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Full Length Research Paper

Perception of utilitarian values of agrobiodiversity by rural farmers in Akwa Ibom State, Nigeria

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Akwa Ibom State is located in the rainforest belt of Nigeria known for preponderance of agricultural biodiversity. Agricultural biodiversity or agrobiodiversity is succinctly referred to as the diversity of agrogenetic resources used directly for food and agriculture; the diversity of species that support production and the diversity of species that support agroecosystem, as well as diversity agroecosystems themselves. It performs many closely interrelated socioeconomic and environmental functions, including promoting food and livelihood security, maintaining productive and environmental sustainability; and contributing to resilient rural economics. Because of these enormous potentials, farmers have been making frantic efforts at conserving this vital resource. However, despite these efforts, agrobiodiversity is being lost at an alarming rate. This study was designed to appraise the status of agrobiodiversity conservation among rural farms in Akwa Ibom State. The specific objective was to determine rural farmers' perception of utilitarian value of agrobiodiversity. A research question and one related null hypothesis were formulated to guide study. A total of 858 respondents comprising rural farmers, agricultural extension officers and forestry officers were involved in the study. The data were obtained through a structured questionnaire. The data were analyzed with mean, chi-square and analysis of variance (ANOVA). The findings of the study revealed that rural farmers indicated high perception of the utilitarian value of agrobiodiversity, especially in areas such as herbal medicine, food, recreation, aesthetic, ecology and culture.

Key words: Agrobiodiversity, utilitarian values, rural farmers.

INTRODUCTION

The conservation of biodiversity is one aspect of environment, which has recently received global attention. Biodiversity refers to the variety and variability among living organisms and the ecological complexes in which they occur (BOSTID, 2002). It is essentially synonymous with life on the earth. It is usually considered at three different levels: 1) genetic diversity, 2) ecosystem diversity, and 3) species diversity. Generic diversity is the sum total of genetic characteristics of individual plants, animals and other living organisms inhabiting the earth. Such characteristics may include rapid growth, high yields, diseases and pests resistance, and environmental adaptation. Species diversity refers to the variety of living organisms on earth, while ecosystem diversity refers to the variety of habitats, biotic communities and ecological processes in the biosphere, as well as the tremendous diversity within ecosystems in terms of habitats differences and the variety of ecological processes. The concept of agricultural biodiversity or agrobiodiversity as it is sometimes referred could be identified within a macro concept of biodiversity. Agricultural biodiversity is restricted to plants and animals used in commerce or having potential use (Srivastava et al., 2001). It is the diversity of genetic resources (varieties, breeds, species, cultivated, reared or wild) used directly for food and agriculture; the diversity of species that support

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production (soil biota, pollinators, predators etc.) and those in the wider environment that support agroecosystems (agricultural, Pastoral, forest and aquatic), as well as the diversity of agroecosystems themselves (FAO, 2008). Agro ecosystems are those ecosystems that are used for agriculture, and comprise polycultures , monocultures and mixed systems including crop-livestock systems (rice-fish), agroforestry, agrosilvo pastoral systems, aquaculture as well as rangelands, pastures and fallow lands (Pimbert, 2009).

Agricultural biodiversity is of immerse benefit to humanity. Man depends on various livestock and crop species for food, fuels, fibre, medicine, drugs and raw materials for a host of manufacturing technologies and purposes. The productivity of agricultural system is as a continuous alteration of once wild plant and animal germplasms. Also, genetic engineering especially in the pharmaceutical and food processing industries uses agro-genetic resources from sources worldwide. Besides these direct values, agricultural biodiversities are important parts of the processes that regulate the earth's atmospheric, climatic, hydrologic and biochemical cycles. It provides local ecological services including the protection of watersheds, cycling of nutrients, combating erosion, enriching soil, regulating water flow, trapping sediments, mitigating erosion and controlling pest population (Ehrenfeld, 2000). Furthermore, agrobio-diversity holds ethical and aesthetical values and also forms the basis for sustainable rural development and resource management. In most rural areas of Akwa Ibom State, the diversity of local plants and animals is being harnessed for sustainable economic development. Locally adapted traditional animal breeds (sheep, goats, and cattle), crop varieties (fruit trees, fodder plants and cereals) and 'wild' foods are being explored to generate local products, jobs, income and environmental care.

In spite of the enormous potentialities of agro-biodiversity in retaining plants, animals, soils and water as well as serving as the foundation of sustainable development, most of the environmental discussions in this regard draw attention to it being increasingly subjected to devastation and loss. The loss of agro-biodiversity is a relative phenomenon. Agrobiodiversity is lost when it suffers a reduction in intrinsic qualities or a decline in its capabilities or complete extinction resulting from a causative factor or a combination of factors which reduce its physical, chemical or biological status hence restricting its productive capacity. It also involves a loss of potential utility or the reduction, loss or change of features or extinction if agro-species could not be replaced (Dumsday, 2007). Akwa Ibom State occupies one of the geographical zones located in the rainforest belt - an area known for high density of agro-genetic diversity. Throughout its ecological ones, the diversity of agroecosystem is being rapidly eroded. This erosion may be primarily due to intensive resource exploitation and extensive alteration of habitats. Other associated factors include: the neglect of agrobiodiversity conservation; institutions and management systems; the blueprint approach to development whereby monoculture systems and uniform technologies are promoted; the quest for the transnational corporations that market agricultural inputs and process food and fibres for commercial profits and uncontrolled over-production; inequitable access to and control over land, water, trees and genetic resources of the part of local people; market pressures and the under-valuation of agricultural biodiversity; demographic factors and oil spillage.

