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Research Application Summary

The role of environmental education in soil conservation and management in Kalisizo, Rakai district, Uganda

Nassuna, J. [1] & Egeru, A.[2]
[1]Department of Environmental Management, School of Forestry, Environment and Geographical Sciences College of Agriculture and Environmental Sciences, Makerere University, P.O. Box 7062, Kampala, Uganda
[2]Regional Universities Forum for Capacity Building in Agriculture, P.O. Box 16811, Wandegeya, Kampala, Uganda
Corresponding Author: joanitanassuna@yahoo.com

Abstract

This study examined the role of environmental education in soil conservation and management in Rakai District. Data were collected through a mixed methods approach involving the use of cross-sectional survey, focus group discussions and key informant interviews and was descriptively analysed. Findings indicate that over 90% of farmers practice soil conservation and management in one way or another using a combination of indigenous and 'modern' techniques. Adoption of soil conservation practices is perceived by many respondents (97.1%) to be influenced by a decline in soil quality and productivity. Environmental education has had a positive impact among 60% of the farmers in terms of adopting better soil and water conservation measures. This study has shown that providing farmers with learning opportunities leads to a gradual shift towards desired goals such as adoption of soil conservation and management. There is need to educate the public on the benefits of pro-activeness in soil and water conservation and management.

Key words: Adoption, Rakai district, soil conservation, Uganda

Résumé

Cette étude a examiné le rôle de l'éducation environnementale dans la conservation et la gestion des sols dans le district de Rakai. Les données ont été recueillies au moyen d'une approche de méthodes mixtes impliquant l'utilisation d'enquête transversale, des entretiens de groupes et entretiens individuels avec des informateurs clés. La statistique descriptive a été utilisée. Les résultats indiquent que plus de 90% des agriculteurs pratiquent d'une manière ou d'une autre la conservation et la gestion des sols, en utilisant une combinaison de techniques endogènes et 'modernes'. L'adoption de pratiques de conservation des sols est largement perçue par les enquêtés (97,1%) comme une pratique influencée par la baisse de la qualité et de la productivité des sols. L'éducation environnementale a eu un impact positif sur 60% des agriculteurs en termes d'adoption de meilleures mesures de conservation des eaux et des sols. Cette étude a montré que l'offre d'opportunités d'apprentissage aux producteurs permet de vite atteindre des objectifs escomptés, tels que celui de l'adoption de la conservation et de la gestion des

sols. Il est nécessaire d'éduquer le public sur les avantages d'anticipation d'actions dans la conservation et la gestion des sols.

Mots clés: Adoption, district de Rakai, conservation des sols, Ouganda

Introduction

Recommendation 96 of the Stockholm conference on human environment called for development of environmental education. The conference parties believed this as one of the most critical elements in tackling world's environmental crises. It premised that this new environmental education must be broad based and strongly related to the basic principles outlined in the United Nations Declaration on the new international economic order. The recommendation also stressed that environmental education should be directed towards the general public; in particular the ordinary citizens living in rural and urban areas, youth and adult alike. With a view of educating them in simple steps they might take, within their means, to manage and control their environment.

Numerous efforts, since then have been put in place to champion environmental education. In the recent past, these efforts are championed by Non-Governmental Organisations (NGOs) and coalitions such as the Green Peace Movement in Europe and Americas, Earth Conscious, National Green Corps in India and World Overview of Conservation Approaches and Technologies in East Africa. The Indonesian Forum for Environment has a record of over 450 registered NGOs playing a part in environmental education. Efforts seem to have picked quickly in South East Asia. In contrast, sub-Saharan Africa seems to lag behind in a number of ways despite unceasing environmental degradation. Development partners and NGOs in the region have however stressed the importance of tackling environmental degradation mainly because it is a challenge to food security and poverty reduction. This has breathed a lease of life into environmental education as a component of combating environmental degradation. Although, notwithstanding the challenges existing in implementation and organization. Numerous NGOs that sprang up have largely been criticized for being self-seeking. Nonetheless, environmental education has become critical owing to its role in raising awareness and increasing community knowledge on environment and embedded challenges.

