
STRATEGIES FOR INVOLVING RURAL FARMERS IN AGRICULTURAL BIODIVERSITY CONSERVATION IN AKWA IBOM STATE, NIGERIA

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ABSTRACT

Akwa Ibom States is located in the rainforest belt of Nigeria known for preponderance of agricultural biodiversity. Agricultural biodiversity or agrobiodiversity is succinctly referred, is 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, and 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 determine the measures for enhancing the involvement of rural farmers in agricultural biodiversity conservation In Akwa Ibom State, Nigeria A research question and one related null hypothesis were formulated to guide the study. A total of 858 respondents comprising rural farmers, agricultural extension officers, forestry officers, professional conservators and staff of conservation based NGOs were involved in the study. The data were obtained through a structured questionnaire. The data were analyzed with mean, and analysis of variance (ANOVA). The findings of the study revealed that some of the key measures for involving rural farmers in agricultural biodiversity conservation In Akwa Ibom State, Nigeria include the application of incentive system in the management of agricultural resources, non-imposition of fines on agro based produce/products and the provision of adequate marketing outlets in the rural areas for agro-based produce among others. Finally, it was concluded that to enhance agrobiodiversity conservation, programmes of agrobiodiversity conservation in the state should involve the rural communities who are the major actors in the development of agrosources and its conservation principles.

Keywords: Biodiversity, Agrobiodiversity, Agroecosystems, Conservation, 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 (Board on Science and Technology for International Development (BOSTID), 2002. It is a term used to describe the degree of nature's variety including both the number and frequency of ecosystems, species or genes in a given assemblage. It is essentially synonymous with life on the earth. It is usually

considered at three different levels: genetic diversity, specie diversity and ecosystem diversity. Genetic 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. Specie 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 habitat 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, Smith and Ferno, 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 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 (Food and Agriculture Organization, 2008). Agroecosystems 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 immense benefit to humanity. Man depends on various livestock and crop species for food, fuel, fibre, medicine, drugs and raw materials for a host of manufacturing technologies and purposes. The productivity of agricultural system is as a result of a continuous alteration of once wild plant and animal germplasms. Also genetic engineering especially in the pharmaceutical and food processing industries uses agrogenetic 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, agrobiodiversity 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, cattle), crop varieties (fruit trees, fodder plants and cereals) and wild fruits are being explored to generate local products jobs, income and environmental care.

Inspite of the enormous potentialities of agrobiodiversity 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 its being increasingly subjected to devastation and loss. The loss of agrobiodiversity is a relative phenomenon. Blaide and Broodfield (2007) maintained that 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 utility or potential utility or the reduction or change of features or extinction of agro species which 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 zones, 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 indigenous knowledge 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 on the part of local people; market pressures and the under-valuation of agricultural biodiversity; demographic factors and oil spillage.

It is an acclaimed fact that rural farmers often have profound and detailed knowledge of agro-species and the related ecosystem's with which they come in contact and have developed effective ways of ensuring they are used sustainably (McNeely, Miller, Reid, Mittermeier, & Werner, 2000). However, they are constrained by a number of problems in their attempt to adopt conservation systems that sustain its own capital - agricultural resources of plant and animal sources. According to FAO (2009), the factor which causes a gap between the desired and actual farmer behaviour in conservation border on knowledge, motivation and technology, type of incentives and disincentives, land use, population growth and poverty among others.

McNeely *et al* (2000) noted that at its most fundamental level agrobiodiversity is threatened because people are out of balance with their environment. Benefits are being gained from exploiting agricultural resources without paying the full cost of such exploitation. They identify six main obstacles to greater progress in conserving agricultural biodiversity. These are:

- a. Development objectives give insufficient value to agro-resources
- b. Agro-resources are exploited for profit, not for meeting the legitimate needs of local people.
- c. The species and ecosystem upon which human survival depend are still poorly known.
- d. Conservation activities by most organizations have had to focus too narrowly.