To address these multifarious and complex threats to agrobiodiversity, a wide range of conservation actions are essential. Conservation as applied to agrobiodiversity refers to the preservation, maintenance, sustenance, sustainable utilization, restoration and enhancement of all species, breeds and strains of livestock and varieties of crop plants, especially those of economic, scientific and cultural interests to mankind for agriculture either at present or in future (IUCN, 2000).

In the pre-colonial Nigeria, religious beliefs and practices played important roles in the conservation of agrobiodiversity in various parts of Akwa Ibom State. Sacred animals and crop habitats were not exploited by people and so they remained in their pristine state. Traditional methods of conserving agrobiodiversity such as reserving certain areas for religious purposes, prohibiting firewood collection from certain areas and on certain days, stipulating only seasonal collections of natural products and maintenance of herbarium were largely in vogue. However, with the institution of western values and cultures, these traditional methods of conservation gradually disappeared.

In the last few years, a number of actions have been undertaken by the federal and state governments, the non-governmental organizations and the rural farmers aimed at promoting agrobiodiversity conservation in the state. Some of these actions bordered on policy changes, integrated land management, agrospecies protection and pollution control. Rural farmers have made invaluable contributions in the conservation of agricultural bio-diversity in the state. They play dual roles of cultivators and conservationists. Their roles on this direction could be identified in various conservation activities channeled at the domestication of livestock and cultivation of a number of varieties of crops besides the maintenance of herbaria, rangelands and diverse agroecosystems. They also embark on selective exploration of forest species, adoption of beneficial farming systems, protection of natural habitats and adoption of legislation based on traditions and customs. However, their consistent and sustainable involvement in the conservation practices are threatened by nuisances bordering on economic, fear of risk , family pressure, religious beliefs , superstition, social status, tradition, and education.

Farmers' education employs various conventional instructional approaches based on basic principles of

participation, communication and teaching/training techniques. A critical appraisal of this approaches as employed in the state is essential. This is with a view to identifying and subsequently designing a rational combination of a variety of them, which when applied, will encourage active involvement of rural farmers and subsequently enhance agrobiodiversity conservation in the state. In Akwa Ibom State, the government, NGOs and rural farmers have for some years now been engaged in massive efforts of addressing the problems of environmental degradation including the loss of agrobiodiversity. For instance, conservation of agrobiodiversity has been an age long activity among rural farmers. They posses a vast wealth of knowledge including information about their agricultural resources built up over centuries. Not only do these knowledge include information about different agricultural bioresources of crop and livestock species, their uses, information about the way they interrelate but also the principles of conserving them.

These efforts notwithstanding, the loss of agro-biodiversity in the state still prevails. Local indigenous and adapted livestock breeds, landraces, other crop species, and agroecosystem are disappearing by dilution and replacement leading to the loss of genetic resources of great value. These accelerated degradations which could be attributed to a number of influences including habitat destruction, pollution, climatic changes, over-exploitation, and poverty could be checked thereby conserving agrobiodiversity, their habitats, agro-ecosystem and man's future options for their utilization, conscious appraisal of the status of agrobiodiversity conservation among rural farmers in the state with the ultimate aim of devising concrete measures for its enhancement is a necessary action in this regard. This is the base from which this work was conceived. This study was generally aimed at appraising the perception of agrobiodiversity conservation among rural farmers in Nigeria. The specific objective of the study was to determine the rural farmers' perception of the values of agrobiodiversity in Akwa Ibom State.

The concept of biodiversity, diversity and agrobiodiversity

This term biodiversity appeared in conservation circles in the 1980s (WRM, 2001). It was given concrete expressions in the international conservation programmes of the World Research Institute, World Bank, and International Union for the Conservation of Nature (IUCN) and the World Wildlife Fund (WWF). A varied conception about the term exists. According to BOSTIDS (2002), biological diversity as it has come to be called, refers to the variety and variability among living organisms and the ecological complexes in which they occur. Golley (1983) views it as a term commonly used to describe the number, variety and variability of living organisms. Diversity as a contemporary concept literally refers to the range of variations or differences among some set of entities; the number of different item and their relative frequency (OTA, 2007) for biological diversity. These terms are organized at many levels, ranging from chemical structures that are the molecular basis of hereditary to chemical ecosystems. Genetic diversity represents the heritable variation within and between populations of organisms. This is a function of genes. It simply means the variety of genes. There are two types of genetic diversity: 1) interspecific and 2) intraspecific diversity. Interspecific diversity refers to the great variety of species from the single cell plankton to the more complex organisms. This type of diversity increases as new species evolve but is exceedingly slow. Intraspecific diversity is the genetic variation present among the individuals within species. Individual of a species share many genetic characteristics. This variety results in some individuals being adapted to changing environment than others.

Species diversity as a unit of biodiversity measurement, literary means groups of interbreeding or potentially interbreeding natural populations that are reproductively isolated from other such groups. Huxleys (2000) defined species as a distinct self-perpetuating unit with an objective existence in nature. BOSTID (2002) views species as a taxonomic category ranking immediately below genus. It includes closely related morphologically similar individual organisms that play a particular ecological role. There are several kinds of species diversity – (a) Species richness- that is the number of species in the community, and (b) evenness- that is the distribution of individuals among species, also called equitability. In these respects, species diversity could be understood either as richness diversity or heterogeneity diversity. Another aspect of species diversity is the scale: alpha diversity – within the community or within habitat; (c) beta diversity- diversity between habitat –that is the extent of changes in species composition and gamma diversity- diversity in the whole landscape. Ecosystem diversity or ecodiversity as it is simply referred, is a term that was coined by Odum (2003). It refers to a system of living organisms interacting with the physical, chemical, biological and social environments. The idea of the system here connotes the fact that a complex of living organisms and the environment interacting together to form a whole.

