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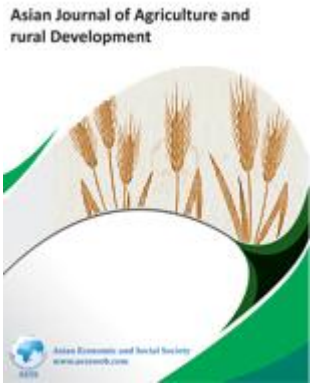

Adopted Engineering and Agronomic Conservation Measures of Agricultural Land Use in Lafia L. G. A. Nasarawa State of Nigeria

Jonathan Kuje Yohanna (Department of Agricultural Engineering Technology, College of Agriculture, P M B 33, Lafia, Nasarawa State, Nigeria)

Simeon Ode (Department of Agricultural Engineering Technology, College of Agriculture, P M B 33, Lafia, Nasarawa State, Nigeria)

Habiba K. Ali (Department of Agricultural Engineering Technology, College of Agriculture, P M B 33, Lafia, Nasarawa State, Nigeria)

Usman A. Fulani (Department of Agricultural Engineering Technology, College of Agriculture, P M B 33, Lafia, Nasarawa State, Nigeria)

Azagaku E. Dominic (Department of Crop Production Technology College of Agriculture, P M B 33, Lafia, Nasarawa State, Nigeria)

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Author(s)

Jonathan Kuje Yohanna
Department of Agricultural Engineering Technology, College of Agriculture, Lafia, Nasarawa State, Nigeria
Email:engrkuje@yahoo.com

Simeon Ode
Department of Agricultural Engineering Technology, College of Agriculture, Lafia, Nasarawa State, Nigeria

Habiba, K. Ali
Department of Agricultural Engineering Technology, College of Agriculture, Lafia, Nasarawa State, Nigeria

Usman, A. Fulani
Department of Agricultural Engineering Technology, College of Agriculture, Lafia, Nasarawa State, Nigeria

Azagaku, E. Dominic
Department of Crop Production Technology, College of Agriculture, Lafia, Nasarawa State, Nigeria

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Abstract

The study examined agricultural land use and adopted conservation measures in Lafia local government Area of Nasarawa state. The data were collected by oral interview and structured questionnaire. Two hundred farmers were randomly selected across the local government area. The field survey revealed that 42% of the farmers are at the range of 35-45 years of age. 60% of the farmers within the study area don't practice irrigation farming. The results also showed that 58% of the farmers have attended post primary school. 66% of the land area is relatively flat thereby leading to moderate erosion. 88% of the farmers used local methods of cultivation leading to small area (1-4ha) of land being cultivated per a farmer. 44% of the farmers experienced sheet erosion on their farm lands leading to 40% of low yield. 22% of the farmers practiced most of the conservation practices on the land to minimize soil degradation and nutrient restoration. 40% of farmers surveyed encountered problem of high cost of labour and 46% of them obtained loan from the agricultural bank to solve some of the problems encountered. It is therefore recommended among other things that agricultural land use should be studied and conservation methods should be adopted to increase agricultural production in the study area.

Keywords: Conservation Measures, Adoption, Agricultural Land Use, Lafia

Introduction

Land refers not just to soil but the combined resources of terrain, water, soil, and vegetation that provide the basis of land use (Pieri et al., 1995; King, 2009 and Ezeaku, 2011). The concept of land has been defined as the area of the earth`s surface, the characteristics of which embraces all reasonably stable or predictable cyclic attributes of the atmosphere vertically above and below this area, including those of the atmosphere, the plant and animal population and the result of the past and present human activities, to the extent that the attributes exert a significant influence on the present and future uses of the land (FAO, 1976). Land has also been referred to as the totality of fundamentals to our existence (Akamigbo, 1999).

Land use and town planners, surveyors and other professions refers it to that portion of the earth which input and use by man for specific or particular purpose (Naguto and Usman, 2004). Land use also has been defined by Vink (1975) as any kind of permanent or cyclic intervention to satisfy human needs from complex of material and artificial resources which together constitute land. According to Odingo (1991), land use in Africa is excessively influenced by existing ecological conditions and is in turn influenced by the pattern of use which have been set by previous generations and administrators depending on the land and level of technology which was available to them at that time. Due to changing human needs and competition for different uses of land, there is need for systematic land use planning where land evaluation serves as a basis for land use planning.