On insufficient value being given to agro-resources in the national and private development objectives, McNeely et al pointed out that maintaining a nation's agro-agricultural diversity is integral to maintaining its agricultural wealth, but the importance of species and ecosystem is seldom sufficiently considered in the formulation of national development policies. Rural farmers do not consciously consider the value of species and ecosystems in their farm practices. Development tends to emphasize short-term exploitation to earn income or foreign exchange rather than long-term sustainable utilization of agricultural resources. Farmers focused on their expressed immediate needs and tend to seek relatively short-term returns on their investments. Uncontrolled use of agricultural resources by farmers contributes to specie extinction and loss of agricultural biodiversity. McNeely et al also pointed out that most conservation efforts made by the farmers have addressed a small species such as ruminants, monogastrics, poultry, major species of plants or certain tree species. Farmers lack ability conserve if the conservation efforts are poorly paid. Besides, those responsible for creating awareness opportunities for advancement, lack specialized training and have low prestige, lack sufficient equipment and managerial capacity. These ultimately affect the conservation efforts of the rural farmers.

Shepherd (2002) blames the poor conservation disposition of the rural farmers on tenure and land use changes. He noted that one of the facts which emerge of recent in the conservation circle is the tremendous paucity of formal forester knowledge about the conservation of forest-based agro-resources. Set against this knowledge, one finds the imposition of European concept of property and land tenure, with disastrous effect. The most important gap was the failure to understand the Swidden fallowing system which had used the landscape sustainably for some years now. swidden fallowing is coming to an end and more marginal lands are farmed with accompanying destruction of bush areas. Each household head now tries to spread his bets by sowing over as wide and varied an area as possible with the result that conservation practices such as manuring, intensive sowing and weeding, planned fallowing and water conservation, have been replaced by quick easy farming (Thompson, Feeny, and Oakerson, 2006).

Indirectly related to this is the land use changes relating to economic change and the loss of authority of elders in the traditional farming community. Thompson *et al* (2006) noted that the introduction of plantation crops such as oil palm, cocoa and rubber as major economic crops has a negative effect on other many areas with attendant loss of agro-ecosystem and agrobiodiversity. He also said that in some local communities the authorities of the clan elders who were originally solely responsible for livestock and agro-resource management, is being eroded by modern education for the young and the promulgation of Land Use Acts by the government. Pointing out the effect of this on conservation effort, he said that, the

weakened position of the elders makes the conservation of agro-resources through the institution of sacred groves no longer tenable.

Another factor which has tremendous adverse influence on the ability of the rural farmer's conservation is unattended population growth. Nigerian Environmental Study/Action Team (NEST), (2001) rightly argued that a finite world can support only a finite population. Under a given socio-economic system and technology, there is an upper limit to the number of people which land area can support. As long as the number of people is below this critical value their demand for agricultural land, grazing land and food at least in theory can be met without the environment being degraded or destroyed by population pressure, However, if the critical population density is exceeded, these human demands translate into excessive pressure on the land and agro-resource, The partnership between population and the environment becomes endangered and may break down as problems of deforestation and loss of agrobiodiversity Once the population sinks into a miserable state, what was once a harmonious and happy partnership between people and environment can easily become a vicious cycle in which environmental degradation makes people desperately poor. Poverty forces people to over-exploit the available agro-resources with disregard to conservation.

Population pressure seems to have led to the shortening of fallow periods under the shifting cultivation, In its traditional form, shifting cultivation is known for a rich source of crop diversity (BOSTID, 2002) In Nigeria, the whole cycle has less than halved in length and the fallow period is less than a third of what it was (NEST, 2002). The tendency is for the fallowing system to shrink in the end to the point where it is replaced by, crop rotation and monocropping. In these systems conservation practices are often replaced by quick easy farming (Thompson, Fenny, & Oakerson , 2006).

One of the constraints to the conservation of agrobiodiversity by rural farmers is lack of education. Nigeian Conservation Foundation (NCF), (2005) pointed out that tackling environmental problems (loss of agrobiodiversity inclusive), requires action mostly from environmental education, Noibi (2002) noted that a person's level of ignorance of the environment can be said to be positively related to the degree of damage to the environment. He exemplified this by relating a case of farmers who over-graze their land or substitute chemical fertilizer for organic manure and pesticides for biological means of pest control without bothering about the implications of that action on land and agrobiodiversity, It could therefore, be inferred that lack of environmental education among the farmers is the single greatest contributor that constraints the conservation of agricultural biodiversity by rural farmers. Education can impart knowledge and determination necessary to resolve a given set of environmental problems.