To Soule and Piper (2002), ecosystem is a functional system that includes the organisms of the natural community, together with their physical environment. In other words, ecosystem is the interaction of living things, plants, animals, and micro-organisms together in characteristic communities. It also includes abiotic components, this being partially determined by soil parent materials and climate. Ecosystem diversity is often evaluated through measures of diversity in the component species.

This involves the assessment of the relative abundance of different species as well as the consideration of the types of species (WCWC, 2002). Biological diversity therefore, encompasses all species of plants, animals, micro-organisms and the ecosystems as well as the ecological processes of which they are part. It is an umbrella term for the degree of variability of nature's ecosystems, species, or genes in a given assemblage. Summarily, biodiversity is essentially synonymous with "life on earth", and it is usually considered at three different levels: genetic diversity, species diversity and ecosystem diversity. Genetic diversity is the sum total of genetic information contained in the genes of individuals of plants, animals and living organisms that inhabit the earth. Ecosystem diversity refers to the variety of habitats, biotic communities and ecological processes in the biosphere, as well as the tremendous diversity within ecosystems in terms of habitat differences and the variety of ecological processes.

Agricultural biodiversity (agrobiodiversity) is an alloy term coined from the concepts, agriculture and biodiversity. Conceptually, it refers to the diversity of agrogenetic resources (varieties, breeds, species, cultivated, reared or wild) used directly for food and agriculture; the diversity of species that support agroecosytems (agriculture, pastoral, forest and aquatic) as well as the diversity of agroecosystem themselves (FAO, 2008). According to Srivastava et al. (2001), agrobiodiversity is restricted to plants and animals used in commerce or having potential use. Like biological diversity, agrobiodiversity is considered in three levels, 1) diversity of genetic resources of agro-species, 2) diversity of agro-species and 3) the diversity of agroecosystem. Diversity of genetic resources refers to the genetically transmitted characteristics of organisms, which are of actual or potential value. Such characteristics may include rapid growth, high yield, diseases and pest resistance and environmental adaptation (WCWC, 2002). Agroecosystems diversity or agroecodiversity as is being succinctly referred, is the variation and variability of these ecosystems that are used for agriculture. They comprise polycultures, monocultures, and mixed systems including crop-livestock systems (rice-fish), agroforestry, agro-silvo-pastoral systems, aquaculture as well as rangeland, pasture and fallowlands (Pimbert, 2009).

Uses and values of agrobiodiversity

A variety of approaches have been devised for assessing the uses and values of agrobiodiversity. McNeely et al. (2000) have outlined three main approaches, which have been used for determining uses and the values of agrobiodiversity, this is summarized as follows:

(a) Consumptive use value: Assessing the value of agro products and by-products such as firewood, fodder, fruits etc that are consumed directly without passing through market.
(b) Productive use value: Assessing the value of products that are commercially harvested, e.g. timber, wool, meat and medical plants.
(C) Option value and existence value: Assessing the value of agroecosystem function such as watershed protection, regulation of climate, and protection of soil (non-consumption use values of keeping options open for the future and simply knowing that certain agrobiospecies exists.

WCMC (2002) adopts an approach on the human values, benefits and utilization of components of agrobiodiversity of plant and animal sources. These diverse approaches emanate from the fact that the benefits derived from one agro-resource can be measured for one purpose by a method that may not be appropriate for other objects; and the ease to measure one resource may not be the same for others. However, agricultural biodiversity provides the basis for life on earth. The fundamental social, cultural and economic values of these resources have been recognized by man in religion, art, and literature from earliest days of recorded history (Fisher and Hanemann, 2004).

It makes enormous contributions to agriculture, medicine and industry (McNeely, 2008). Perhaps even more important are the essential life processes that are carried out through it, including stabilization of climate, protection of watersheds and protection of soil. Appraising the importance of these processes is essentially the assessment of the functions of plants and animals species that constitute the ecosystem. More so, it is an ecological imperative that humans depend on plant sources and other animals for basic requirements for existence.

Values uses and of agrobiodiversity of plant resources

Agrobiodiversity of plant source has wide uses. These include utilitarian uses, ornamental uses, medical and biomedical uses. Agrobiodiversity of plant source provides an extremely wide range of useful products relied on by people. A mixture of direct harvesting from the wild and cultivation ranging from basic subsistence farming to sophisticated agricultural system supplies food, medicine, ornamental plants and timber, plants provide a wide variety of resources used in industry and commerce. One of the most fundamental values of plant agrobiodiversity is supplying the world's food. Originally, plants were consumed directly from the wild and gathering of wild produce continues throughout the world today (McNeely et al., 2008). Through the processes of domestication, wild plants became reservoirs of new crop species and they are now an invaluable source of genes

needed to improve the word's crops. According to IUCN (2000), of the estimated 250,000 species of flowering plants, about 3,000 have been regarded as food source. Others provided forage and browse for animals. Specifically about 200 plants species have been domesticated for food and of these, about 15 to 20 are crops of major economic importance (Davis, 2007).

