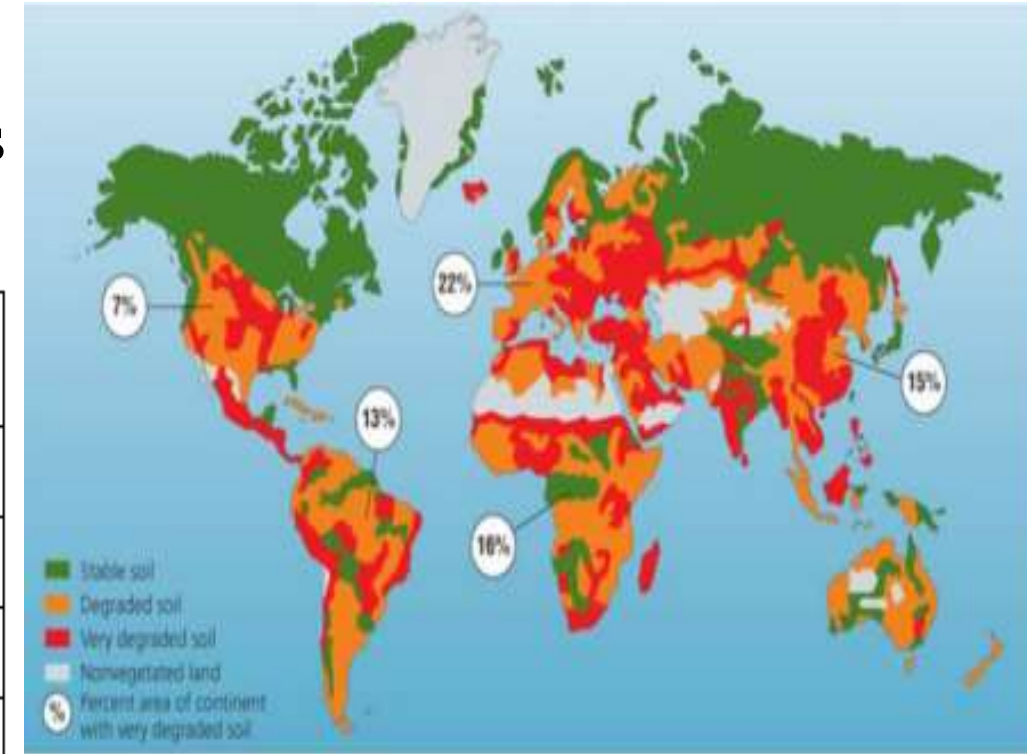
Outlines

- Background
- Study Objectives
- Material and methodology
- Results and Discussion
- Conclusions and recommendation

Background

- ✓ One of the most significant environmental issues facing the world today is soil erosion, which poses a threat to both agriculture and the environment

Country/Continent/world	Soil loss rate/Soil loss /continent	Sources
United State	16 t/ha/y	Deore, 2005
Europe	20-40 t/ha/y	Deore, 2005
Ethiopia	25-30 t/ha/y	Deore, 2005
World	Annually, 75 billion t soil eroded	Dissanayake et al., 2019
Ethiopia	Annually, 1.5 billion t soil eroded	Taddese, 2001

