



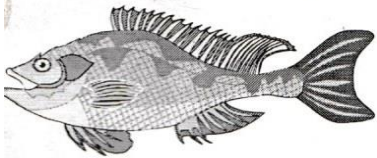
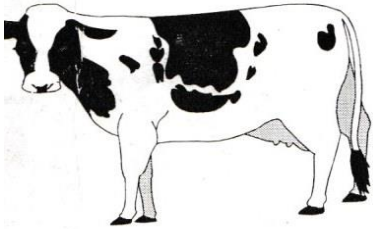
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ISSUES IN SUSTAINABLE LAND USE AND MANAGEMENT IN THE RAIN FOREST BELT OF SUB-SAHARAN AFRICA

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ABSTRACT

The practise of agriculture depends on land-use and resource allocation. For the subsistence farmer resource endowment and management capacity are low, the framework of land-use is viewed therefore, to have a short-term planning horizon as little attention is paid to the status and management of their agricultural land. However, allocation, use and management of a resource like land requires quality maintenance and resource-use efficiency, which is a pivot of sustainability, built within the paradigm of social, economical, cultural and environmental dimensions. This paper therefore, seeks to elucidate relevant issues in sustainable agricultural land-use and management with a view to creating better awareness to Sub-Saharan African peasant farmers.

Introduction

Sustainability as a concept in agriculture transcends practices that involve the successful management of available resources to satisfy identified objectives, while maintaining or enhancing the quality of the environment and conserving natural resources (FAO, 1989; Lyman and Herdt, 1989). Sustainable use and management of agricultural land recognizes bio-physical, socio-political and techno-economic dimensions so that its benefits are enjoyed by all users.

The spectra of hunger, mounting food deficits, and widespread rural poverty are the consequences of persistent decrease in productivity of agricultural sector of which land is a limiting factor. Therefore, the availability of land and its productivity has become an area of emphasis. Specifically, the average arable land per farmer in Nigeria, especially in the forest belt is a thing of concern in the face of demographic and environmental pressures. The reports of NEST, (1991) and World Bank, (1995) asserted that about 36 percent of the land area in Nigeria is devoted to agriculture and the average arable land per farmer is about 1.08 hectares respectively. However, the potentials of this limited farmland are gradually and sometimes rapidly degraded (Oldema, et al. 1991). This becomes even more visible in areas of high population growth as evidenced in soil erosion, farming on highly erosive land, loss of soil fertility, down stream pollution and deforestation.

Demographic and environmental indicators for the country are presented in Table 1.

Table 1: Demographic and environmental indicators in Nigeria

Indicators	Values
Population density (people 100/ha, 1996)	924
Average annual population change (5) (1990 - 1994)	2.9
Population change in rural area (%) (1990)	2.7
Population in rural area (%) (1990)	77.5
Percentage of total land area; Under crop land (1993)	36
Under permanent pasture (1993)	44
Percentage change in total forest area (1993 - 1995)	88.5
Deforestation per year (%)	3.3
Percentage change in crop land (1983 - 1985)	5.7

Sources: (1) World Resource (1988)
(2) World Development (1989 and 1996)
(3) CBN Bulletin 1996 edition.

From the table, the rates at which population and deforestation are increasing show the extent to which Nigeria agro-ecosystem is endangered. Specifically, the total forest area has been decreasing over the years. In 1993, about 93.345 sq.km of forest land was protected. But as of 1995 only about 10,752 sq.km was left indicating a decline of about 88.5 percent (CBN, 1996). This is an indication of increasing and indiscriminate use of agricultural land.

The challenges posed by the above indicators require effective allocation, use and management of agricultural land to ensure sustainable agricultural production. Recent discussions on agriculture emphasizes criterion being framed

within the context of socio-economic and environmental paradigm. This paradigm is reflected in the emerging consensus of the inextricable link among agricultural production, environmental degradation and demographic trends (Udoh, 1998). Sustainable land use and management should therefore, be viewed within this framework and must aim at addressing the simultaneous aspect of production and conservation. This however, involves combined technologies, policies and activities aimed at integrating socio-economic principles with environmental concern (Symth, *et al.* 1993; IITA, 1992).

The Basis for Land-use and Management in the Rainforest Belt.