Environmental education and conservation has been part and partial of life and practices among African peoples. Folk tales, folk lore, spiritual life, food types and food sources as well as socialization of African peoples held conservation education messages. Several researchers (e.g. Dirwa, 2007; Kaumbutho and Kienzle, 2007; Macchi, 2008) have attested to fact. In sub-Saharan Africa for example, soil conservation has a long tradition; indigenous techniques spanning from pre-colonial era focused on erosion control in combination with water conservation by ridging, mulching, construction of earth bunds and terraces, multiple cropping, bush fallowing, and tree planting (Igbokwe, 1996; Scoones *et al.,* 1996; Shetto, 1999; Neef, 2001). These practices both conserved

and restored soil fertility. Astonishingly, this long tradition of indigenous soil conservation measures has disintegrated. Consequently, soil degradation now ravages most of the African lands, Uganda inclusive.

In Uganda, soil degradation is most pronounced in the "Cattle Corridor," and highland areas. These are the most fragile ecosystems in the country. It is estimated that 4% to 12% of the national GNP is lost to environmental degradation. Soil erosion contributes to about 85% and water contamination 9% of the loss, with biodiversity loss, water hyacinth and deforestation contributing the remainder. By 1991 about USD 170-460 million per annum was lost due to environmental degradation. This value rose steadily to about USD 230-600 million by 2003 (Berry *et al.,* 2003). Soil degradation problems such as erosion and nutrient depletion are of growing concern in the country (Akello, 2002). The International Food Policy Research Institute (IFPRI) has noted that soil fertility depletion, cultivation of marginal lands, continuous cropping, poor soil and crop management practices and government policies that fail to help smallholder farmers are causing declining productivity in Uganda.

Agriculture as well as environmental management in Uganda is managed at district level following the decentralization of service delivery. This means that much of the effort to tackle land and soil conservation lies with the local authorities (Local Governments). Local Governments in Uganda have undertaken environmental education in coordination with other agencies especially NGOs and Community Based Organisations (CBOs) in their areas of jurisdiction. Environmental education programmes are also supported in the education curricular for both primary and secondary school. Although these strides have been implemented, they do not go without challenges. Constrained financial resources, political interference and delivery of contradicting information by some self-seeking politicians are increasingly becoming stumbling blocks to a few gains made. As such, serious land degradation and soil conservation challenges still pertain in rural areas of Uganda particularly in the dryland areas. It is within this background that this study was conceived to investigate the contribution of environmental education in soil conservation and management in Rakai District, Uganda.

Methodology

Study area

Rakai District lies in south western Uganda, about 200 km southwest of Kampala. The district has four counties (Kabula, Kakuto, Kyotera and Kooki) and 22 sub-counties. The district is bordered by Masaka district to the east, north and north east, Mbarara district to the west and Ssembabule district to the northwest, Lake Victoria to the south east and the Republic of Tanzania to the south. Rakai district is part of the broader cattle corridor of Uganda. This study was specifically carried in Kalisizo sub-county. The area experiences a bi-model modified equatorial climate. However, it also experiences frequent climate variabilities leading to drought and floods. Rakai has a diversity of vegetation ranging from medium altitude forests on the shores of Lake Victoria, through

swamps, savannah and communities on sites with impeded drainage, to past cultivation communities. Over 75% of district is underlined with ferritic soils in the final stage of weathering with little or no minerals reserves left. Some heavy clay varieties have some fertility but sandy varieties are particularly poor. Other types include lithosols, alluvial and lacustrine sands and alluvial clays. Over 90% of the population is constituted by rural dwellers with 85% engaged primarily in agriculture. Livestock also punctuates the livelihood sources in Rakai; in general the people of Rakai can be described as agro-pastoralists.

Data collection and analysis

A total of 35 households were purposively selected for this study. Semi-structured questionnaires were administered to selected households to assess their knowledge on the role environmental education has played in soil and water conservation. Respondents were particularly asked to identify soil conservation practices in use in their community, identify what factors influence the farmers to adopt soil conservation and how environmental education has contributed to this practice. In addition to guided interviews, focus group discussions were conducted with village elders, women and youths. Two focus group discussions were conducted in total. Further, interviews were conducted with key informants and these included the area Local Council Chairpersons. Household responses were analysed descriptively using SPSS V.16 while FGD comments were analysed based on emerging themes.

Results

Socio-Demographic characteristics of the Respondents

Results show that 74.3% of the respondents were male while 25.7% were female of these, sixty per cent (60.0%) were married, 29.9% were single, and 14.3% were widowed (Table 1). About 46% of the respondents had attained primary level education, 11.4% secondary education, 17.1% attained tertiary level education while 25.7% had no formal education. Over 90% of the respondents were involved in farming with at least 11.4% of these engaging in organic farming.