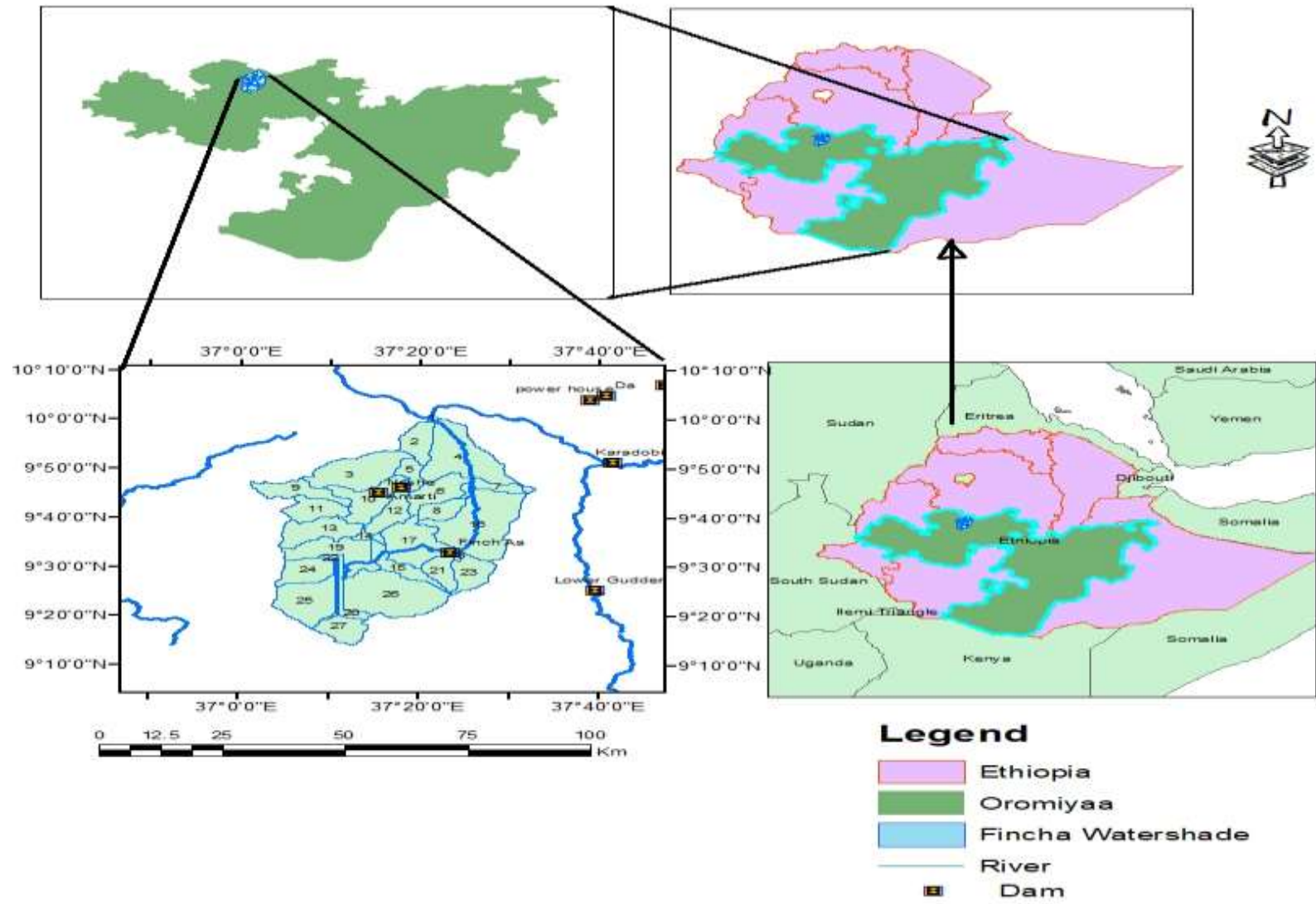


Agegnehua et al., 2017

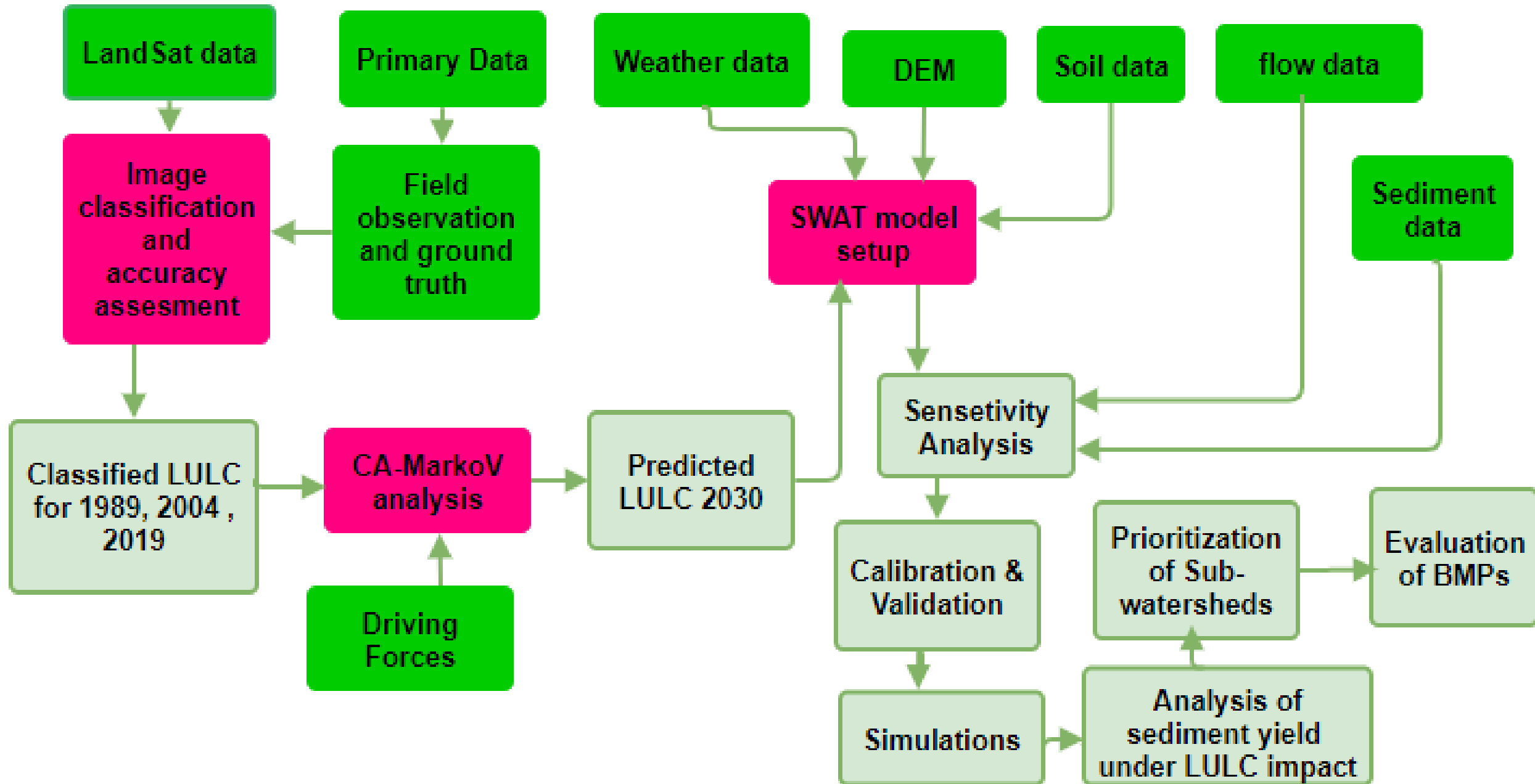
The study aims to evaluate the effect of management practices on reducing soil loss and sediment yield across the watershed, via numerical modelling