By nature soils in Sub-Saharan Africa in general the rainforest belt of Nigeria in particular, are fragile; losing organic matter and nutrients quickly (Spencer, 1989). To a greater extent, farmlands are seriously fragmented, especially under inheritance tenural arrangement. In an effort to increase food production, low-external-input farmers who are predominantly peasants depend primarily on expansion of cultivated areas at the expense of restorative bush fallow, thereby causing a considerable decline in length of the cultivation cycle involved in slash-and burn cultivation (Spencer, 1990; Tisdell, 1996). In areas where population is quite high, marginal lands and forest reserves are encroached upon for crop cultivation. Continuous cultivation of these soils by most farmers with little time planning horizon and without property rights does not reflect proper and adequate land use options. The problem is further compounded by constraints such as existing land tenure system, (individual and communal land ownership pattern) financial states of the farmers, lack of relevant information or relative ignorance of the farmers as regards soil properties. Basically, in most cases of land-use, 'mining' of the land is the common practise.

The basis for land utilization and management practice by subsistence farmers in Sub-Saharan Africa and especially the rain forest belt with limited resources focus on practices aimed at achieving farm level objectives in terms of economic viability, food security and risk aversion (Krusemen, *et al.* 1996). Farmers therefore, carry out various land-use options and management practices in order to safeguard their respective concerns. But achieving economic benefits without sacrificing future land use resources is the essence of sustainable production and soil conservation. Therefore, an

understanding of trade-offs between economic and environmental consideration is quite imperative so that a compromisable land-use and management for environmental conservation and economic decision which would ensure a scenario of sustainable agriculture can be worked out. This involves studying the factors which lead to a particular system being chosen and continuing with the option. Since decisions concerning land-use and management are made by the farmers in the context of family concerns and priorities, farming systems that should ensure sustainable development must of necessity include the development of technologies and farming practices that enhance the productivity of land, labour and water resources, and/or improve plant and animal productivity. This can be achieved through the introduction of biological technology or new management practices to meet the present needs without compromising the benefits of future generation.

Land use and soil fertility management

The properties and characteristics of land are the major determinants of choice for land use in a given location (Verheye, 1986). But this is seldom the case under small-scale peasant agriculture in Sub-Saharan Africa, as land and soil types are rarely closely associated (Ogunkule and Eghaghara, 1992, Udoh, 1998 and Udoh *et al.*, 1999). Low external-input farmers assess their land use options in terms of crop preferences, productivity, profitability, resource requirement (land, labour and power), risk aversion (Rai, 1995). Choice and preference of optimal land-use options becomes quite difficult for marginal and small-holder farmers who are predominantly risk averse. Essentially, using land for agriculture often results in the net removal of soil nutrients, which must be replenished to provide a lasting cropping base. Non-sustainable use of land has resulted in massive land degradation and soil infertility. Greenland (1975) suggested certain basic principles of soil management that are essential for sustainable agricultural system in the rainforest belt. These include:

- replenishment of chemical nutrient removed by crops;
- maintenance of physical condition of the soil;
- prevention of infestation of weeds, pests and diseases;
- reduction in the rate of soil erosion; and
- reduction in the soil acidity or toxicity of elements, etc.

These principles are built on the levels that provide pathways which seek to connect the form

of land use with the multitude of environmental, economic and social conditions which collectively determine whether a form of land management is sustainable or will lead to sustainability.

Farming system that evolves a more permanent cultivation inevitably mine in the natural fertility base of the soil and becomes less productive. Effective soil fertility management lies in controlling land use and restoring its productivity, which can be achieved via innovative technology options in area of land clearing and development, tillage methods and other agronomic practices (Lal, *et al.* 1986).

Basic practical actions for sustainable use and management of agricultural land

Practical actions necessary for sustainable land use and management must as a matter of relevance have dimensions of optimality, equity, fairness and productivity. These measures should aim at improving and maintaining the resource base so as to ensure efficiency in factor use. These actions could be precautionary or remedial, embracing a spectrum of activities, ranging from choice of farmland, land clearing and development, tillage practices. Within the context of peasantry, the actions must be conventional and farmer's oriented. In case of government intervention, programmes that promote bottom-up approach should be adopted. It should be stressed that any action taken with the major aim of protecting the environment without dealing with food availability and security is futile and would be highly resented by the farmers. Therefore, a good land management should be linked with the twin issue of welfare of environment and the survival of the farmers.