The social and perceptual factors also influence the conservation attitude of the rural farmers. According to Kellert (2008), the development of compelling rational and effective strategy for protecting endangered agro-species will require an increasing recognition that

most contemporary extinction problems are largely the result of socio-economic and political forces. Norton (2008) pointed out that only a small minority of people possess much concern or empathy for the plight of endangered agro-species. Kellen (2008) while reflecting this view noted "the study of vanishing biodiversity is necessarily *the* study of man's perception of animals and plants. What we fear, what we hope and what we admire in animals/plants will inevitably determine their fate. Agro-species are there but most of them figure as villain in our myths".

As Norton intimates, agro-species are viewed somewhat more positively when they possess some aesthetic and utilitarian values. Human benefit factors include animal capacity to provide food, clothing, recreation and companionship. Ecological factors include species rarity and its contribution to diversity and ecological balance. Important psychological factors include the animal's species aesthetic characteristics, spiritual and religious associations, habituating capacity and behavioural plasticity. These factors and values outline the perceptual categories rural farmers typically employ in deciding which species are worthy of preservation.

Another factor affecting conservation by rural farmers borders on the conservation policies operating in the country. NEST (2008) pointed out that one of the biggest bio-resources management problem is the absence of well coordinated rational policies and legislation operating in the country, but such policies have often been implemented without really considering local socio-economic issues. Also conservation policies tend to be largely "western" in outlook and having been designed and possibly managed by government officials can be poorly adapted to meet vital local needs (Barrow, 2008) He pointed out that conservation can involve a range of different interests such as central government, state/local government, local farmers, and conservation group/development staff and there may be conflict of interest between them. He concluded that developing conservation policies without taking the needs and demands of these different group's will tend to end in difficulty.

Constraints to the conservation of agrobiodiversity by rural farmers are also associated with culture and religious beliefs. NEST submits that because of the closer relationship between culture and the environment, any campaign for environmental awareness and conservation must take on a new cultural time, calling for new ways of life and a new orientation. During pre-colonial times, religious beliefs and practices played important roles in the conservation especially agrobiodiversity. Sacred grooves and sacred animals were not exploited by people and so they remained in their pristine state. However, with the institution of colonial government and the spread of western values and culture, our traditional methods of conservation gradually disappeared and sacred forests became hunting ground (NEST, 2001).

On the adverse effects of religious influence on traditional conservation practices, various traditional farmers have developed over the centuries, effective method of using the environment sustainably. These included the setting aside of land for religious and other

purposes. Such land served as community forest estates protected by local law and custom and serving the spiritual or material needs of the people or both forestlands also were regularly set aside for various purposes: as hunting forests religious grooves, and isolation or quarantine forest. NEST observes that the coming of Islam and Christianity and of modernity in general has eroded adherence to traditional religion.

Inappropriate agriculture is also blamed as one of the factors inhibiting the conservation of agricultural biodiversity by rural farmers. Jackson (1983) commenting on the problems of conservation in Nigeria, cited bush fire as one of He said that in most farming communities in the tropics, the vegetation is usually set on fire annually. He pointed out that although burning is, often carried out to provide an early- flush of palatable tender grasses for livestock fires often penetrate into and burn up protected areas. Present studies also indicate that fire often results in the destruction of wild crop landraces and wildlife the custodian of genetic resources of importance. Besides, repeated burning usually results in decreasing growth of perennial vegetation. Barrow in a related comment pointed out that there has been a tendency of western attitude and technology to replace established, often successful local farmers' agricultural practices, sometimes with catastrophic results and effects on conservation. A further complication is that farming has tended to become more dependent upon chemicals such as fertilizers and pesticides. On the effect of this practice on conservation, Soule *et al* (2002) noted that the most critical problems associated agricultural pesticide use are those affecting toe fields crops themselves. These ultimately affect conservation. Some works also indicate that even nitrogenous fertilizer have all been blamed for causing stress action that increases the level of free amino acids and sugars in plant cells. This condition makes plants more appetizing to herbivores and can lead to higher herbivory levels. This is a threat to conservation. Soule also claims that herbicides have been found to intensify pest problem and hence affect agrobiodiversity of plant source. He explained that when herbicide applied before the crop comes up successfully removes all the weeds, it removes all alternative foods for the resident herbivores. In some cases this heightens the vulnerability of tender, newly emerging crop seedlings. This problem is of greatest concern when the herbivores have generalist-feeding habits - in other words they feed on a variety of plant species Most conservation programmes aimed at enhancing the conservation often fail because of lack of involvement of local farming population in the planning, execution and managing of conservation programmes. NEST (2001) pointed out *that* rural farmers are often marginalized in the day to day issues. Concerning conservation the local farmers are not made benefit from the conservation proceeds.