Knowledge of soils and problems faced relating to soils

Over 65% of the respondents did not have knowledge of soils they were using for farming; they could only describe the soils by appearance but did not have proper knowledge on local names. From the 32% respondents who had knowledge of soil names, they enumerated the following as soils found in Kalisizo and Rakai district: Lidugavu, Lukuusi, Luyinjayinja, Kisenyi, and Lwazi. Soil erosion was identified as the major problem affecting soils in Kalisizo sub-county; this was followed by pests and diseases, decline in soil fertility and decline in soil quality (Table 2). These problems were also ranked by order of adversity as portrayed in Table 2.

Table 1: Socio- demographic characteristics of respondents

Characteristic	Response	Percentage
Sex	Male	74.3
	Female	25.7
Marital status	Single	29.9
	Married	60.0
	Divorced	2.9
	Widowed	14.3
Education level	Primary level	45.7
	Secondary level	11.4
	Tertiary level	17.1
	No formal education	25.7
Activities	Farming	94.3
	Organic farming	11.4

Table 2: Problems faced in the area that relate to soils

Problems	Percentage
Soil erosion	47.1
Pests and diseases	20.6
Soil infertility	10.3
Decline in soil quality	8.8
Decline in soil productivity	5.9
Bare grounds	2.9
Hardening of the soil	1.5
Reduction in crop yields	1.5
Nutrient loss	1.5

Soil conservation and management practices

A considerable number of farmers (94%) acknowledged to using one or more forms of soil conservation practice in one way or another. Respondents perceived some practices as indigenous while others as 'modern' practices of soil conservation. Applying of manure, incorporation of crop residues and crop rotation were perceived as traditional (indigenous). A combination of organic manure application, crop rotation and use crop residues were the dominant soil conservation and management practices with 18% of the farmers using them. This was followed by farmers using a combination of manure application and crop rotation (15%), 9% applied manure. Generally, all the other methods of soil conservation and management were used by farmers between 2-3 per cent. These practices included multiple cropping and cover crops (Fig.1), fallowing, and planting live fence around their gardens, use water ways, agro-forestry, intercropping and stone rows.

Figure 1: Multiple cropping Figure 2: Mulching

Respondents categorized use of mulching (figure 2), water ways, vegetative cover, agro- forestry, intercropping and structures as 'modern' practices of soil conservation that have been promoted by environmental education. It was noted that use of water ways (15%) is the most current practice adopted by farmers in the area due to its ability to control sheet erosion, this is followed by agro-forestry (9%) because of its multiple benefits, multiple cropping (6%) because of its multiple food benefits. Other methods identified were a combination of traditional and perceived 'modern' practices.

Perceived factors influencing adoption of soil conservation practices

Respondents observed that they adopted soil conservation and management practices because of the benefits associated with adoption. Respondents identified reduction in soil erosion, improved soil productivity, improved yields, reduction in pests and diseases, increased soil deposition, increased soil quality all that contributed to increased food production as major benefits of adoption. Further 94.1% of the respondents noted that they turned to soil conservation and management due to decline in soil quality. They identified low yields and productivity, increased soil erosion, increased presence of weeds and poor soil structure as evidence for reduced soil quality (Figure 3).

Environmental education featured as a key factor in influencing their adoption of soil conservation and management practices. The over 40% of the respondents who acknowledged to receiving environmental education noted that fellow farmers (6.7%), seminars (3.3%), radios (23.3%), newspapers (16.7%), extension workers (3.3%), National Agricultural Advisory Services (NAADS) seminars (23.3%) and schools (6.7%) were the major sources of soil conservation and management information (figure 4). Over 50% of the respondents noted that environmental education has been responsible for raising awareness on the need for soil and water conservation, 20% noted that it had contributed to the introduction of new soil conservation practices and 10% observed that it had contributed to reduction in soil erosion. Other contributions of environmental education identified included improvement in soil fertility and improvement in yields. Ninety seven per cent (97.1%) of the respondents observed that they adopted soil

conservation and management because of the declining quality of their soils. They identified the increased soil erosion, lower yields and productivity, bare grounds, pests and diseases frequency, dominance of weeds and increasing presence of striga as indicative of soil quality decline.