Relatively few botanical families account for the world's most domesticated plants. *Graminae and Leguminaceae* are the most important followed by *Crucifareae, Rosaceae, Umbellifeerae, Solanaceae and Labitaceae.* Other significant families are the *Chenopodiaceae, Araceae, Cucurbitaceae* and *Compositae* (McNeely et al., 2008). Although relatively few plants contribute to food production, globally, at a local level, plant resources provide a varied source of nutritional need (Vavilov, 2005). Wood is one of the basic commodities utilized world-wide that is harvested as one of the most important products of agrobiodiversity. Timber provides the primary source of fuel on many developing nations, shelter in traditional home building and sophisticated construction, and the basis for the international pulp and paper industry (Hawkes, 2003). Wood as one of the most important commodities in international trade accounts for a particularly significant proportion of the export earnings of developing countries (IUCN, 2000). After timber, rattans (lignoid palms) provide the second most important source of export earnings from tropical agrobiodiversity of crop source (Dransfied, 2001). Rattans are mostly used in the production in the production of cane furniture. Local uses include the production of mats, basket, fish traps, dyes and medicines. The rattan industry relies almost entirely on wild stocks, about 90% of the remaining 10% from plantations (IUCN, 2000). Over-exploitation, habitat destruction of lodging, shifting cultivation and spontaneous settlement has led to the decline of major commercial rattan species and species and species that are valuable in local use.

Pharmaceutical production is a prominent area in which agrobiodiversity is extensively utilized. The medicinal value of plants agrobiodiversity and their derivatives have been recognized for millennia. About 119 pure chemical substances extracted from some 90 species of higher plants are used in medicine throughout the world. WHO has also listed over 21,000 plant names that have reported medicinal uses. About 80% of the people in developing countries rely on traditional medicines. Medicinal plant species are still to a large extent harvested from the wild although a good number are cultivated as crop plants (Hoyt, 2008). About 25% of pharmaceuticals are traceable to plants based origin. Schumacher (2001) identifies three major ways in which plants are used within the pharmaceutical industry. These are: (i) constituents isolated from plants and used directly as therapeutic agents; (ii) plants constituents used as raw materials for the synthesis of useful drugs and (iii) material products used as models for the synthesis of pharmacologically active compounds. He also gives examples of crop plant base drugs to include tubocurian, derived from plant based cure and used as muscle relaxant during surgery, and diosegenin used in the manufacture of contraceptive pills is obtained from a yam species *Dioscorea deltoidea*. Another medicinal plants which have been developed as a major crop species, are quinine *Cinchonna* spp. The main use of quinine, extracted from bark of *Cinchonna* trees is used as anti-malaria drugs. The genetic base of some of the pharmaceutically based drugs is very narrow and conservation of wild varieties is important to prevent its loss (Schumacher, 2001).

Agrobiodiversity of plant source also find its use as ornamentals. Novelty and variety remain important factors in horticultural market. The discovery, domestication and cultivation of ornamental plants have a long history comparable to that of food crops. For example, lilies have been cultivated for both medicinal and decorative purposes for about 2,000 years (FAO, 2004). According to Olivier (2001), the diversity of decorative plants species established in cultivation far surpasses the variety of plants commonly grown for food around the world, and in the tropics alone, an estimated 3,000 species are in general cultivation in addition to the wide range of cultivars and hybrids. With sophisticated propagation technique developed for ornamental plants, significant quantities of plants in some groups are obtained from cultured orchards. This is apparent for example with bulbs, orchids, cacti, insectivorous plant species and other succulent plants (Hawkes, 2003). Plant species of horticultural value are under threat both through the processes of habit destruction and through direct exploitation for local use and international trade.

Agrobiodiversity of plant source is a valuable genetic source essential in crop breeding programme. Genetic resources can be defined as the genetically transmitted characters of organisms, which are of actual or potential value to people. Such characteristics may include rapid growth, high yields, diseases and pest resistance and environmental adaptation. The genetic resources of crop plants represent the total genetic diversity of cultivated species and their wild relatives much of which is of immense value in crop breeding programmes (WCWC, 2002). As pointed out by Davies (2007), many of the species from which crop plants have been selected continue to survive in the wild today. These together with closely related species, comprise the wild relatives of crops, which continue to revolve under natural conditions, and provide a largely untapped reservoir of genetic diversity. He pointed out that some traditional farmers still utilize the closest wild or weedy relative of maize to increase corn yields. The same applies to certain wild relative of cocoa. Wild forms of cocoa, *Theobroma cacao* can be crossed readily within or near the cultivated crop population, so that a natural cross may occur and produce fertile hybrid stock that can be selected for

desirable characteristics.

Another common use of agrobiodiversity of wild genetic resources in crop breeding programmes has been in the introduction of resistance to pests and diseases. Wild tomato species, *Lycopersicon pimpinellifolium* and *Lycopersicon peruvamum* have for example, been used in breeding programmes to confer resistance to various forms of bacterial wilt. Genes from wild relatives of the tomato have also conferred resistance against a range of viruses, moulds, and other pests (Hawkes, 2003). Likewise, wild potato relatives have been crossed with cultivars for many years now, the wild species yielding genes for resistance to viruses, bacterial wilt, nematode, aphids and range of other potato disorders. In addition to wild relatives, agrobiodiversity of crop source is important in providing landraces, another storehouse of genetic crop diversity. Landraces which are known for their inherent range of variations are races or populations of crops that have become adapted under natural and artificial selection processes to the local conditions under which they are cultivated (WCWC, 2002). Landraces are developed over centuries of traditional agriculture and are now being explored as a source of genetic material for crop improvement programmes. Recent research work in International Rice Research Institute revealed a number of primitive rice cultivars with resistance to major pests and diseases including bacterial blight, tungro virus, gall midge and stem borer.

Uses and values of agrobiodiversity of animal resource

The role of agrobiodiversity of animal source in the achievement of sustainable development is well recognized. As documented by FAO (2008), (i) the livestock sector is responsible for over half of the output of agriculture in the developed world; (ii) in developed countries as a whole, calculated on similar basis, it is responsible for a quarter of output; (iii) when account is taken of non-commercial contributions of livestock, such as work, fuel, and manure, livestock are responsible for almost half of the output of agriculture and (iv) in many countries with large pastoral resources, livestock are the mainstay of the economy. Many of the arguments used to justify the conservation of agrobiodiversity rely on the benefits that can be obtained, both economic and otherwise, from sustainable use of animal (Hodges, 2000). Also, the ability of various types of livestock to use roughages, crop residues, and various waste feeds and by-products is well known and utilized (Barker, 2004). Besides, the contribution to food on terms of milk and meat, provides valuable albeit in many cases small, addition to protein intake and the animals provide products for use as hides, skins, wools plus manure either as fertilizer or as fuel, in many cases, animal provides draught power (Hodges, 2000).