Data and Methodology

Location of study area



Methodology

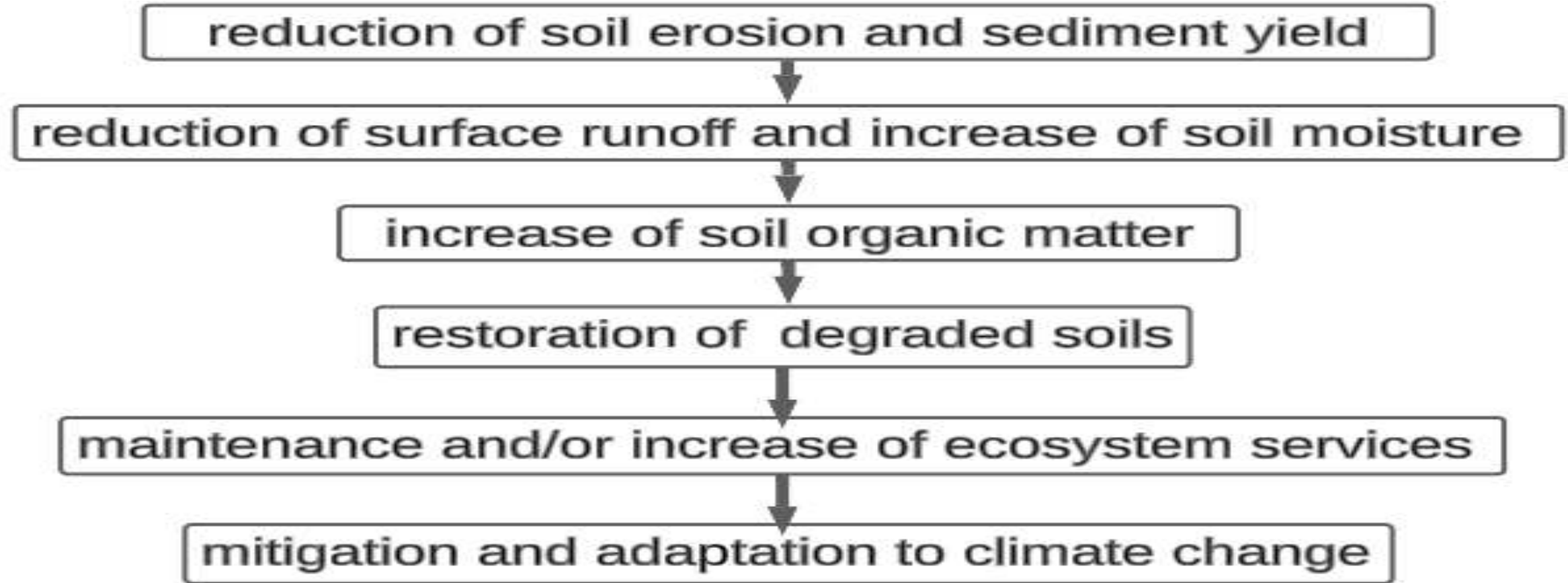


Methodology

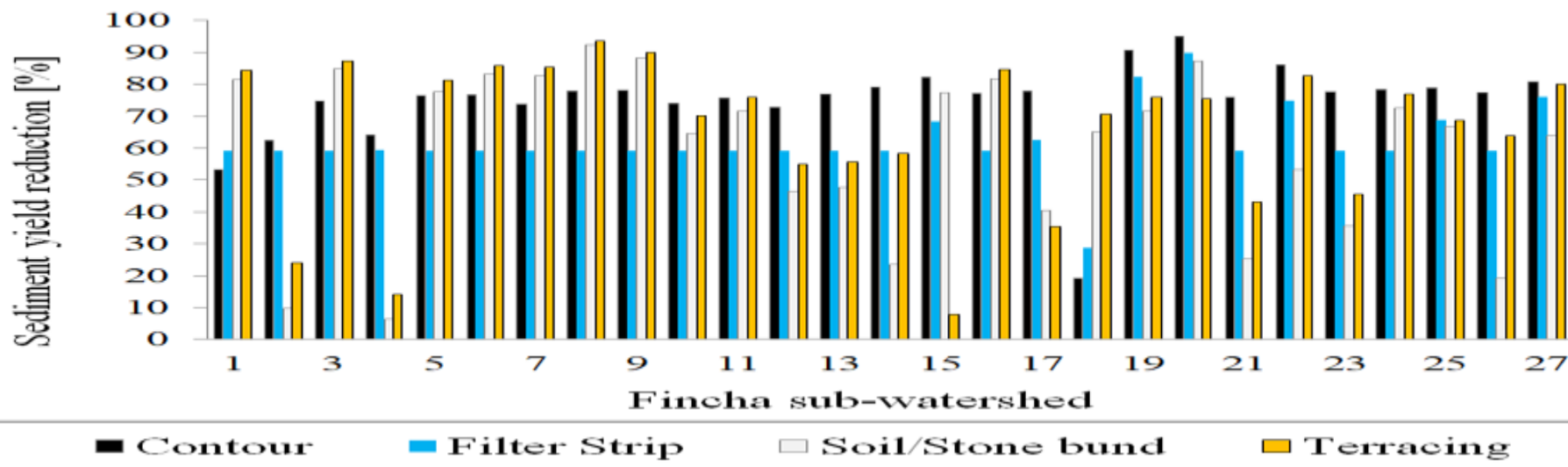
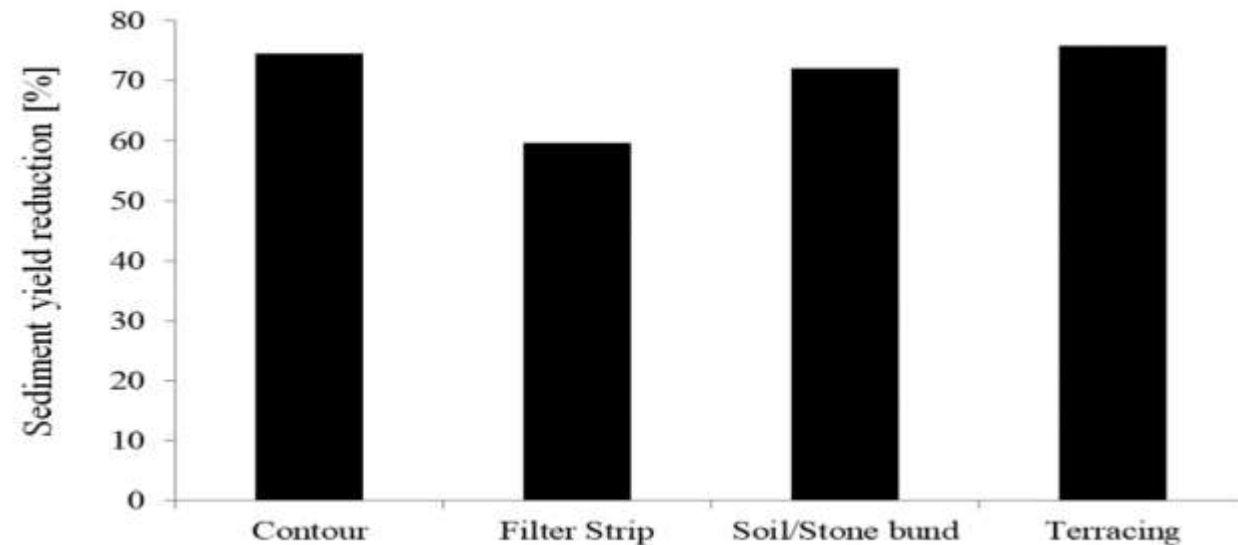
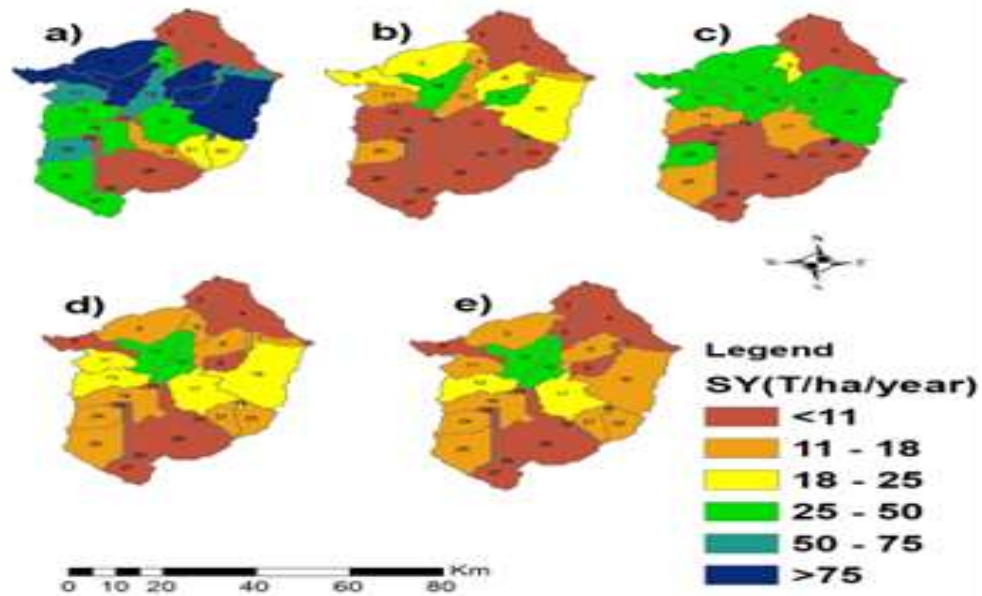
Scenarios	Description	Parameters	Calibrated value	Modified value
Baseline	The existing condition in the watershed	-	-	-
Filter strip	5m (modified from swat mgt database) wide grass strips established on cultivated land	Filter width	0	5 m
Contour	plowing and planting across slope contours to create a man-made water break that allows enough time for water to enter to soil	<i>USLE_P (Management support practices factor)</i>	0.53	0.32
		<i>CN2 (Curve number)</i>	83	80 (reduced by 3 units)
Soil or Stone bund	Elevated physical soil/stone or form a barrier along the contours that slow down the water run-off	<i>SLSUBBSN (slope Length)</i>	18.292	0.5* (reduced by 50%)
		<i>USLE_P(Management support practices factor)</i>	0.53	0.32
		<i>HRU_SLP (slope)</i>	0.327	0.75* (reduced by 25%)
		<i>CN2 (Curve number)</i>	83	80 (reduced by 3 units)
Terracing	Constructed channels across the slope and reduces runoff velocity	<i>SLSUBBSN(slope Length)</i>	18.292	0.5* (reduced by 50%)
		<i>USLE_P (Management support practices factor)</i>	0.53	0.32
		<i>CN2 (Curve Number)</i>	83	80 (reduced by 3 units)

