Various explanations can be given for the observed plant species alterations. Historical information indicates that fire was used to enhance the palatable (decreaser) species. This practice might have tampered with the regeneration capacity of the native species through the destruction of seeds and seedlings. Lack of seeds hinders natural regeneration of native/indigenous vegetation (Islam *et al.*, 2001). Probably, the current charcoal burning activities may be worsening the situation. The dominance of *Dodonaea viscosa* in the watershed can be attributed to its great powers of withstanding fire as well as its ability to regenerate very freely, even in dry rocky localities (Dale and Greenway, 1961). Inhibiting regeneration of native species increases the chances of invasive species growing in the area. For instance, it was established that the dominance of *Lantana camara* cut across the three locations compared with other native flora such as *Rhus species*, *Croton dicogamus* and *Tarconanthus camphoratus*.

Heavy grazing also contributes to vegetation composition deterioration. This study affirms this notion. The current dominant species in the watershed are all less palatable. The most palatable species have been grazed or/ and browsed upon to the extent that their natural regeneration capacity has been exceeded. The perception of the locals on overgrazing is however different. Like in the charcoal burning, only 7.5% of the respondents admitted that overgrazing is detrimental. As mentioned earlier, the dominant vegetation type in the watershed is shrub vegetation. Studies have shown that shrubland in ASALs exacerbates soil erosion (Adeel *et al.*, 2005). This study indicated that there is a strong positive correlation (r=0.82) between cover and vegetation type at 0.01 significant levels. This implies 67% of cover can be explained by the type of vegetation. As a plant species increases in size, cover too increases. Tall vegetation, in spite of its cover, is not efficient in protecting the soil from the rain drop impact as compared to the herbaceous vegetation, especially grasses. In addition the unpalatable shrub species have a wide resprouting capability and are highly adaptable in poor site conditions. *Acacia mellifera* was also considered as dominant with 20.3% cover. Although *Acacia mellifera* is considered a good forage tree, the locals believe that no grass grow underneath it. This was confirmed during field observations. However, the truth in this conviction is yet to be established.

3.4 Land Degradation Characterization

Excellent cover (> 70%) dominated the whole watershed with Koibos recording the highest at 18.7% followed by Kapkechui location at 12.5% and Simotwe recording the lowest at 9.4%. Overall, 40.6% of the watershed recorded excellent cover while 31.2% of the area recorded fair cover (45-55%) and 18.8% good cover. There were no portions of poor cover in Kapkechui. Based on this cover class system, vegetation cover in the watershed seems sufficient. The situation is different when using absolute/ straight numbers as indicated in the previous section. The cover class system has the problem of slight errors at the margins of cover classes. For instance, choosing between 30-60% and 60-100% cover classes for a 59.5% cover may lead to huge differences in the overall estimation.

Evident from the results is that the dominant vegetation across the three locations is shrub/tree type. As mentioned earlier, there are more shrubs than trees in the area. The results indicate that 84.4% of the watershed is dominated by shrub/tree vegetation. Grass was found to be the least dominating vegetation with 3.1%. The dominance of herbaceous (forbs) vegetation species was 6.2% twice that of grass. This is a threat to the major livelihood (livestock production) given that most of the dominant shrubs are unpalatable. Poor soil condition and overgrazing are the major factors for the observed trend.

Signs of erosion were recorded during vegetation sampling and household economic survey. The results reveal that no portion of the watershed is free from erosion. Rill erosion is the most prominent type of water erosion in the watershed. There were less gullies (25%) observed near homesteads compared to those further in the fields (34.4%). Sheet erosion dominated in the farms (42.5%) while it was least observed in the fields (15.6%).

The differences in the proportion of erosion recorded in the land cover form and that of the questionnaire can be attributed to the fact that farms near homesteads are taken care of as compared to those further away. One expects to see no/less rills and gullies near homesteads and vice versa. Similar observations have been recorded by Tenge *et al.*, (2004). Sheet, gully and rill erosion were prominent in Kapkechui, Simotwe and Koibos location, respectively (Figure 4).