Cunningham (2004) pointed out that in the short evaluation of agricultural systems coverage somewhat less than 10,000 years, surprisingly, few animal species have been drawn into domestication and that evidence from the earliest human settlement, indicate that the same species have been used from the start: sheep, goat, cattle, pigs, buffaloes. He explained further that though other species (*Cacelidae*, rabbits) are locally important, practically all of the world animal agriculture can be accounted for by less than 20 mammalian and avian species.

He noted that despite this narrow species, the animals used in agriculture represent an enormous breath of agrobiodiversity. Agrobiodiversity of animal source has a great deal to contribute to the short and long term alleviation of individual and national poverty. FAO (2004) noted that one of the prominent places of agrobiodiversity of animal source is in food supply This special place arises thus (i) animals can use wastes otherwise useless and can supply traction and fertilizer, (ii) animals provide a form of low risk savings, (iii) if milked, mammals can provide daily income, and (iv) animal husbandry being year round necessity can provide sustainable food supply. It added that birds generally provide meat and egg for human consumption. The advent of efficient transportation and storage has allowed the development of commercial food industries based on trades in livestock meat. In addition to its nutritional value, agrobiodiversity of animal source provides important utilitarian products for both domestic and commercial markets. As enumerated by WCMC (2002) for hide, scales, bones, and feathers may be used to make a variety of clothing and utensils, and fat may be rendered for oil. Glue and household implements such as needles and hooks can be made from bones and scales. Other animal products are valued for their ornamental, decorative or ceremonial purposes. Cattle, sheep and goat skins for instance are fabricated into bill card, balls, shoes, piano keys and a variety of jewellery and artifacts. Bird feathers are also used as items of adornment often being incorporated into traditional dress to indicate status or hierarchy.

Agrobiodiversity of animal sources are widely used in medicine by traditional medicine societies and even urbanized societies. Smith (2004) described 181 animal based remedies used in Nigeria most of which were derived from domestic livestock animal species. He noted that in many local markets in Africa several parts of livestock including the fur, genitalia, hair, skull and beak which are sold for medicinal and marginal purposes are not uncommon sights. He added that medicinal livestock products are frequently traded domestically and internationally, particularly to satisfy the demand for traditional oriented medicine. Livestock is being used in orthodox medicine. Sale (2001) revealed how the live animal is used in micro-surgery. The sucking action and substances produced by rabbit during feeding for

instance help survival of accidentally severed parts such as fingers and ears after re-attachment. According to him, rabbit-saliva contains anti-coagulants, anaesthetics, vasodilatory agents and a spreading factor (which allows other agents to spread far beyond the edges of the incision) all of which have potential uses in the range of research and medical fields. The spreading agent (herminton) also serves as anticoagulant, which can help prevent blood clot from forming and can also dissolve already formed clot.

Besides rabbit, a species of pig reported also by Sale is used in fundamental research into human blood testing and clotting properties. According to him, gram negative bacteria are responsible for a wide range of serious diseases in man such as spinal meningitis, and gonorrhea. The blood of this animal clots rapidly as soon as it comes into contact with gram negative bacteria or their endoxins. Refined and free-dried samples of the pigs blood can therefore, be used in a very accurate assay for the presence of these endotoxins, allowing rapid diagnosis of disease and routine checking of purity of blood samples. The use of live animals particularly rabbit as an experimental animal in the biomedical trade. Agrobiodiversity of livestock animal source also finds its uses in draught animals, in sport hunting, in the provision of recreation, tourism and holds aesthetic value. They also serve social and cultural significance and as companion animals. A number of livestock species are trained to assist in various human activities. For example, camel, donkey, and bull are used in various countries of the world for transportation, carrying of load and for ploughing the soil (Sale, 2001). Some animals are also used as draught animals in forest industries, warfare and for ceremonial purposes. Also in many societies, animals are hunted for pleasure and in affluent societies private individuals may pay large sums of money for the privilege (Barton, 2006). In many cases, the off takes are controlled by a system of hunting licenses or permits sold by the government, which can raise significant revenues for the government treasuries. Some animals have enormous recreational and aesthetic value. Many people derive pleasure from livestock either by observing them in the course of their daily times by making special excursions to view them, by domesticating them, by watching them on film or television or simply by knowing that they continue to exist without necessarily wishing to see for themselves (Sale, 2001).

Livestock also influence the philosophy, language, art, religion and social structure of many societies. Citing African culture as a typical example, Sale (2001) noted that animals feature prominently in community beliefs, mythology, and works of art such as carvings and paintings. Economic dependence on livestock he pointed out produces a close relationship between the ecological factors governing social organization in some tribes and that in many cultures, a man's social worth is measured by his prowess as a livestock rearer. Hodges (2000) in affirmation said that for thousand years livestock have been intimately associated with human life. They are one of the special characteristics' of human culture. They are comparable with many other reminders of man's past civilizations and lifestyles which are treasured and preserved with little dispute. Animals are also kept as pets or companion animals, for entertainment, and for private and public displays. He also noted that pet-keeping is an almost ubiquitous human activity

Agrobiodiversity of animal source provides genetic materials for breeders. The biological diversity represented by a multiplicity of different breeds enables productive agriculture to be carried out in a wider range of environments than would be the case if it were genetic uniformity and the local adaptation of breeds can reduce dependence on veterinary care (WCMC, 2002). Agrobiodiversity especially breeds with unique traits that are of great interest scientifically in a number of ways. I-lodges (2000) cited some obvious examples such as the unique DNA sequences of species, breeds, strains and populations, the specialized physiological and adaptive functions and the opportunity to study animals as models and biological diversity. Breed diversity also permits more rapid genetic progress to be made. It is always quicker to develop livestock by importing genes from outside than by selecting within a breed. Sometimes new genetic mutations manifest themselves in flocks and herds and these can act as a foundation of a new breed which can turn out to be an ideal or potential for a desired genetic resource of importance.