Results

- ✓ What benefits can Best Management Practices (BMPs) provide?



Results



Results & Discussion

- ✓ Using BMPs produced encouraging results in the reduction of sediment yield.
- ✓ The effectiveness of the chosen BMPs ranges from 59.75% to 75.82%.
- ✓ Terracing, Contour, and Soil/Stone bund scenarios involved the highest reduction, while Filter strips the lowest.
- ✓ Due to resource limitations, it is not possible to carry out soil and water conservation measures simultaneously throughout the entire watershed.
- ✓ To achieve sustainable development of the basin land and water resources, priority should be given to sub-watersheds at high risk of soil erosion or more vulnerable.

Conclusions

- ✓ This study pointed out that most of the sub-watershed of Fincha watershed are highly threatened by soil erosion, and the same trend will be expected for the future if no countermeasures will be implemented.
- ✓ MPs can help in reducing sediment yield at the watershed scale, but they might be not yet effective in lowering soil erosion below a critical threshold in highly-impacted areas.
- ✓ Terracing resulted the most effective BMP to reduce sediment yield in the Fincha watershed.

Recommendations

- ✓ The challenges related to data and hydrological modeling:
 - Improve hydro-metrological monitoring
 - Improve data recording centers, technical skills, office services

- ✓ In a country where financial constraints are prevalent it is required to:
 - Prioritize hotspots
 - Prioritize the most effective BMPs

- ✓ Application of BMPs requires additional soil and land management measures:
 - Eco-hydrology, riparian restoration
 - Buffer zone, stream bank stabilization

Thank you for your Attention