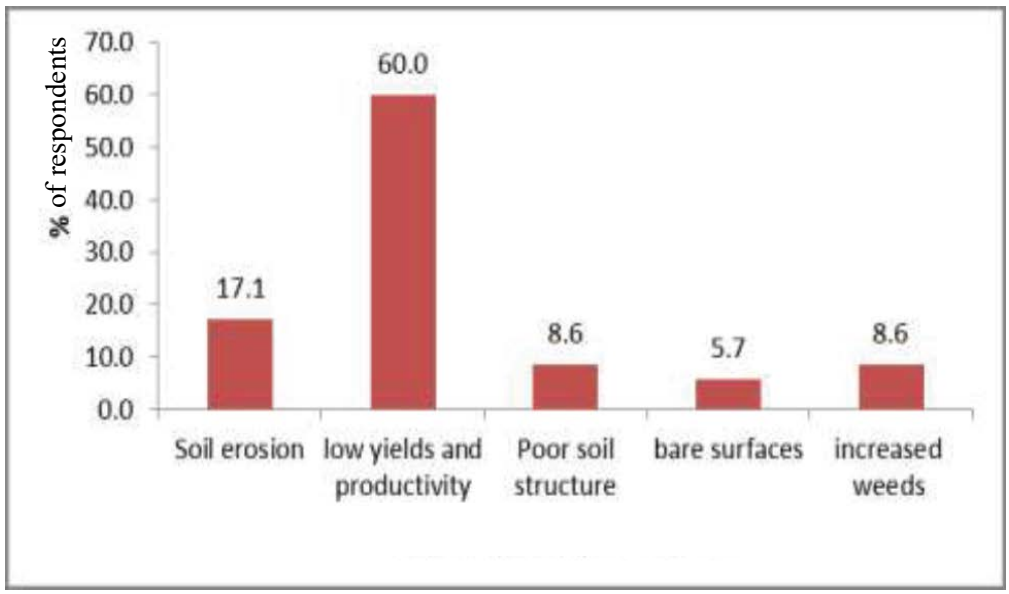

Figure 3: Perceived indicators of soil quality decline

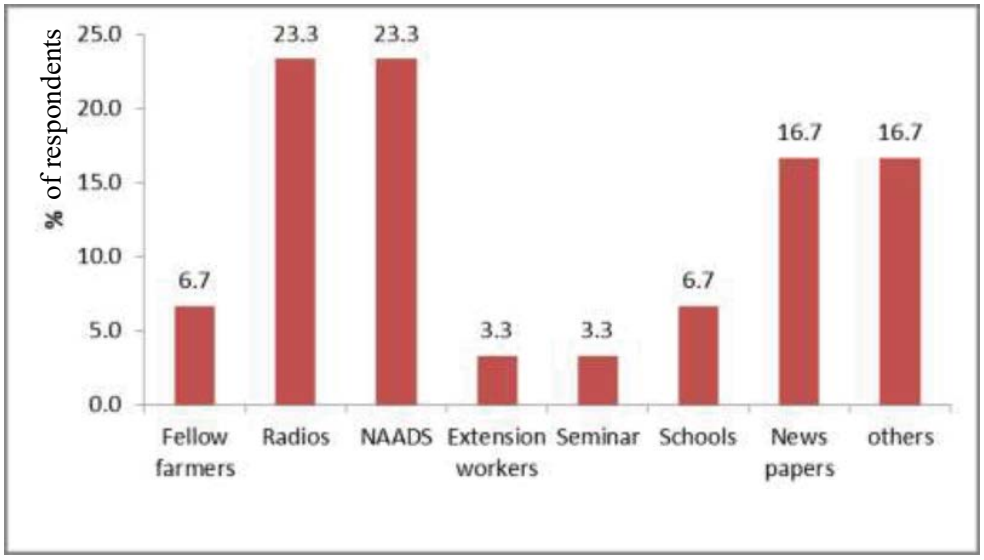

Figure 4: Sources of soil conservation and management information

Discussion

Gauging by the number of respondents, subsistence farming is still a major engagement in Rakai district. This may not be in a downward trend in at least the next decade given the nature and size of farming units. Consequently, having productive soils will remain imperative for the people of Kalisizo. Although the number of households engaged in subsistence cultivation may appear rather too big above the 68% national average depicted by Uganda Bureau of Statistics (UBOS); it does not challenge the centrality of subsistence farming as a livelihood source. Studies conducted elsewhere in Uganda (Mugisha, 2002; Kaggwa *et al.,* 2004; Egeru *et al.,* 2011; Barua, 2011) at a small-scale such as district, county and sub-county level have also indicated a high dependence on subsistence agriculture. The percent number of households found in these other studies to depend agriculture ranges between 70% to slightly above 90 percent depending on the study scope.