Land degradation in Nigeria may be grouped into soil erosion, soil fertility and soil pollution by soil spillage and industrial waste (Asadu et al., 2001, 2004) soil degradation is accelerated when the forest cover is removed or pasture are overgrazed . Soil compaction could be as a result of misuse of machinery on agricultural soils or over-grazing. A soil that has been degraded required fallowing for effective rehabilitation. Soil degradation refers to the processes through which soil productivity is reduced (Hulugalle 1992; Lal, 1993; Steiner, 1996). Soil productivity is the capacity of a soil

to produce a certain yield of crops or other plants with a specified management system (Kang et al. 1999a). In rehabilitating a degraded soil, the level of degradation must be put into consideration as this would influence rate of soil recovery or soil resilience. Kay (1990) defined resilience of soil structure as the ability of a soil to recover its structural form through natural processes when applied stresses are reduced or removed. Land degradation due to nutrient, mining, erosion, and desertification is the major problem facing crop production in Nigeria. Over the years farmers have relied on the application of mineral fertilizer for maintenance of soil and crop production. However, high cost of mineral fertilizers has led to interest in soil conservation (Ali, 2006). Therefore, conservation is defined as the use of land within the limit of economic feasibility according to its capabilities and its needs in order to keep it permanently productive for the present and future generation. According to Yohanna and Isa (2007), when land is used carelessly, it can be swept away in a very short time. Yet it has taken some hundreds of years to form. It is for this reason that soil should be given special care and every effort should be made to prevent erosion. Thus, soil conservation is a system of preventing the soil from being damaged or destroyed or lost and to maintain and increase the fertility of the soil by good soil management.

Conservation has also been referred to as the dynamic application of appropriate legal economic and operational measure to preserve specific assets from destruction or deterioration and safeguard their future. Ali (2006) further defined soil conservation as the use of land within the units of economic feasibility, according to its capabilities and its needs in order to keep it permanently productive for the present and future generation. All adaptable measures to achieve permanent production of soil constitute different forms of conservation.

Soil conservation on agricultural lands guarantees sustainable productivity of the soil (Badajo and Togun ,2001). Based on recent consideration of environmental and soil quality, soil conservation indicates environmental issues such as mitigation of gas emission from the soil under forest or agricultural practices into the atmosphere (Duxbury 1999, Bourma 1997, Auserward and kukilik 1998 and Adesina et al. 1999).The research was aimed at studying agricultural land use and to evaluate the uses of land in terms of agricultural activities in Lafia Local Government Area. Other objectives include; to identity soil conservation techniques adopted by the farmers within the environment of the study area and to recommend ways of minimizing land degradation processes and the best methods to be adopted as soil conservation practice

Materials and Methods (Methodology)

The study area is Lafia Local Government Area of Nasarawa State located within the guinea ecological/savanna zone of middle belt of Nigeria. It is located within latitude $8^o – 9^o$ north of the equator and between $8^o – 9^o$ east of the Greenwich meridian. The area has an estimated land area of about $2733km^2$ (Focus, 1991) and a projected population of about 260,000 (NPC, 1991).

A well developed and structured questionnaire was administered to 200 farmers within the two districts of the study area. The questions on the questionnaire sought information on farmers personal and socio-economic characteristics, level of education, farm size, major occupation, types of crops cultivated, sources of water, nature of farm land, acquisition of farm land, method of cultivation, nature of erosion and its effects and control measures and how land is being utilized among other things. Data were collected from using the administered questionnaire developed as the main tool. The questionnaire designed investigated and described the farming conditions in the study area. It also evaluated the conservation measures adopted in the study area in order to increase agricultural productivity.

Results Presentation and Analysis

The information collected from the interview scheduled are presented and analysis using simple descriptive statistics such as frequency distribution tables and percentages.