FAO (2001) commenting on common constraints to the farmers' involvement in conservation pointed out that rural farmers tend to work together and contribute strength in conservation mostly when the benefits are immediate. NCF (2005) added that the failure of experts to consult local opinions (farmers) has sometimes resulted in expensive methods holding sway where knowledge and experience are .already available and passed on through oral tradition was not properly taken into reckoning.

Poverty is argued the single most influential factor inhibiting the conservation of agrobiodiversity. Poverty refers to a situation and process of serious deprivation or lack of resources and materials necessary for living within a minimum standard conducive to human dignity and well being. NEST (2001) opines that poverty is a major cause as well as a result of environmental degradation. In drawing analogy between poverty and environmental degradation, NEST (page 61) noted that poverty is the single most appropriate word with which to describe the local farmers in Nigeria today. As the World Commission on Environment and Development states "Poverty creates environmental stress in a different way. Those who are poor and hungry will often destroy their immediate environment to survive. They will cut down forests; their livestock will overgraze pasture, they will over-use marginal land; and in growing numbers they crowd into congested cities.

The poor attitude of rural farmers towards conservation is also blamed on modernization. Associated with modernization is the on-going increase in monoculture at the expense of polyculture-style agriculture. Soule *et al* (2002) noted that one of the dominant themes of modern agricultural development has been the reduction in diversity. This is seen in crop and livestock breeding where local farmers are encouraged to patronize genetically narrow varieties and 'breeds that now dominate agriculture at the replacement of a multitude of locally adapted strains. Shiva (2001) added that in traditional agriculture and forestry system; biodiversity regenerates itself, it is both means of production and product thus seed has been the source of grain as well as future source of seed. Industrialized agriculture and the seed industry especially, with the advent of modern biotechnologies, convert this seed into mere raw materials for seed as commodity patented and privatized. Drake (2009) noted that importation of exotic breeds is one of the reasons for the disappearance of local breeds found among local farmers.

Another factor which impacts conservation among rural farmers, borders on what FAO (2009) refers to as a type of disincentives. These include fines, withholding of supplies/materials, punishment/pressures from the community, withholding of land use rights, withholding of services, closing of market outlets and impounding of agricultural products. Many farmers lack the resources to address properly the conservation problems with which they are confronted.

The conservation of agrobiodiversity by rural farmers is also threatened by natural phenomena a factor which farmers do not claim control. According to Ashton (2008), the gravest threat to biodiversity or at least the straw that breaks the camel's back, is climate change brought about by air pollution and the increase in atmospheric carbon dioxide due to deforestation and burning fossil fuels. (International union for the conservation of Nature (IUCN), 2002) has shown that increasing atmospheric carbon dioxide concentration alters the growth rate and reproductive potentials of crop plants and ultimately affect interaction at community level and beyond and that rapid climatic change may have contributed to major extinction event in the earth's history.

Barrow (2008) also associates the problem of conserving agrobiodiversity to waterlogging when drainage is impeded leading to saturation, that is, soil interstitial spaces are water-filled. Some crops and livestock species are adapted to waterlogged soils, some are not. Barrow explains that if water logging of a soil occurs gradually, plants and animals may adapt or new species have time to colonize. If the water logging is relatively sudden, there may follow a period when existing organisms die or move away and new, adapted species have colonized. To address these multifaceted issues need therefore arises for conscious determination of the strategies for enhancing the involvement of rural farmers in agrobiodiversity conservation in the State.

MATERIALS AND METHOD

RESEARCH QUESTION

This study was guided by this question. What measures if adopted could enhance the involvement of rural farmers in agrobiodiversity conservation in Akwa Ibom State?

HYPOTHESIS

This null hypothesis guided the study. There will be no significant difference in the mean ratings of agricultural extension officers, forestry officers and professional conservation officers on the measures which could enhance the involvement of rural farmers in agrobiodiversity conservation in Akwa Ibom State.

DESIGN OF THE STUDY

This study was carried out using a survey design method.

