JOURNAL OF AGRICULTURE & SOCIAL SCIENCES
ISSN Print: 1813–2235; ISSN Online: 1814–960X
08–038/AWB/2009/5–4–128–130
http://www.fspublishers.org

Full Length Article

Impacts of Traditional Soil Conservation Practices in Sustainable Food Production

I.J. TEKWA[1] AND M.D. BELEL
Department of Agricultural Technology, Federal Polytechnic, Mubi, Nigeria
[1]Corresponding author's e-mail: Mustaphabelel@yahoo.com

ABSTRACT

Soil is the most age long indispensable rudiment in sustainable crop production. Success to such lies in the soil conservation practice in use. In this study, some traditional soil conservation practice applicable to nine locations (Humbutodi, Wuro-Gendeji, Gella, Lamorde, Mararraba, Digil, Yewa & Duda) within Mubi area were evaluated. Identified soil conservation practices recorded differing impacts in the locations studied. Hillside terraces, Earth-contour bunds and stone-bunds impacts stood tall among other methods in conserving large erosion associated losses characteristic of the Mubi undulating topography. The challenging concepts to strike a timeless supply of food through suitably compatible traditional soil conservation practices in the study area are discussed. It is hoped that prospective farmers could integrate viable and affordable conservation practices as a road map in achieving the purported food availability in Mubi.

Key Words: Traditional conservation; Impact; Food production

INTRODUCTION

Over the centuries, intensive systems of traditional soil conservation practices have been developed by local farmers around the Mandara Mountains of Northern Nigeria to restore and maintain soil fertility for sustainable food production. Traditional soil conservation measures appears indispensably crucial and can best be understood as farming practices that evolved over the course of time through periodic experience, observation, political and ecological conditions (Reij *et al*., 1996).

In recent years, farmers have acknowledged prioritizing the invitation of holistic integration of traditional realistic conservation wits such as hillside-terraces, stone-lines and bunds, earth-contour bunds, sand-bags, trash-lines, organic manuring and mulching, packaged to deliver profitable crop production stably in sufficient quantities. However incompatible land use methods such as the modern fragile conservation technologies practiced in some soil environments has been an age long limitation to sustainable crop production(Reij *et al.*,1996). This singular mishap has arrived most arable lands into perpetual degradation (Anonymous, 1995). Consequently, crop returns depletes sharply and translate into prohibitive food dearth and starvation among human population (FAO, 1996). In Nigeria for instance, farmers who once grew enough now experience declining crop returns (Olawoye, 2000). This event not only ignites alarming attention, instead, it lit up an invitation to revitalization of existing farming culture capable of mitigating our potentially fertile soils into food baskets. This drive is achievable through appreciated practice of affordably promising traditional conservation practices evident in the study area.

Mubi and its environments are of noble agricultural history that is embattled by variable factors of land degradation. Hence only little sensitization work on this menace is documented. This investigation therefore was purported to evaluate and recommend compatible options of traditionally based conservation practices towards sustainable food production in the study area.

MATERIALS AND METHODS

Study area. Mubi is located in the North eastern part of Adamawa state, Nigeria. It has a land area of 504.40 square km with a population size of 759,045 at a density of 160.5 persons per square km. It borders Michika local government area to the north, Askira-Uba of Borno state to the west and Hong local government to the south. Its eastern boundary belts the Nigeria-Cameroon borders by the Mandara Mountain ranges. Mubi is located between latitude 9°26' and 10°10'N and longitudes 13°1' and 13°44'E (Nwagboso & Uyanga, 1999). The area is marked by tropical wet and dry climate, where dry season spans from November to March, while wet season last between April and October seasonally with a mean annual rainfall from 700 mm to 1,050 mm (Udo, 1970; Adebayo, 2004). The vegetation is typically a Sudan savannah type, which connotes grassland interposed by shrubs and few trees mainly Acacia, Eucalyptus, Lucost bean tree among others (Adebayo, 2004; Tekwa & Usman, 2006). The predominant physical feature in the area is the Mandara Mountain, which extends through

To cite this paper: Tekwa, I.J. and M.D. Belel, 2009. Impacts of traditional soil conservation practices in sustainable food production. *J. Agric. Soc. Sci.*, 5: 128–130

the length of Mubi. It usually has mixed assemblages of scattered granite outcrops on a gentle steep slope with dissected surfaces (Udo, 1970). The land use type is basically arable farming and livestock production.

Data collection. The research adopted purposive sampling techniques to collect primary and secondary data using randomly administered questionnaires (Table I) and on-farm personal interviews with farmers practicing traditional soil conservation methods. Other sources were: field surveys and existing literatures. Findings are scoped for use within the study area. The research period was between April and November, 2005.

Data analysis. The analytical tool employed in treating the data collected were percentage rates and comparative assessments between practices and locations studied. The soil samples were analysed in the laboratory using standard procedures. The particle size distribution was determined using the hydrometer method (Sheldrick & Hand Wang, 1993) from where the texture was obtained using the soil textural triangle, while the land slopes were measured using the Abney level.