Agricultural biodiversity generally speaking, often provide value without being consumed, traded in market place or reflected in national income. McNeely et al. (2008) summarized some of the indirect non-consumptive value of agrobiodiversity particularly of ecological services as follows:

i) Photosynthesis: Fixation of solar energy, transferring this energy through green plants into natural food chains and thereby providing the support system for species that are harvested,
ii) Ecosystem functions: Involving reproduction, including pollination, gene flow, cross fertilization, maintenance of environmental forces and species that influence the acquisition of useful genetic traits in species and maintenance of evolutionary processes leading to constant dynamic tension among competitors in ecosystems,
iii) Maintaining water cycles: Including recharging ground water, protecting watersheds, and buffering extreme water conditions such as flood and drought,
iv) Regulation of climate, at both macro and micro climatic levels: Including influences on temperature, precipitation and air turbulence,
v) Soil production and protection of soil from erosion,
vi) Storage and cycling of essential nutrients: e.g. carbon, nitrogen and oxygen and maintenance of carbon dioxide

balance,
vii) Absorption and breakdown of pollutants: Including the decomposition of organic wastes, pesticides and air and water pollutants, and
viii) Provision of recreational, aesthetic, socio-cultural, scientific, educational, spiritual and historical values of the environment.

METHODOLOGY

For the purpose of this paper, a research question was posed as a guide, what is the perception of rural farmers about the utilitarian values of agrobiodiversity? To answer this question, survey design method was adopted. The area of the study is located in Akwa Ibom State, which is classified into three agricultural zones – Eket, Ikot Ekpene and Uyo, based on the geological characteristics of the state, Eket zone is identified with fresh water and mangrove swamp forest ecological structure. It is located along coastal creeks, estuaries and lagoons. It is dominated with varieties of vegetations such as tall trees with prop roots which yield timber and pulps. The thick forest also serves as habitat for wildlife. Proportionate stratified sampling was used to draw up a sample size of 552 farmers for the study in this case. A sampled population drawn for the study comprised of rural farmers, agricultural extension officers and forestry officers serving in the three different ecological/ agricultural zones of Akwa Ibom State.

A well structured questionnaire was used in the study. It was divided into two main parts: 1 and 2. Items in part 1 were structured in such a way as to elicit demographic data on the characteristics of prospective respondents. It sought information bothering on the status and agricultural zones of operation of the respondents. Part 2 was designed to get information aimed at providing answers to the research question considered in the study which is all about the perception of rural farmers on the utilitarian values of agrobiodiversity. To determine the reliability of the instrument, copies of the questionnaire were administered to 30 rural based farmers, 10 forestry officers and 10 agricultural extension officers. The internal consistency of the instrument was determined by analyzing the data obtained from the exercise using Cronbach alpha reliability test. The reliability indices of items yielded a coefficient of 0.71. The result indicated that the instrument could considerably be relied upon to generate consistent information relating to the problem of the study. To facilitate the administration of the instrument, the questionnaire was administered by personal contacts through the assistance of experienced and professional agricultural extension officers, forestry officers and teachers of agriculture serving in different agricultural zones in the state.

RESULTS

Research question 1

What is the perception of rural farmers about the utilization values of agrobiodiversity? To answer the research question, items showing utilitarian value of agrobiodiversity were presented to the respondents (rural farmers) to indicate the extent of their agreement based on their perceptual dispositions. The mean scores of the responses to each item are presented in Table 1. Table 1 shows the distribution of opinions of farmers on the utilitarian values of agricultural biodiversity. The farmers agreed that agrobiodiversity holds the following utilitarian values, which serves as source of food, medicine, recreation, fuel wood, fodder for livestock, and timber for building houses. Besides, it also performs ecological functions such as the protection of watersheds, recycling of nutrients, enriching the soil, and regulating the water flow. These items recorded mean score of 2.50 and above. The result further shows that the farmers do not perceive agrobiodiversity as source of genetic resources for crops and livestock breeding and source of livestock use for work and transportation. These items received mean score values of less than 2.50.

DISCUSSION OF FINDINGS

Perceptions of rural farmers on utilitarian values of agrobiodiversity

Majority of rural farmers' respondents rated agrobiodiversity as possessing utilitarian values in a number of ways. The aforestated details are revealed by data in Table 1. A great concordance exists between the aforementioned findings and that from previous works and literature on the utilitarian values of agrobiodiversity. McNeely et al. (2000) in their respective related research works analyzed and summarized the values of agrobiodiversity under three main aspects;

(i) Ecological functions; including the maintenance of and protection of watersheds and soil, the regulation of climatic and habitat for wild plants and animals;
(ii) Subsistence values: including the provision of foods, fibres, medicine and other products that are consumed outside a market economy; and
(iii) Commercial usage, including extractive products sold on local and regional markets, export goods such as resins, dyes, rattan and timber and genetic resources used in agricultural and forestry crops.