Table 1: Distribution of farmers according to age

Age class interval	Frequency	Percentage (%)
15 – 25	-	-
26 – 35	68	34
36 – 45	84	42
46 and above	48	24
Total	**200**	**100**

Source: Field survey, 2011

Table 2: Distribution of farmers according to sex

Sex	Frequency	Percentage
Male	184	92
Female	16	8
Total	**200**	**100**

Source: Field survey, 2011

Table 3: Distribution of farmers according to educational level

Educational level	Frequency	Percentage
Post primary school	84	42
Others	116	58
Total	**200**	**100**

Source: Field survey, 2011

Table 4: Types of crops cultivated

Types of crops	Frequency	Percentage
Rice	12	6
Maize	16	8
Cassava	28	14
Groundnut	4	2
All of the above	140	70
Total	**200**	**100**

Source: Field survey, 2011

Table 5: Distribution of districts based on those practicing irrigation

Districts	Frequency	Percentage
Lafia	92	46
Assakio	108	54
Total	**200**	**100**

Source: Field survey, 2011

Table 6: Crops cultivated using irrigation

Crops grown under irrigation	Frequency	Percentage
Rice	36	18
Maize	48	24
Sugarcane	32	16
None using irrigation	84	42
Total	**200**	**100**

Source: Field survey, 2011

Table 7: Frequency of farmers according to farm size using irrigation practices

Farm size (ha)	Frequency	Percentage
1 – 2	32	16
3 – 4	36	18
5 – 6	12	6
7 and above	0	-
None using irrigation	120	60
Total	**200**	**100**

Source: Field survey, 2011

Table 8: Frequency of farmers based on farm size using pastoral farming

Farm size (ha)	Frequency	Percentage
1 – 2	40	20
3 – 4	16	8
6 above	4	2
None	140	70
Total	**200**	**100**

Source: Field survey, 2011

Table 9: Distribution of farmers based on the nature of the farm

Nature of farm land	Frequency	Percentage
Flat	132	66
Steep slope	32	16
Sloppy	36	18
Total	**200**	**100**

Source: Field survey, 2011

Table 10: Distribution of farmers according to land owner

Source of land	Frequency	Percentage
Purchase	32	16
Hiring	28	14
Inheritance	116	58
Borrowing	24	12
Total	**200**	**100**

Source: Field survey, 2011

Table 11: Distribution of farmers based on method of cultivation used

Methods of cultivation	Frequency	Percentage
Local (hoe)	176	88
Mechanized (tractor)	24	12
Animal Traction	-	-
Total	**200**	**100**

Source: Field survey, 2011

Table 12: Distribution according to nature of erosion taking place on the farmland

Types of water erosion	Frequency	Percentage
Sheet	88	44
Rill	64	32
Gully	32	16
All of the above	16	8
Total	**200**	**100**

Source: Field survey, 2011

Table 13: Distribution based on the effect of erosion on farmland

Effect of erosion	Frequency	Percentage
Low yield	80	40
Farmland reduction	56	28
Farm operation difficulty	64	32
Total	**200**	**100**

Source: Field survey, 2011

Table 14: Distribution according to method of controlling erosion

Method	Frequency	Percentage
Ridge construction	56	38
Drainage system construction	68	14
Plant cover crops	52	26
All of the above	44	22
Total	**200**	**100**

Source: Field survey, 2011

Table 15: Distribution based on problem encountered during farm operations

Problem	Frequency	Percentage
High cost of labour	176	88
Leaching	44	22
High cost of input	56	28
Diseases	20	10
Total	**200**	**100**

Source: Field survey, 2011

Table 16: Distribution based on how problems were tackled during farm operations

Solution to problems encountered	Frequency	Percentage
Purchase of chemical	36	18
Contacting of extension agents	72	32
Obtaining loan from Agric Bank	92	46
Total	**200**	**100**

Source: Field survey, 2011

Table 17: Distribution on how land was conserved

Method of conservation	Frequency	Percentage
Crop rotation	56	28
Monoculture	72	36
Shifting cultivation	40	20
Bush fallowing	32	16
Total	**200**	**100**

Source: Field Survey, 2011

Discussion of Results

The results of the field survey showed that most of the farmers in the study area are in the range of 36 – 45 years. It also shows that most of the people within the age range of 15 – 25 years do not participate in the farming (Table 1). Most of the farmers (92%) are males (Table 2). It is also observed that majority of the farmers surveyed (58%) attended post primary school (Table 3). The survey revealed that 70% of the farmers in the study area cultivate rice, maize, cassava and groundnut (Table 4) but in the course of the field survey most of the crops grown include yam, millet and tree crops. This shows that farming has a dominant revenue yielding sector for the general population of the study area.

It is also revealed from Table 5 that, 54% of the respondents in Assakio district do practice irrigation but for the high percentage (54%) of those that practiced irrigation, yield is increased and of high quality as a result of sufficient water supply and a variety of crops such as rice or maize may be grown twice in a year as stated by Yohanna and Isa (2007). Most of the crops grown under irrigation during the dry season are vegetables (such as Okra, Tomatoes, and Pepper), maize, rice and sometimes sugar cane.