RESULTS AND DISCUSSION

The results of field parameters such as traditional conservation practices with corresponding impacts are presented in Table II. The present land-use varied from arable farming (Humbutodi & Wuro-Gendeji), orchard farming (Hurida) to animal grazing/arable farming in the area studied. The site vegetation reveals typical savannah grass lands interposed by few trees and shrubs at varying densities. The land slopes ranged between gentle (0-4%) slopes (Digil, Humbutodi & Mararraba) and steep (20-22%) slopes (Duda & Gella). The slope nature influenced the extent of land degradation evident in the area (Table II). This event agrees with the report of Tekwa and Usman (2006) that slope nature dictates the extents of soil erosion especially in gully prone environment.

The result of the particle size distribution gave a textural class of predominantly sandy clay loam (SCL) textures that are largely militated by surface erosion. Both the Wuro-Gendeji loamy-sand (LS) and Hurida sandy-loam (SL) textured soils were confronted by impeded drainage problems, especially at peaks of rainy seasons. Corresponding traditional conservation practices adopted were earth-contour bunds, drainage ditches and sand bag lines used for redirecting the and channelizing run offs to achieve good drainage. Areas with sandy clay loam (SCL) textures (digil,Yewa, & Lamorde) experienced surface erosion including sheet and rills with mild gulling incidence in Lamorde. This degradation occurrence could be attributed to soil topography (Ray, 2008). Compatible soil conservation measures such as sand bag lines, stone bunds and vegetative barriers were timely established as check to the erosion scourge evident in some of the areas studied (Table II).

Basically the traditional soil and water conservation practices in place tallies the land use methods and the soil topography. It was equally observed that not all measures are suitable for combating every soil degrading agent operative in a place (Reij *et al.*, 1996). Other measures such as the Hillside terraces proved effective in areas marked by steep slopes/terrains (Gella & Duda) compared to application of earth contour bunds and drainage ditches in gentle to moderately sloping (Humbutodi & Wuro Gendeji) loamy areas with poor drainages. Trash- lines, Rice- bran mulch and organic manuring appears of nutritional significance in areas such as Mararraba, Hurida, Digil and Yewa sites. The noticed high crop returns in these areas seem a function of the established traditional conservation measures that are farmer friendly in nature.

Other results on the analysed field data are presented in Table III. The results revealed that the farmers' experiences in traditional conservation practice were generally ample for any valuable evaluations. Major crops grown in the area include: maize, sugar-cane, rice, sweet potatoes, guinea corn and vegetables. Crop establishment in the locations followed compatibility to land use, soil texture and topography as much as the traditional conservation practices in place (Ekwue & Tashiwa, 1992; Tekwa & Usman, 2006).

These land-use suitability guides, yielded commensurably in crop returns in the areas (Table II). Precisely, maize yields in Digil and Lamorde recorded quite impressive results. Duda and Gella, which cultivated Guinea corn on their Hillside terraced farms equally yielded moderately, while Yewa, Hurida and Humbutodi flood plains, where sugarcane, vegetables and sweet potatoes were respectively cultivated indicated quite high crop returns. This yield rates could likely be due to the soil nature and moisture regimes and as facilitated by the traditional conservation practices over time periods. Reij *et al.* (1996) reported similar for crop husbandry practices in the Mandara Mountains of Northern Cameroon.

CONCLUSION

Traditional soil conservation practices are ever farmer-friendly crop management machine, for gearing sustainable food production in our generation. However correct sense of land–use application with compatible traditional soil conservation practice are to be cherished with utmost levels of concern, as its poor application could trigger land degradation into a prohibitive threshold limits. Subsequent field surveys are hoped to employ more practicable conservation trials as an effort to integrate a number of practices in same farming unit. This could explore virgin ideas not earlier implemented by existing farmers. It is recommended that traditional farmers should incorporate modern conservation practices e.g., use of herbicides, organic and inorganic soil fertilization as replacements to some of the soil disturbing conservation practices evident in the area studied.

Table I. Questions included in the questionnaire given to farmers

1. Name
2. Nature of farming
3. Location in Mubi area
4. Age of respondent
5. Number of years in farming: (a) 1-5 years (b) 5-10 years (c) 10-15 years (d) 15-20 years (e) Above 20 years
6. Type of crop grown (a) Maize (b) guinea corn (c) sweet potato (d) sugar cane (e) Others
7. Land degradation factor experienced (a) Gully erosion (b)sheet erosion (c) impeded drainage (d) gully/landslide erosion (e) Others
8. Type of conservation method (s) practiced (a) Rice bran mulch (b) House hold Refuse (c) terracing (d) earth contour bunds (e) Sand bags (f) vegetative barriers (g) others
9. How successful is the conservation method practiced? (a) Very successful (70-100%), (b) successful (51-69%), (c) Moderately successful (31-50%), (d) Marginally successful (11-30%) and (e) Not successful (0-10%)
10. What is the extent of land degradation experienced? (a) Very devastating, (b) Devastating, (c) Mildly Devastating and (d) Not Devastating