AREA OF THE STUDY

The area of the study is Akwa Ibom State. Akwa Ibom State is one of the states in Nigeria. It is situated in the Niger Delta environmental setting known for preponderance of agrobiodiversity. It is divided into three agricultural zones – Eket, Ikot Ekpene and Uyo based on her ecological characteristics. 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. The location of Akwa Ibom just north of the equator and within the humid tropics and its proximity to the sea makes the state generally humid. On the basis of its geographical location, the climate of Akwa Ibom State can be described as a tropical rainy type which experiences abundant rainfall with very high temperature. The state experiences two main seasons, the wet and the dry seasons. The wet or rainy season lasts between eight to nine months starting from mid- march till the end of November. The dry season has a short duration of between the last week of November or early December and lasts till early march.

POPULATION OF THE STUDY

The target population for the study was 6,242. This comprised rural farmers, agricultural extension officers, forestry officers serving in the three different agricultural zones in the State. Others were the conservation staff of Ministry of Environment and Staff of Conservation-based non-governmental organizations operating in Akwa Ibom State

SAMPLE AND SAMPLING PROCEDURE

Sampling was carried out in the rural farmers' population group only. The technique of stratified sampling was used in this case. Ten percent of rural based farmers were sampled for the study. A total sample size of 552 rural farmers respondents were used for the study. The entire population of professional forestry officers (118), agricultural extension officers (138), conservation officers of Ministry of Environment (26), and staff of NGO (24), were involved in the study .The grand total of the sample for the study was 858.

INSTRUMENT FOR DATA COLLECTION

A structured questionnaire was used in the study. It was divided into two main parts, 1 and 2. Items in part 1 were structured aimed at obtaining demographic data on the characteristics of prospective respondents. Part 2 elicited information aimed at providing answers to the research questions

RELIABILITY OF THE INSTRUMENT

To determine the reliability of the instrument, copies of the questionnaire were administered to 30 rural based farmers, 10 forestry officers, 10 agricultural extension officers, five conservation staff of Ministry of Environment and three staff of NGOs with one drawn from each NGO. The internal consistency of the instrument was determined by analyzing the data obtained from the exercise using Cronbach alpha reliability test. The reliability coefficient was 0.77. The results indicated that the instrument could be considerably relied upon to generate consistent information relating to the problem of the study.

METHOD OF DATA COLLECTION

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 ecological zones in the State.

RESULT

Research Question

This study was guided by this question. What measures if adopted could enhance the involvement of rural farmers in agrobiodiversity conservation in Akwa Ibom State? This research question was answered by presenting possible measures that could enhance

agrobiodiversity conservation for respondents to indicate their opinion. The mean scores are presented in Tables 1 and 2.

Data in Tables and 2 show the mean distribution of the measures for enhancing agrobiodiversity conservation as perceived by farmers and agricultural extension officers respectively. The result indicated that all the considered measures hold potential for enhancing the involvement of rural farmers in agrobiodiversity conservation in Akwa Ibom State?

Table 1: Measures for Enhancing Agrobiodiversity Conservation as Perceived by Rural Farmers

Item No	Measures for enhancement	\bar{x}	Remark
1	Provision of sufficient resources by government for creating awareness on the need for conserving agrobiodiversity	3.39	*
2	Promotion of poverty alleviation programme among rural farmers	3.49	*
3	Provision of adequate and effective conservation facilities e.g. seed banks at the disposal of farmers	3.58	*
4	Imposition of fine on agro-based produce/products	3.46	*
5	Provision of adequate marketing outlets in the rural areas for agro-based produce.	3.57	*

*N = 552; * = Agree;*

Table 2: Measures for Enhancing Agrobiodiversity Conservation as Perceived by Agricultural Extension Officers, Forestry Officers and Professional Conservationists

Item No.	Measures for enhancement	\bar{x}	Remark
1	Provision of fiscal and administrative support for studies into ways to maintain and enhance agricultural biodiversity in crop and animal production and in different kinds of agroecosystem in the State	3.28	*
2	Strengthening capacity to develop new crop varieties and animal breeds that are specifically adapted to the local environments of the State	3.11	*
3	Planning and managing rural landscapes to sustain agrobiodiversity and agroecosystem services	3.26	*
4	Promotion of environmental education among policy makers, professionals, the public and farmers on agrobiodiversity management	3.42	*
5	Strengthening of conservation based NGOs, local groups and institutions devolving administrative or legal bottlenecks to local planning, or actions on agrobiodiversity conservation	3.57	*
6	Supporting the development of local institutions for common	3.58	*