There is already a commendable number of small-holders using soil conservation measures in one form or another. The admittance of benefits from soil conservation is a strength that needs to be used as a pillar in environmental education campaigns. With over 90% of the respondents indicating that they turned to soil conservation due to decline in soil quality; there a window of opportunity to draw more subsistence households into utilizing a conservation techniques available. Offering subsistence holders a menu of techniques that will deliver economic benefits, increased productivity as well as that which is affordable to implement on farm will probably increase adoption. Several scientists (Manjoro, 2006; Porras *et al.,* 2007; Leyva *et al.,* 2007; Junge *et al.,* 2008; Prager and Posthumus, 2010) have indicated greater adoption of soil conservation technologies and practices where benefits are foreseeable and where farmers are negatively impacted. Further, utilizing the wealth of experience from the farming community will provide a window for increased attention to environmental education and adoption soil conservation. This is because the farming community is the 'experienced scientists'. They are the ones that till the land.

Environmental education in Rakai is conducted in various media and mechanisms such as radios, newspapers, education and workshops. While most of these channels are primarily used to raise awareness, the practical aspects associated with various soil conservation techniques barely addressed. Further, what farmers noted as extension workers were field staff deployed by local CBOs intermittently. These, due to limited training leave out technical intervention components of soil conservation techniques. A number of them are neither trained in agricultural sciences nor in agricultural extension. The channels of communication such as newspapers, workshops, and radios provide general information on soil conservation. This information is meant for the broader public; it is not target specific. However, according to Manjoro (2006) the organisation of soil conservation programmes ought to be more participatory and based on adequate knowledge of intended beneficiaries. This allows for the introduction of more suitable

practices to beneficiaries and offers opportunity for higher adoption levels.

Conclusion

This study has shown that subsistence farmers are often reactive to a given shock. As has been evidenced here, a perceived decline in on-farm crop productivity necessitated adoption of soil conservation measures. Environmental education plays a role in adoption of soil conservation measures though it is not the ultimate pushing factor. Awareness campaigns need not to cease. Efforts should be geared towards making subsistence holders in Rakai appreciate the benefits of soil conservation. There is equally need for joint initiatives between GoU, Local Governments, NGOs and CBOs to develop joint initiatives and standards for soil conservation and environmental education programmes. These initiatives should include package of information including practical steps for implementing a particular method. This should be locally available in local dialects. Finally, there is need to undertake scientific studies on the effectiveness of some soil conservation methods in use as well as the economic returns associated with their utilisation.

References

Akello, G. 2002. The Role of Micro-Credit in Addressing Land Degradation in Uganda: In: Policies for Sustainable Land Management in the East African Highlands. Benin, S., Pender J. and Ehui, S. (Eds.). Washington, D.C. and Nairobi, Kenya: International Food Policy Research Institute and International Livestock Research Institute.

Barua, P. 2011. Assessment of the Short-Run Impact of Brac's Agriculture and Livestock Programme in Uganda. Research and Evaluation Unit, BRAC, Uganda. http://addis2011.ifpri.info/files/2011/10/Paper_2C_Proloy-Barua.pdf, Accessed on 21/03/2012

Berry, L., Olson, J. and Campbell, D. 2003. Assessing the extent, cost, and impact of land degradation at thenational level: Findings and lessons learned from seven pilot case studies. Global Mechanism with Support from the World Bank. http://www.global-mechanism.org/dynamic/documents/document_file/cost-of-land-degradation-case-studies.pdf. Accessed on 10th November, 2011

Dirwa, C. 2007. Sustainable environmental management: An ethno-based approach; the case of totems, spirostachys africana and acacia nigrescens in conserving Zimbabwean fauna and flora. *Journal of Sustainable Development in Africa* 9 (4): 48-80.