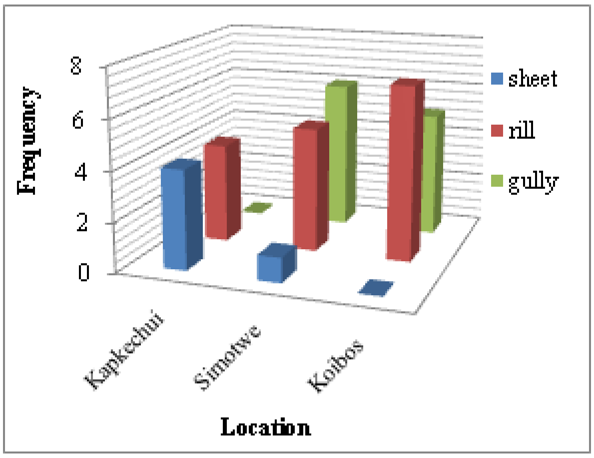

Figure 3: Visible erosion in the three locations

The erosion scenario in the middle section can be explained by the less vegetation cover. The other contributing factor is the low organic matter content which makes the soil aggregates more unstable and susceptible to erosion. In spite of the good crown cover recorded in Koibos location, rills and gullies are outstanding in the location. Rill and gully formation in the lower section of the watershed can be attributed to the high rock cover and the cumulative effect of increased surface runoff from the upper and middle sections of the watershed. In addition trees and shrubs are not effective in protecting the soil.

In general, the results reveal that the whole watershed is degraded. Only 12.5% of the watershed is experiencing moderate land degradation but the rest 87.5% is highly suffering from land degradation. Simotwe location is the most affected region in the watershed.

4. Conclusion and Recommendations

The findings of this study indicate that river Loboi watershed is highly degraded. Vegetation deterioration especially plant species alterations is not only exacerbating the soil degradation processes but also threatening the livelihoods of the locals. The vegetation cover in the river Loboi watershed was established to be 59.6% with *Dodonaea viscosa, Tarconanthus camphoratus, Lantana camara, Acacia mellifera, Acalypha fruitcosa* and *Croton dicogamus* being the dominant species. The current vegetation can neither protect the soil nor provide forage for livestock production. The middle stretch of the river Loboi watershed is the worst hit.

It was also established that lack of knowledge and finances is constraining the locals reaction toward this ecological challenge of land degradation. Therefore, the study demonstrates the need for developing and establishing more effective and scientific ways to curb and monitor land degradation processes in the watershed. In addition keystone plant species that are important for the health and survival of many other native vegetation species in the watershed need to be identified and their dynamics understood.

5. Acknowledgements

We would like to acknowledge the assistance, collaborative effort and encouragement from different sources. Special thanks to Egerton University for research funds, field assistants and local leaders of River Loboi Watershed for their valuable cooperation and information during data collection.

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Author Profile

Gwako Alice Bitengo has a B.Sc. degree in Natural Resources Management and a M.Sc. degree in Environmental Science from Egerton University. She is currently a Teaching Assistant in the Department of Environmental science, Egerton University, Kenya.

Stanley M. Makindi, *Ph.D* is a Senior Lecturer in the Department of Environmental science, Egerton University, Kenya. He holds B.Sc. and M.Sc. degrees in Natural Resources Management (Egerton University, Kenya), a Ph.D. in Environmental Science (University of KwaZulu-Natal, South Africa) and professional training certificates in Sustainable Management of Agriculture and Forestry Resources (University of the Ryukyus, Japan), Environmental Impact Assessment and Audit (Egerton University) amongst others. He has a strong background and experience in consultancy work and research in Conservation science and Environmental assessment.

Wilkister N. Moturi, *Ph.D* holds a Ph.D in Environmental Science. In addition, she has attended various professional courses in various parts of the world and won several awards. She is currently a Senior lecturer and chairperson of Environmental Science Department, Egerton University. She has wide knowledge and experience in the field of Environmental Science and has done research and presented papers in various fora. She has published widely in the field of Environmental health. She is the Kenyan mentor of myclimate; a Swiss based NGO, a reviewer of several journals and the patron of Egerton University Students Association. She is a collaborator with the Family Planning and Environmental Sustainability Assessment (FPESA), a project of the Worldwatch Institute (USA).