7	agro biodiversity conservation programmes and activities Encouraging local participation in planning, management and evaluation of agro biodiversity conservation programmes and activities	3.30	*
8	Involvement of women and men farmers, herders and fishermen in the development of land use, policies and technologies that aid agro biodiversity conservation	3.39	*
9	Provision of institutional space and incentives for professional conservators to understand the social, cultural, complexity, and agroecological diversity of the State.	3.42	*
10	Reformation of policies and laws on rights of access, use and control by farmers and indigenous people over land, trees, water, and agrogenetic resources in the State	3.12	*
11	Reformation of international, national and State policies that contribute to the loss of agro biodiversity in the State	3.36	*
12	Elimination of policies and economic incentives that erode agricultural biodiversity particularly subsidies for high yielding varieties, pesticides and fertilizers.	2.00	**
13	Elimination/discouragement of variety release and seed certification legislation that hinder the utilization of diverse genetic materials through their requirements for distinctiveness, uniformity and stability	2.13	**
14	Building agro biodiversity conservation related conditionality into concession agreements with investor in area of the State where crude oil, extensive timber and other agrobioresources are exploited	3.26	*
15	Promotion/encouragement of afforestation and reforestation programmes in the State.	3.37	*
16	Enforcement of related laws and regulations that limit unfair market dominion by corporations that sell seeds, agrochemicals, veterinary products and biotechnologies and or process and distribute food and fibres in the State.	2.07	**
17	Establishment of flexibility in the marketing standards to allow food distributions and retailers to diversity varieties of produce in the State.	2.93	*
18	Elimination of pricing and tax policies that favour genetically and ecologically uniform production system	2.61	*
19	Establishing legal means for protecting or regulating the use of habitats that are important for conserving agro biodiversity	3.07	*
20	Enlisting more collaborators, example other non-conservation sectors including ministries and departments that depend directly or indirectly on agro biodiversity	3.45	*

*N = 256; * = Agree; ** = Disagree*

HYPOTHESIS

There will be no significant difference in the mean ratings of agricultural extension officers, forestry officers and professional conservation officers on the measures that could enhance agrobiodiversity conservation.

Table 3 contains data testing the above hypothesis. The data in Table 3 show the summary of Analysis of Variance (ANOVA) on the measures that could enhance the conservation of agrobiodiversity in the State. The analysis of the data reveal f-value of 0.056 for 2 and 57 degrees of freedom and $p = \alpha 0.05$. This value is less than the critical f-value of 19.5 for 2 and 57 degrees of freedom. Therefore, there is no significant difference in the mean ratings of the forestry officers, agricultural extension officers and conservation officers. Hence the null hypothesis of no significant differences was accepted. The result indicated that all the considered measures hold potential for enhancing the involvement of rural farmers in agrobiodiversity conservation in Akwa Ibom State.

Table 3: Summary of Analysis of Variance (ANOVA) on Agrobiodiversity Conservation Enhancement Measures.

<i>Source of variance</i>	<i>Sum of square</i>	<i>Degree of freedom</i>	<i>Mean square</i>	<i>P</i>	<i>f-cal</i>	<i>f-tab</i>	<i>Decision</i>	<i>Remark</i>
Between groups	0.026	2	0.013	$\alpha 0.05$	0.056	19.5	NS	*
Within groups	13.66	57	0.239					

$N_1 = 138; N_2 = 118; N_3 = 26; NS = \text{Not Significant}; * = \text{Accepted}.$

DISCUSSION

MEASURES FOR ENHANCING AGROBIODIVERSITY CONSERVATION

Apart from factors bordering on the elimination of policies and economic incentives and discouragement of variety release and seed certification, all other measures were agreed upon as potentials for enhancing agrobiodiversity conservation in the State. Some of such key factors as revealed by the study are the application of incentive system in the management of agricultural resources, non-imposition of fines on agro based produce/products and the provision of adequate marketing outlets in the rural areas for agro-based produce.