Egeru, A. 2011. Subsistence holders and fuelwood demand: Subsistence cultivation and fuelwood dependence a hostage situation in Olio Sub-county. What next? Lambert Academic Publishing, Saarbrucken, Germany. ISBN 978-3-8443-1808-1

Igbokwe, E.M. 1996. A soil and water conservation system under threat. A visit to Maku, Nigeria. In: Sustaining the soil - indigenous soil and water conservation in Africa. Reij, C., Scoones, I. and Toulmin, C. (Eds.). 219-243 pp. London: Earthscan

Publication.

Junge, B., Abaidoo R., Chikoye D. and Stahr K. 2008. Soil Conservation in Nigeria: Past and Present On-Station and On-Farm Initiatives. Soil and water conservation Society. http://www.swcs.org/documents/filelibrary/SoilConservationInNigeria.pdf Accessed on 12/12/2011.

Kaggwa, R., Hogan, R. and Gowa. E. 2004. Land use change, land degradation and human welfare: Lessons learned from the Lake Kyoga catchment area. Policy Brief. UND-UNEP Poverty-Environment Initiative, Nairobi Kenya.

Kaumbutho, P. and Kienzle, J. (eds.). 2007. Conservation Agriculture as practiced in Kenya: Two case studies. A joint publication of FAO, CIRAD, ACT and World Agroforestry Center. ISBN: 9966-7219-0-8.

Leyva, C.J., Martinez, J.A.F. and Roa, M.C.G. 2007. Analysis of the adoption of soil conservation practices in Olive Groves: The case of mountainous areas in southern Spain. *Spanish Journal of Agricultural Research* 5 (3): 249-258.

Macchi, M. 2008. Indigenous and traditional peoples and climate change. Issue Paper. IUCN. http://cmsdata.iucn.org/downloads/indigenous_peoples_climate_change.pdf. Accessed on 21/03/2012.

Manjoro, M. 2006. Understanding farmers: Explaining soil and water conservation behaviour in small-holder farmers in southern Zimbabwe. http://www.jsd-africa.com/Jsda/Spring2006PDF/ARC_Understanding%20Farmers.pdf. Accessed on 21/03/2012

Porras, I., Grieg-Gran, M. and Meijerink, G. 2007. Farmer's adoption of soil and water conservation: Potential role of payments for watershed services. Green Water Credits Report 5, ISRIC-World Soil Information, Wageningen. http://www.isric.org/isric/webdocs/docs/GWC_Report_5.pdf. Accessed on 21/03/2012.

Prager, K. 2008. Soil sonservation and policy measures findings from eight case studies across Europe. Website of the SoCo Project. Sustainable Agriculture and Soil Conservation. Available at http://soco.jrc.ec.europa.eu. Accessed on 01/02/2012.

Prager, K. and Posthumus, H. 2010a. Socio-economic factors influencing farmers' adoption of soil conservation practices in Europe. In: Human dimensions of soil and water conservation: A global perspective on agriculture issues and policies. Nova Science Publishers, Inc., Hauppauge, NY, USA. ISBN 978-7-61728-957-6.

Prager, K. and Posthumus, H. 2010b. Adopting sustainable soil management-the role of socio-economic factors. A paper for the 16th Annual International Sustainable Development Research Conference, Hong Kong, China. http://www.kadinst.hku.hk/sdconf10/Papers_PDF/p136.pdf. Accessed on 21/03/2012.

Mugisha, S. 2002. Patterns and root causes of land cover/use change in Uganda: An acccount of the past 100 years. Land use change and impact dynamics (LUCID). International Livestock Research Institute (ILRI), Nairobi, Kenya.

Neef, A. 2001. Land tenure and soil conservation practices-evidence from West Africa and Southeast Asia. In: Stott, D.E., Mohtar, R.H. and Steinhardt, G.C. (eds). Sustaining the Global Farm. Selected papers from the 10th International Soil Conservation Organisation Meeting held on May 24-29, 1999 at Purdue University

and the USDA-ARS National Soil Erosion Laboratory. http://topsoil.nserl.purdue.edu/nserlwebold/isco99/pdf/ISCOdisc/SustainingTheGlobalFarm/P238-Neef.pdf. Accessed on 20th/03/2012

Shetto, R.M. 1999. Indigenous soil conservation tillage systems and risks of animal traction on land degradation in Eastern and Southern Africa. MARTI Uyole. Mbeya, Tanzania. http://www.atnesa.org/contil/contil-shetto-indigenous.pdf. Accessed on 21/03/2012