Impacts of SWCPs on sediment trapping, landscape disconnectivity & sustainable reservoir use, NW Ethiopia

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Introduction

- The northwest highlands of Ethiopia are the major water sources of Abay River/GERD
- More than 80% of the water is from these highlands
Besides the highlands are:

- Suitable for human settlement (>60% popn)
- Origins of many crop & tree species
- Most suitable for agriculture, agriculture widely practiced, etc.

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However;

- Land degradation in the form of soil erosion, soil fertility depletion, water resources reduction, forest deterioration, etc.

is a prime problem in the highlands.
Consequently:

- Reservoirs/lakes sedimentation
- Reduced agricultural productivity
- Infrastructures damage, etc.

are common problems.
To halt such nature devastating problems:

- SWCPs both physical, biological & biophysical have been practiced for half of a generation age
- 4 - 5 decades
However,

- The natural resource conservation & management works aren’t sustainable,

- Farmers’ are destructing the constructed SWCPs claiming lack of benefits,
- Landscape dis-connectivity/
  
  Slope gradient reduction,

- Soil loss reduction

- Soil fertility improvements

- Crop productivity increment, etc.
Hence,

The objectives of this investigation in the Koga catchment representing the northwest highlands of Ethiopia is,
To investigate the impact of SWCPs on sediment trapping, slope gradient reduction & Maize grain yield improvement
Methodology

- Field experiment
- Field measurement
- Field observation

Statistical analysis

- GIS software
- SPSS
Results

SWCPs are trapping a dry sediment of:

- 26 - 44 kg m$^{-1}$ yr$^{-1}$
- $\sim$55 kg m$^{-1}$ yr$^{-1}$ (Mekonnen et al. 2016)
- $\sim$ 25 kg m$^{-1}$ yr$^{-1}$ (Mekonnen & Getahun, 2020)
- STE $\sim$54%
< 5 yrs old SWCPs

- SB with retention basin trapped more sediment than FJ ridge

- Reason, availability of the retention basin with enough space to trap sediment,
> 10 yrs old SWCPs

- FJ ridges trapped more sediment than SB
- Reason, retention basin was filled by sediment & STE of SB reduced

No maintenance

- But STE of FJ increased
SWCPs are reduced slope gradient by:

- 1.2 % (below 5 yrs)
- 2.2% (5 - 10 yrs)
- 3.2% (10 - 20 yrs)
- 2-3 % in 20 yrs (Mekonnen et al. 2016)
SWCPs are improving crop yield by:

- ~920 kg ha\(^{-1}\) yr\(^{-1}\) Maize
- ~700 kg ha\(^{-1}\) Barley (Mulat et al. 2020)
- 10 -15% (Teshome et al. 2013)
- ETC.
On the contrary,

- No significant soil loss reduction
- Water reservoirs sedimentation is high
- Farmers are using the same rate of fertilizer as before
Nutrient load to water reservoirs is high & causing weed emergency like *water hyacinth*

In general land degradation is still a prime problem
Highlands degradation
Rivers carrying sediment to water reservoirs NW highlands of Ethiopia
Rivers carrying sediment to water reservoirs NW highlands of Ethiopia
Impact of sedimentation on water reservoirs

Koga man-made reservoir
Conclusion

Although the existing SWCPs are

- Trapping large amount of sediment,
- Reducing slope gradient/landscape connectivity,
- Increasing crop yield,
- etc.
- Soil erosion not significantly reduced
- Sedimentation is critical,
- Slope gradient is not minimized,
- Land degradation is the main problem

After half of a generation age
So What ???
Therefore,

- Researchers & experts, are expected to develop alternative approaches or modify the existing practices, after half of a generation age experience.
Thank you