One simple and effective way to ensure that the rural farmers preserve agrobiodiversity in their control is by the 'incentive system'. The mechanism as applied by FAO (2008) and Johnson (2002) refers to socially, encouraging and motivating activities consciously directed at farmers to influence their positive disposition towards conservation. Examples of such

mechanisms as listed by WCMC (2002) include recognition such as awards of positions and titles, supplies/materials, money, land titles and land use rights. Others are credit access to services, praise and scholarly/study tours.

Provision of fiscal and administrative supports for studies into ways to maintain agrobiodiversity in crop and livestock production and in different kinds of agroecosystem is shown in the study as being vital and essential for agrobiodiversity conservation enhancement in the State. This finding is very pertinent on the basic reason that much is still unknown and uncertain about the status, structure and multiple functions of agrobiodiversity in the State. Major investments are needed to expand knowledge in these respects. Historical analysis combining methods from the social and natural sciences, and the knowledge of local resource use are all clearly needed to identify and properly explain the structure and functions of agrobiodiversity at different scales in the State. Studies need to be supported on the relation among cultural patterns, economic basis, social activities and the use of agroresources in order to obtain a baseline data with which to interpret impact on agrobiological diversity of agroecosystem of the State.

Another important measure which could be adopted to enhance agrobiodiversity conservation in the State is the support of local institutions for common agrobiodiversity resources and equitable sharing of benefits from their use. Rural farmers constitute the bulk of indigenous community people who form the foundation for the sustainable use of agroresource. They need not only be more involved in the management of agrobiodiversity but most importantly, be made to benefit economically and otherwise from their sustainable use.

Among the factors affecting farmers' behaviour towards the conservation of natural resources is economic benefits (FAO, 2004), McNeely et al (2000). Rural farmers are often reluctant to venture into conservation programmes unless they are sure it will succeed and attract some benefits. According to McNeely (2000), much of the conservation of farmers is pure shrewdness. They are too smart to take chances particularly as they have few savings, have small fragmented farms, and live near margin of subsistence. To overcome this wise conservatism any agrobiodiversity conservation programme proposed must promise substantial increased benefits.

Afforestation and reforestation, the study has revealed, could be adopted to enhance agrobiodiversity conservation in the State. Deforestation, which is synonymous with the erosion of habitats, has drastically reduced agrobiodiversity while rare species are being threatened by extinction. Succinctly rendered, deforestation automatically means the loss of the habitat, which plant cover gives to the soil and animal. The best ways therefore to counter deforestation is afforestation and reforestation. Afforestation and reforestation could be embarked upon by the planting of woodlots, adoption of agri-silviculture and agricultural land use policy, and planting of relatively fast establishing trees. Furthermore, since forest ecosystem means much more than wood to the rural farmers and other local inhabitants,

conversion of natural forest to single species plantation will as the natural forest areas diminish, constitute some form of deforestation in terms of loss of useful forest components. The animal population and diversity of plantation are also reducing. To remedy this situation, there is need to redesign the species composition and the structure of plantation in the State in order to incorporate all these forest components including agrosources being threatened by extinction.

The study result shows the need for the State government to support agrobiodiversity conservation efforts in the State by (i) strengthening conservation based NGOs, local groups and institutions; (ii) strengthening capacity to develop new crop varieties and animal breeds that are adapted to the local environment and (iii) providing conservation facilities example seed banks and invitro storage at the disposal of farmers. The State seems to lack adequate resources to address these problems and other conservation problem which they are confronted. At the international level, the need for financial assistance to help less developed countries tackle such problems has long been apparent. International development aids have been an important response to this need.

A compelling means of providing for the funding of agrobiodiversity conservation programme is as revealed by the study is through the framework of concessional agreement. This is a system whereby agrobiodiversity conservation conditionality is built into agreements with investors in areas of the state where crude oil, timber, and other agrosources are explored. As part of such agreements, the concession holder could be required to provide support to various agrobiodiversity programmes aimed at maintaining the long term productivity of the agrosources of the area being explored. Where concessions are given for forests use for example, government should ensure that a significant proportion of the rent realized is returned for managing the forest to ensure its long term productivity and sustainable use of agrosources of the forest ecosystem.