It was observed that most of the farmers (34%) cultivated between 1 and 4ha (Table 7 & 8). This is because of the usage of primitive tools (hoes) for the cultivation of their farm lands, a result agreeing with that of Table 11. From Table 8, 70% of the farmers do not practiced pastoral farming because of the effect of soil erosion hence only 2% of the farmers have up to 6ha and above of farm land for pastoral farming (Table 8). Also only small area of land is cultivated due to land tenure system and reduction on the part of land user to embrace mechanization of farms (Asadu et al., 2004) (Table 11).

Most of the land use for agricultural activities (66%) are flat (Table 9); thus resulting to moderate level of erosion. Majority of the farmers (58%) acquired their lands through inheritance (Table 10), agreeing with the system stated by Asadu et al. (2004) that most of the tenure and allocation system restrict ownership to clan and community members. This situation affects agricultural land uses because excess land fragmentation leaves small holdings uncultivated.

The survey also revealed that most of the farmers (88%) in the study area used local methods (hoe) in cultivating their lands (Table 11). The situation may be due to rampant land fragmentation and existence of different land tenure and allocation system. Another reason may be due to financial problem and beliefs that use of tractors causes soil compaction and destruction of soil structure and texture. It is noticed that majority of the farmers surveyed experienced high percentage (44%) of sheet erosion (Table 12). This may be due to its unnoticibility to the eye when the top soil portions are removed in a very thin sheet (Yohanna and Isa, 2007). Table 13 shows that erosion has a serious effect on agricultural land use due to low inherent fertility and poor soil structure are subjected to high rainfall intensity along with high temperatures, in addition to population pressure, all of which, favour land degradation.

The high percentage (38%) of ridge construction and planting of cover crops (26%, Table 14) agreed with what Asadu et al. (2001, 2004) stated that contour ridging and ridging works best on permeable soils such as the Lafia soils and cover crops such as melon hasten soil fertility restoration respectively. The high cost of labour (40%) Table 15, during the farming operations may be due to farmers' reluctance to embrace innovations as one of the problems of agricultural land users in Nigeria. As a result of the problems encountered during farming operations, most of the

farmers (46%) secured loans from the agricultural bank, source (32%) contacted extension agents while 18% bought chemicals to solve some of the encountered problems (Table 16). It is also being observed from the survey that a high percentage (36%) of the farmers practiced monoculture farming (Table 17). This practice affect agricultural land uses due to continuous farming which makes the soil become weak and easily eroded by erosion.

Conclusion

The agricultural land use plan for Lafia Local Government Area to succeed, they have to include government agencies, traditional institutions, farmers, researchers, non-governmental organizations (NGO) and companies involved in land matters for agricultural production. They all have to participate in the process of planning, preparation of agricultural land use plans, execution of plans and monitoring and evaluation of agricultural land and should also provide information for possible revisions and updating.

The soils are generally poor in chemical fertility status and this affects productivity. Generally, the studies on productivity enhancement through soil fertility maintenance in the nutrient poor soils of the study area are interdisciplinary in approach. As such the soil scientists, agro economists, geologists, economists and extension agents should be involved.

The integration of cover crops techniques for sustainable agricultural production has control the noxious weeds, improve soil fertility, soil conservation and improve crop yields.

Recommendations

1. There is the need to increase land area under agricultural activities in the study area. Effort should be made to remove all impediments to farmers' access to suitable agricultural land. This will expand their farmland areas so as to increase their production status.
2. There is the need for more intensive irrigation development, as large irrigation potentials exists in the study area.
3. There is the need to promote a more effective use of modern inputs such as tractors, fertilizers and herbicides
4. The farmers should adopt certain conservation measures to enhance soil fertility restoration or rehabilitation for increased agricultural production
5. The state government and the individual communities should address the problems of farmers/pastorists (nomads). They should encourage forage crop production and restructure the management of grazing reserves livestock in order to reduce erosion
6. Degraded lands should be reclaimed and protected from deforestation and erosion
7. Finally government should effect legislation to control and penalize land degradation activities such as deforestation, bush burning, oil spillage, fishing activities with the use of chemical and establishment of structures in the wrong places.