This seems to emphasize the pertinent fact that agrobiodiversity brings immense benefit to humanity. Its preservation undoubtedly, has the highest social and economic priority. As the fundamental building blocks of economic development and food security, agrobiodiversity provides the basis for local sufficiency (WRM, 2001). Agrobiodiversity of plant resource for instance constitutes an extremely wide source of products which farmers and other groups in Akwa Ibom State rely upon. Food, medicine and a wealth of raw materials are obtained from a mixture of direct harvesting from the wild and cultivation ranging from basic subsistence farming to sophisticated agricultural system. As well as the more obvious plant products such as food, medicine, ornamental plants and timber, agrobiodiversity of plant source provides a variety of resources used in

Table 1. Perception of utilitarian values of agrobiodiversity by rural farmers.

Item No.	Utilitarian value of Agrobiodiversity	$\overline{x}$	Remark
1	Serve as sources of food	3.73	*
2	Serve as sources of medicine	3.54	*
3	Serve as sources of genetic resources for crop and livestock breeding	1.67	**
4	Serve recreational purposes	3.22	*
5	Hold aesthetic values	3.14	*
6	Influence the philosophy, language, art, religion and social structure of a community	3.22	*
7	Serve as source of firewood	3.03	*
8	Fodder for livestock	3.72	*
9	Timber for building and other purposes	3.74	*
10	Protection of watershed	3.70	*
11	Recycling of nutrients	2.57	*
12	Enriching the soil	3.56	*
13	Regulating water flow	2.58	*
14	Source of draught animal	1.36	**
15	Animal used for transportation	1.24	**

N = 552. * = agree; ** = disagree.

industry and commercial in the state. To mention but a few, plant extracts are used in the manufacture of glue, soaps, cosmetics, dyes, plastics, lubricants and polishes.

The result of the study also pointed out .the immense contribution of agrobiodiversity' in the field of traditional medicine in the state. This result is in consonant with many related articles, response .and empirical research studies which described agrobiodiversity of plant source as pharmacies. This course legitimately points to the immense importance it has, for traditional and herbal medicine as well as their future potentials in these regards. About 119 pure chemical substances extracted from 90 species of higher plants are used medicinally. Also, 80% of people in developing countries rely on traditional medicine. The trend in Akwa Ibom State is not different. Majority of people are still relying on traditional healing practices and medicine. Most of these medicines come from agrobiodiversity of cultivated and wild plant sources. The result of the study also pointed out the immense influence of agrobiodiversity on ecological characteristics of the state. BOSTID (2002) in confirmation observed that agrobiodiversity provides ecological services that are more difficult to calculate with precision. Agrobiodiversity, they explained, have immense importance in the processes of biochemical cycles and in providing more locally in protecting watershed, recycling nutrients, combating erosion, enriching the soil, regulating water flow, trapping sediments, mitigating pollution and controlling pest population.

The result of the study also showed that rural farmers do not quite appreciate the values of agrobiodiversity of livestock source in serving as a means of transportation and source of farm power. The reason for this is not farfetched. Farmers in the State however depend on agrobiodiversity of animal source for income generation, employment of labour and cultural and religious rituals, as well as for some social intercourse, but the role of livestock in the socio-economic life of the people in the State is greatly reduced. Agrobiodiversity of crop resources are more appreciated over livestock in most respects whether from the viewpoint or size of income derived, the number of worker engaged or the level of capital invested of the quantity of produce handled. The practice of utilizing agrobiodiversity of livestock source, especially as a source of transport and farm power is more pronounced in the Northern state of Nigeria than in the South in General, and Akwa Ibom State in particular (NEST, 2001). This regional difference is mainly because of the large climatic, vegetation and socio-cultural difference between the two zones. Furthermore, livestock production in the State is predominantly sedentary, dominated by small scale poultry farming, goatry, piggery and rabittery. This is a sharp contrast with the large scale livestock ranching, and pastoralism which is dominated by donkey and cattle feedlot operations. Here, the utilitarian values of agrobiodiversity of livestock source, as a means of transport and source of farm power is quite appreciated.

IMPLICATIONS OF THE STUDY

The findings of this study have far reaching socio-economic implications in areas such as food security/ sustainability, poverty alleviation, crude oil exploration, utilization of ecological fund, and employment of farmer education approach.

Implication for food security in the State

Agricultural progress is the key to rural and national prosperity. The nation's food security system can be built on ecological security (FAO, 2009). Ecological security implies the conservation and sustainable management of the basic life support systems of land/water, flora/fauna and the atmosphere. It involves concurrent and integrated attention to all the components of the biosphere including agrobiodiversity (McNeely, 2008). The study reveals that agricultural biodiversity performs vital functions in agriculture, land and water use. The diversity of plants, animals and micro-organisms is essential for maintaining the productivity and sustainability of farm crops and animals, managed forests and aquacultures. Food security therefore is dependent on harnessing and sustaining agrobiodiversity and its many functions.

The findings of the study also indicated that the security of agrobiodiversity in the state is under threat from human lifestyles and patterns of agricultural, industrial and economic development and urbanization. Population growth is exceeding the capacity of the natural agroecosystem to support them on an ecological basis. There is migration of rural poor to towns and cities with abject abandonment of agriculture. The ultimate implications are reduced food production, with consequent threat of food security. There is need to reverse this trend. WRM (2001) has in its report titled "Our Common Future" raised the need to accord the highest priority to making development ecologically sustainable. While it is important to think about the future, what is even more important is to conserve our agricultural biodiversity on which our food security depends, by encouraging the conservation of agrobiodiversity through rural farmers.