Another measure for enhancing the conservation of agrobiodiversity in the State is enlisting more collaborators example, other non-conservation sectors including ministries and departments that depend directly on agrobiodiversity. Conservation has brought considerable and sustainable benefits to the society but while the benefits are widely shared, only a few institutions are given responsibility for conservation. A far wider range of collaborators is required. Such collaborators include all ministries – agriculture, tourism, energy public health, industry and military. The military for instance control large areas of “buffer zone” in the State. Such areas are often of considerable agricultural and agroecological value, which they should be made to contribute to their conservation.

Respondents, the result of the study recorded, disagreed on the potentials of some measures to enhance agrobiodiversity conservation in the State. These include: elimination of policies and economic incentives that erode agrobiodiversity particularly subsidies for high yielding varieties, pesticides and fertilizers and elimination/discouragement of variety release and

seed certification legislation that hinder the utilization of diverse genetic materials through their requirements for distinctiveness, uniformity and stability. This finding is at variance with related literatures and popular views of conservation experts. Studies by FAO (2004), Shiva (2001) and Srivastra (2001) showed that biotechnology practices with accompanied utilization of pesticides and fertilizers are primary threats to agrobiodiversity conservation. As Soule & Piper, (2002:15) puts it "the technology of breeding high yield variety is a technology which breeds uniformity and this threatens collapse of diversity of genes, species and agroecosystem. The easiest way to safeguard against these Soule et al noted, is to keep growing divers stock in diverse localities and to keep a diversity of healthy agroecosystem functioning while eliminating policies and economic incentives which promote uniformity and monocultural laden technologies".

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. The study reveals that poverty is one of the cardinal causes of loss of agrobiodiversity as well as a hindrance to the involvement of rural farmers in agrobiodiversity conservation in the State. The finding has serious implication for the present poverty alleviation drive of the government.

The geography of environmental development indicates that Akwa Ibom States has a total land area of about 25,661km² and is richly endowed with abundant agricultural resources. Currently, the agrobiodiversity is facing degree of degradation across the length and health 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 grassroots based small scale investors, education and skill acquisition training programmes and many more. There is need for poverty alleviation programme 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 and utilization of local agrosources. 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 grains 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, medical 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 its consequential effects of environmental degradation in general and agrobiodiversity degradation in particular.

The result of the study has a serious implication for adequate utilization of farmer education approaches in the conservation of agrobiodiversity in the State. The study reveals that some farmer education approaches such as office calls, correspondences, flip charts, models, transparencies, wall charts, drama, study tour, competition and apprenticeship are passively utilized in the agrobiodiversity conservation.

CONCLUSION

Based on the findings, these conclusions are made:

1. To ensure consistent involvement of rural farmers in agrobiodiversity conservation, farmer education approaches with a rational combination of techniques such as home and field visits, adult literacy, radio broadcast, demonstrations and local/volunteer farmers should be employed
2. The enhancement of agrobiodiversity conservation calls for measures among which is the support of local (rural farmers) participation in the planning, management and evaluation of agrobiodiversity programmes and activities in the State.
3. Decision about what agrobiodiversity to be conserved, how it should manage and for whom should be based on an understanding of local livelihood and farmers' own definition of well being.

RECOMMENDATIONS

On the basis of the findings of the study, the discussions and conclusions therefore, the following recommendations were made:

1. The state government should develop innovative funding mechanisms to support agrobiodiversity conservation programmes among rural farmers in the State by:
 - a. Collecting special taxes on agricultural resources such as timber extraction, wood trading, trade in crop and livestock products, and other activities connected with the sector.
 - b. Building conditionality into concession agreement for instance, in an area that has such extensive agrosources as timber/fishers concessions could be sold to private investors
 - c. Seeking more collaborators from the private sectors including multinational oil companies, industries and voluntary organization
 - d. Allocating a substantial percentage of Ecological Fund for agrobiodiversity conservation programme/projects

- e. Allocating an appreciable amount in the annual State budget for agrobiodiversity conservation programmes
2. The government should promote agrobiodiversity conservation based education in the State by:
 - a. Initiating informal farmer education activities such as organizing local conferences and awareness campaign for rural dwellers.
 - b. Sponsoring inservices and preservices training of farmers and planners in environmental education.
 - c. Providing the required teaching aid, and diversified instructional aids which will be of assistance to educators in agrobiodiversity conservation awareness work.
3. The State Government should promote local knowledge of agrobiodiversity by supporting studies that combine indigenous agrobiodiversity conservation knowledge with scientific knowledge and use innovative participatory and complementary methodologies.

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