Table II. Field Parameters

Farming locations	Present Land-use	Vegetation	Land slope (%)	Soil texture	Major Degradation	Traditional conservation practices	Corresponding conservation impacts
Digil	Arable farming Animal grazing	Few trees, grasses and shrubs	0 -4	SCL	Sheet erosion, Gully/Landslide	Rice bran mulch, Trash lines, Vegetative Barriers, Sand bags	Protect soil surface, retain earth and conserve moisture
Yewa	Arable farming Animal grazing	Few trees, grasses and shrubs	4 -6	SCL	Sheet and Gully erosion	Vegetative barriers, Trash Lines, Sand Bags and Stone bunds	Protect gully and sheet erosion advances
Duda	Arable farming Animal grazing	Few trees, grasses and shrubs	20 -22	SICL	Rill and Gully erosion	Stone bunds, Hillside terraces, and stone lines	Protect gully and sheet erosion and holds back water
Lamorde	Arable farming Animal grazing	Few trees, grasses and shrubs	18 -20	SCL	Rill and Gully erosion	Stone bunds ,Hillside terraces and Sand bags lines	Protect gully and sheet erosion and holds back water
Humbutodi	Arable farming	Tall grasses, few trees, and shrubs	0 -4	CL	Impeded drainage	Earth contour bunds, sand bags lines and drainage ditches	Redirect run offs and encourage good drainage
Wuro-Gendeji	Arable farming	Tall grasses, few trees	6 -8	LS	Impeded drainage	Earth contour bunds, sand bags lines and drainage ditches	Redirect run offs and encourage good drainage
Hurida	Orchards	Trees and shrubs	8 -10	SL	Gully/Landslide	Stone lines, vegetative barriers sand bags lines and trash lines	Check gully, retain earth and conserves moisture.
Gella	Arable farming Animal grazing	Trees, shrubs and Few grasses	20 -22	SC	Rill and Gully erosion	Stone bunds, hillside terraces, stone lines and stone walls	Protect gully/sheet erosion, holds back water and traps eroded particle
Mararraba	Arable farming Animal grazing	Few trees, grasses and shrubs	0 -4	SICL	Sheet erosion, limited nutrients	Organic manuring, rice bran mulch and trash lines	Conserve moisture and provide plants nutrients.

Key: SCL=Sandy Clay Loam, SC=Sandy clay, SICL= Silty clay Loam, SiL= Silt loam, SL=Sandy Loam, LS=Loamy Sand, CL=Clay loam
Source: Field Survey

Table III. Survey analysis of the study

Farming Location	Average Farming Experience (Years)	Major Crops Grown	Percentage crop returns (%)
Digil	7 -18	Maize	High (60-68)
Yewa	10 – 22	Sugar cane	Very-high (70-82)
Duda	5 -16	Guinea corn	Moderate(40-55)
Lamorde	4 -20	Maize	Moderate to High (45-62)
Humbutodi	11 -25	Sweet potato	Moderate to High (55-70)
Wuro- Gendeji	8 -19	Rice	Moderate (40-51)
Hurida	6-18	Vegetables	Very High(65-76)
Gella	12 -28	Guinea corn	Low to Moderate (35-58)
Mararraba	14 -21	Ground nuts	Moderate (42-56)

Source: Field Survey

REFERENCES

Adebayo, A.A., 2004. *Mubi Region: A Geographical Synthesis*, 1st edition, pp: 17–25. Paraclete Publishers, Yola-Nigeria

Anonymous, 1995. Soil conservation Techniques package. *Spores*, 47: 1–4

Ekwue, E.I. and Y.I. Tashiwa, 1992. Survey of gully erosion features in Mubi local government area of Adamawa State. *Annl. Borno*., 8/9: 181–191

FAO, 1996. Socio-Political and Economic Environment for Food Security. Food and Agriculture Organization of the United Nations. *World Food Summit*., 1: 1–4

Nwagboso, N.K. and J.T. Uyanga, 1999. Population. *In*: Adebayo, A.A. and A.L. Tukur (eds.), *Adamawa State in Maps*, p: 92. Department of Geography F.U.T. Yola, Nigeria

Olawoye, H.U., 2000. Soil conservation and food production: Implications for Nigerian Soils. *J. Sci*., 2: 11–19

Ray, H.H., 2008. The Effectives of Soil Conservation on the properties of a Lithosol in Mubi Area, Adamawa State. *J. Sust. Dev. Agric. Environ.*, 3: 104–109

Reij, C., I. Scoones and C. Toulmin, 1996. *Sustaining the Soil: Indigenous Soil and Water Conservationin Africa*. Earthscan, Publication Ltd, London

Sheldrick, B. and C. Hand Wang, 1993. Particle size distribution. *In*: Carter, M.R. (ed.), *Soil Sampling and Methods of Analysis*, pp: 495–511. Canadian Society of Soil Science, Lewis Publishers, Annl Arbor MI

Tekwa, I.J. and B.H. Usman, 2006. Estimation of soil loss by gully erosion in Mubi, Adamawa State, Nigeria. *J. Environ.*, 1: 35–43

Udo, R.K., 1970. *Geographical Regions of Nigeria*, 1st edition, pp: 195–197. Heinemann, London

(Received 24 September 2009; Accepted 28 September 2009)