References

Adesina, F. A., W. O. Sajanbola., F. A. Oketola., D. A. Pelmo., S. A. Momadu., A. O. Adegbalugbe and **C. O. Ojo (1999)** "Potential of agro-forestry techniques in mitigating CO_2 emission in Nigeria: Some preliminary estimates", *Global Ecology and Biography letters*, Vol. 8, pp. 103-73.

Akamigbo, F. O. R. (1999) "Land capability classification as a tool for effective land use policy; in evolving an effective agricultural land use policy for Nigeria", Proceedings of the National seminar on land use policy and practice Ibadan.

Ali, A. (2006) "The need for introduction of conservation agriculture to Nigerian farmers", Paper Presented in Training workshop on principles and practices of conversation agriculture at FMARD, Dept of Agricultural land Resource, PADP Jos-Plateau State.

Ausserward, K. and **M. Kutilet (1998)** "A European View to the protection of soil resources", *Soil tillage research*, Vol. 46, pp. 9-11.

Asadu, C. L. A., P. I. Ezeaku and **Nnaji G. U. (2001)** **"**The soils of sub-saharan Africa and management needs for sustainable farming", in M.A. Badeje and A.O. Togun, eds strategies and Tactics of sustainable agriculture in the tropics, College press Ltd, Ibadan.

Asadu, C. L. A., P. I. Ezeaku and **Nnaji G. U. (2004)** "Land use and soil management situation in Nigeria: An analytical review of changes", *USA journal of Outlook on agriculture*, Vol. 33(1), pp. 27-37.

Badejo, M. A. and **Togun A. O. (2001)** "Strategies and tactics of sustainable agriculture in the tropics", Vol. 2 College press ltd Ibadan-Nigeria

Bourma, J. (1997) "Soil environmental quality: A European perspective", *journal of environmental quality*, Vol. 26, pp. 26-31.

Duxbury, J. M. (1995) "The significance of greenhouse gas emission from soils of tropical Agro ecosystems; In R. Lal, J. Kimble, E. Levirie and B.A."

Stewart (eds); Soil management and greenhouse effect CRC press, Boca Raton, FL, USA pp. 279–91.

Ezeaku, P. I. (2011) "Methodologies for agricultural land use planning: Sustainable soil management and productivity", Great AP express publishers ltd. Nsukka-Nigeria

FAO (1976) "A framework for land evaluation", *Soil bulletin*, No. 32, FAO-Rome 71p.

Focus (1991) "Focus on Lafia Local Government Area: pamphlets produced by Lafia L.G.C. Information Unit.

Hulugalle, N. R. (1992) "Amelioration of highly degraded tropical alfisol changes in Soil Physical and Chemical Properties 1989-1991", *Land degradation and rehabilitation*, Vol. 3, pp. 141-52.

Kang, B. T., Affa-krah, A. N. and **L. Reynolds (1999a)** "Alley farming", The tropical agriculturalist series. Macmillan Education Ltd. London, UK.

Kay, B. D. (1990) "Rates of change of soil structure under different cropping systems", *Advance in soil science*, Vol. 12, pp. 1-52.

King, C. (2009) "Soil Microsoft Encarta premium", Redmon, W.A. Microsoft corporation.

Lal, R. (1993) "Tillage effects on soil degradation, soil resilience, soil quality and sustainability", *Soil and tillage research*, Vol. 27, pp. 1-8.

Naguto, M. S. and **M. D. Usman (2004)** "Problems of land use accelerated soil erosion and soil quality", A paper presented in estate management department, Federal Polytechnic, Nasarawa State.

NPC (1991) National population Census of 1991

Odingo, R. S. (1991) "Research and Development of land use policies in Africa", Paper presented for the United University Project in the institute of National Resources in Africa, Nairobi-Kenya.

Pieri C., J. Dumanski., A. Hamblin and **A. Young (1995)** "Land quality indicator World Bank decision paper", Washington D. C. 204333, USA 63Pp.

Steiner, K. G. (1996) "Causes of soil degradation and development", Approaches to sustainable soil management GTZ Eschborn Germany 83Pp.

Vink, A. P. A. (1975) "Land use in advancing agriculture", New York springer verlag Berlin", WorldBank 1992 staff appraisal report.

Yohanna J. K. and **Isa I. A. (2007)** "Agricultural land use adopted conservation measures in Lafia L.G.A., Nasarawa State-Nigeria", Unpublished PGD Project, Department of Agronomy, Faculty of Agriculture, Nasarawa State University, Keffi.