Sustainable land use and management in Sub-Saharan Africa is hinged on the following participatory actions:

ACTION DURING CHOICE OF FARMLAND

The key issue for sustainable choice of farmland use is to associate land use and soil types. However, since this is seldom practised by low-income farmers, farmland to be cultivated must have been allowed to fallow for considerable number of years depending on pressure on the land and total available land; the choice of steepy farmland should be highly restricted and should be reserved for agro-forestry. Government via extension service should adequately educate farmers on the condition to be met before any piece of land is used. This would involve land use planning. That is, there should be continuous assessment of the status of land use and its productivity vis-à-vis socio-economic conditions of

the people. This should be carried out by the agency saddled with this responsibility by the government.

ACTION DURING CHOICE OF LAND CLEARING/DEVELOPMENT

Within the resource base of the peasant farmers, land clearing/development should be such that, optimal production and better conservation are ensured. Basically, researches in rain forest belt have indicated advantages of conventional (manual over machine) clearing. Maduakor *et al.* (1984) noted that conventional tillage which involves seeding via a crop residue mulch without ploughing has definite advantages for soil and water conservation. Also, slash-and-burn agriculture has been noted to be an ecological sustainable system to poor rural farmers of the rainforest belt. Cultivation on soil should be done with minimum soil disturbance since these soils are fragile and lose organic matter easily. The use of heavy implement for land clearing and tillage should be discouraged to minimize the possibility of soil erosion, leaching, flooding and other soil related problems. Cultivation on slope should be done in such a way that would improve the drainage condition of the area. This could be in form of terrace cultivation, stripped farming, alley cropping, contour farming etc.

ACTION DURING THE CHOICE OF FARMING SYSTEM

This will cover choice of crops, cropping pattern and intensity. Agronomic practices that would satisfy neo-classical economic optimisation needs of the farmers and still maintain better environmental condition should be encouraged. Efforts should be geared towards evolving the most profitable crop combination and geometry that would be effective in checking soil erosion and loss of water via run-off. Mixed cropping and inter-cropping with appropriate crop types, canopy cover and management are more sustainable under peasant management than sole cropping. Mixed farming system is also an ideal farming system for sustainable land use. Soil fertility management in small-scale farming system can be through the use of inorganic fertilizers and organic fertilizer such as; green manure, termitarium soils, crop residues, wood-land litters, compost and house waste. The use of improved, but adaptable species, breeds and cultivars should be encouraged. No matter how important and suitable a farming system might be for soil and water conservation, if it does not take

adequate care of farmers' socio-economic and cultural affinities on land, its sustainability is questionable. This has been the case for non-acceptability of alley farming system by most farmers. Any action to be taken must start from the initial knowledge of the farmers for better awareness and general acceptability. Where land is quite limiting, the practice of crop rotation would ensure sustainable land use and management.

Basically, actions, measures and strategies necessary for sustainable use and management of agricultural land should therefore be framed to cover natural conservation with utilization measures, that are socially, culturally, politically, economically and environmentally viable and acceptable, and be integrated into the economic development efforts. There is need for full participation of farmers and other users of land in the design and implementation of land use, development, management and conservation to ensure effective integration of conservation into the social life of the farmers and into the local agricultural and other economic systems. Special care should be taken to protect steep slopes, hilltops, and ecologically fragile areas. Cultivation of plantain, banana and even pineapple on steep slopes would prove to be sustainable.

CONCLUSIONS

The concern on how agricultural land is being used has always been an area of emphasis as any unsustainable use of agricultural land in the rain forest belt would jeopardise food security. Therefore, best and common crop management options practised by farmers toward soil conservation as they aim at meeting their socio-economic objectives should be evaluated. Creating adequate awareness on the ecological and economic problems that normally follow if farmlands are allowed to depreciate in value and quality should also be paramount.

Practical actions necessary for sustainable land use and management must take full account of the rural resource base with a view to securing tenurial security for the land users, providing immediate socio-economic survival benefits and also ensuring optimal fallow period for agricultural lands. Therefore, specific educational actions aimed at creating adequate awareness on the dangers of unsustainable land use; the relationship of land resource conservation to environmental protection; importance of conservation to present a future generation should be largely embarked upon by the government. It is pertinent to note that it would be ecologically wrong to transfer any land

management practice that has been successful elsewhere to the rain forest belt without testing and confirming its suitability and acceptability. The local people know best concerning their land and as such any new action should complement their actions rather than supplementing them. Their involvement in project or programme initiation and implementation is quite important. Effective land-use planning is a process of necessity and it is the surest way of ensuring sustainable land-use and management in the Sub-Saharan Africa.

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