Implications for crude oil exploration in the State

The study reveals that one of the major causes of agrobiodiversity degradation is oil spillage which occurs on both on and off-shore locations in the state. Since the discovery of crude oil in the state, agricultural biodiversity' has been subjected to continuous degradation. The impact of oil spills has ranged from the barely tolerable to utterly disastrous dimensions. The resultant spillage which usually covers extensive areas destroys economic trees, farmlands and cause structural changes, a crust and a pan formation on the soil. A pan which often occurs after oil spillage on the soil is a hard concretionary layer formed at, or beneath, the soil surface. Pans can restrict roots, making crops or natural cover vulnerable to physiological drought, trees vulnerable to wind throw and subsequent death. The process of agrobiodiversity degradation may be difficult and very costly to heal or reverse once it gets underway. In some cases, it may be virtually impossible to reclaim or rehabilitate the agrobiodiversity in the area affected by oil spill. This is particularly the case if vital seeds, fungi and soil organism are lost and with such loss there is also likely to be altered micro climate. This is usually afflicting to the rural farmers and people in the state. The implications is that the aggrieved people out of the frustration abandon these dry and barren lands and resorted to the immediate means of livelihood which they find in oil pipeline sabotage.

Alternatively, most of them engage in protest and widespread resistance against the destruction of their resource base which they believe cannot be compensated for. Agrobiodiversity consequent upon oil spillage is one of the most crucial problems today in the rural farming communities of the state. It is a problem that is accelerating and one that tends to get too little attention from the government and oil prospecting companies in the state. The state government should not wait to observe the rich diversity of agricultural resources to be driven to extinction by oil spillage. A definite action could be that of lobbying the Federal Government to sign the 1971 International Convention on Civil Liability for Oil Pollution Damage which established International Fund for Compensation for Oil Damage (IOPC). This convention provides for a free-standing fund that awards compensations to any person, group or community suffering oil pollution damage (WCMC, 1992).

The IOPC is financed by initial annual contributions. Initial contributions are payable when a state becomes a member of the IOPC fund and is calculated on the basis of fixed amount per tonne of crude oil received the year preceding the State's entry to the convention. Annual contributions are paid by any persons who have received in the relevant calendar year, more than 150,000 tonnes of crude oil in the member state. The levy of contributions is based on reports of oil receipts which are submitted by governments of member States. The contributions are paid by the individual contributors directly to IOPC Fund. Governments have no responsibility. It should be noted that such funds if attracted to the State, could be a viable source of funding agrobiodiversity conservation programmes in oil spill devastated parts of the State.

Implication for poverty alleviation programme

The study reveals that poverty is one of the cardinal causes of loss of agrobiodiversity, especially among rural farmers as well as a hindrance to the involvement of rural farmers in agrobiodiversity conservation in the State. The results of the finding have serious implications for the present poverty alleviation drive of the government. The geography of environmental development indicates that Akwa Ibom State has a total land area of about 25,661 km^2 and is richly endowed with abundant agricultural resources. Currently, the agrobiodiversity is facing a

degree of degradation across the length and breadth of the state. The natural support systems are under siege. Key environmental indicators are increasingly stressed. The agrobiodiversity conservation culture is fading. All these problems according to studies have strong linkage with poverty. So the change is to reduce poverty by accelerating equitable income group and promoting access to the necessary resources technologies and education.

The present poverty alleviation programme of the government is a laudable effort in this direction. The scheme has many palliative programmes some of which include the provision of soft loans to would be grass roots based small scale investors, education anti skill acquisition training programmes and many more. There is need for poverty alleviation programmes to be focused on the poor rural farmers through credible grassroots based organizations. This is because rural farmers have made unalloyed contribution in protecting and developing agricultural resources in particular a diversity of cultivated semi-wild and wild plants used for food, fuel, and medicine. Poverty alleviation should make provision for programmes that will support agrobiodiversity conservation anti utilization of local agroresources. Village-based rural farmers' institutions should be supported and encouraged. The roles of NGOs should be promoted. It should be ensured that they have access to grants and credits to promote the utilization and improvement of local varieties including, for example, their marketing and processing. Successful poverty alleviation policies and programmes focused on rural farmers will have double benefit. Firstly, their efforts in maintaining and developing food crops, medicinal plants and their wild and semi-wild relatives will make direct and vital contributions to practical conservation of the State's agricultural biodiversity. Additionally, such farmers form a large part of a growing rural population sustainable development of their systems of production is the key to improving food security, reducing poverty and reducing the consequential effects of environmental degradation in general and agrobiodiversity degradation in particular.

Conclusions

Based on the findings of the study, the author came to a conclusion that agricultural biodiversity as perceived by rural farmer's have a very intrinsic value for agrobio-diversity in terms of its recreational, ecological, cultural/ symbolic, and historical values. It also fulfills specific functions both in ecological services and existence values.

RECOMMENDATIONS

On the basis of the findings of the study, the discussions and conclusion therefore, the following recommendations were made: The state government should develop innovative funding mechanisms to support agrobiodiversity conservation programmes in the state by:

(a) Collecting royalties, concessionneering fees and special taxes on agricultural resources such as timber extraction, wood trading, trade in crop and livestock products directly from the forest and other activities connected with the sector;
(b) Building conditionality into concession agreement for instance, in an area that has such extensive agro resources as timber/fisheries; concession could be sold to private investors;
(c) Seeking more collaboration from the private sectors including multinational oil companies, industries and voluntary organizations;
(d) Allocating a substantial percentage of Ecological Fund for agrobiodiversity conservation programmes/projects;
(e) Allocating an appreciable amount in the annual state budget for agrobiodiversity conservation programmes; and
f) Designing a programme of education and awareness creation on the appreciation of agro ecological biodiversity and methods of conservation with the rural farmers being the drivers of the process and programmes.

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