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Agrobiodiversity Conservation Techniques Adopted by Rural Farmers in Kware Local Government Area Nigeria

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Abstract

The study examined agrobiodiversity conservation techniques adopted by rural farmers in Kware Local Government Area, Nigeria. Multistage sampling procedure was used to arrive at 120 farmers from three selected villages. Forty (40) interview schedule were administered in each of the sampled villages. Descriptive statistics was used to analyze the primary data collected. Results of the findings showed that most of the farmers (25.0%) were in their active age with fairly large family size (6-10 persons). Majority were married (90.8%) with most of them having secondary education (33.3%) or less and earning between ₦101, 000 - ₦200, 000 annually. Most of the farmers conserve animals using random mating (30.8%). On the other hand, 43.3 percent conserve plants by practicing collection and preservation of seeds. The major challenge faced by the farmers was insufficient capital (43.3%). Government and NGOs need to educate and provided necessary support to the farmers who practice agrobiodiversity conservation.

Keywords:
Agrobiodiversity,
Conservation,
Techniques,
Rural, Farmers

1. Introduction

Agrobiodiversity is a subset of biodiversity which refers to all forms of plants and animals relevant to agriculture. Agrobiodiversity also known as agricultural biodiversity or the genetic resources for food and agriculture includes; harvested crop varieties, livestock breeds, fish species, and non-domesticated (wild) resources within field, forest range land including tree products, wild animals hunted for food, and in aquatic ecosystem (FAO, 2007). Food and livelihood security depends on the sustained management of various biological resources that are agriculturally important.

Nigeria is rich in biodiversity, because the country is endowed with a variety of plants and animal species found in the boundless forests and grass lands. There are about 7895 plant species identified in 338 families and 2,215 genera. There are 22, 000 vertebrates and invertebrates species. These species include about 20, 000 insects, about 1000 birds, about 1, 000 fishes, 247 mammals and 123 reptiles. Of these animals; 0.14% is threatened while 0.22% is endangered. About 1,489 species of micro-organisms have also been identified. All these animal and plant species occur in different numbers within the country's vegetation that range from the mangrove along the coast in the South to the Sahel in the North (Nigeria first National Biodiversity report 2001).

Most of the biodiversity sustains the rural economy. At present, in Nigeria, the destruction of natural habitats continues apace resulting in the depletion of the country's biodiversity (Iment and Adebobola 2001). For example the Nile crocodile (*Crocodilus niloticus*) which was once found in the Nigerian coastal waters right up to Lake chad in Northern Nigeria is fast disappearing due to loss of habitat and the hunting of crocodile for their meat, egg, hide and skin (Iment and Adebobola; 2001). Also, the forest elephant, chimpanzee, leopard, yellow-backed duiker, the Royal python, quenon (*Cercophithecus erythorgaster*) are among the animals on the endangered list in the southern part of the country.

Rural farmers domesticate plants and animals that are considered most essential for their survival, the domestication is due to either the fear of losing such varieties of plants or breeds of animals, or for ensuring continuous utilization of such plants and animals. These rural farmers have various ways or

methods by which they sustain plants and animals that are mostly needed by the community. Fear of losing such varieties and breeds lead to the conservation of such plants and animals. The methods used in the conservation of plants and animals are referred to as "Conservation Techniques". The continuous existence and survival of these plants and animals is through employing some conservation techniques. Agrobiodiversity conservation is a key to poverty and hunger reduction among rural dwellers whose major occupation is farming (Chikare, 2016). The practice also provides basis for health security in terms of the medicinal plants such as *Cassia occidentals* (*Sanga-Sanga*) and most of the tree crops parts such as; mango leaves, orange leaves, guava leaves, etc. and their trunk peels. Domesticated animals are also used for several purposes such as; meat, milk, skin and hides production, manure, cultivating lands etc.

Agrobiodiversity conservation techniques used by a community will determine either the availability or scarcity of such plants and animals that need to be conserved. A process known as on-farm conservation was introduced evidence from the High Andes of South America to maintain crop diversity and assessing the effectiveness of projects supporting on-farm conservation of native crops (Bellon *et al.,* 2015). Agrobiodiversity conservation techniques aimed at; increasing productivity, providing food security, making farming system more stable, robust, and sustainable, improving human nutrition and providing sources of medicines and vitamins, provision of fiber, milk, hides, furs, power, organic fertilizer, fish-products, etc.

The techniques could be shifting cultivation, alley cropping, mixed cropping, collection and preservation of seeds, collection and planting or preservation of vegetative materials, establishment and preservation of sacred grooves, selective maintenance and cultivation of valued species of crops in the farm or back yard, adoption of a planned grazing and browsing pattern, adoption of indigenous free conservation management practices, establishment and maintenance of range land with diverse forage crops species, domestication of live population of diverse species of ruminant and monogastrics in the herd, adoption of natural breeding, random mating, and pedigree breeding (Pimbert, 2009).

Wiley *et al.* (1979) reported that there is no doubt we now face a multiplicity of often competing demands in rural areas and a scarcity of means to meet them. Major among them is the need to conserve agrobiodiversity. Rural communities are faced by challenge to conserve agrobiodiversity, as a result, facing continuous decrease in the ability to adequately provide for their needs. The extinction of these plants and animals could make it almost impossible for the rural people to cater for needs such as food, feed, health care services, materials used for shelter etc.

However, against the aforementioned needs and challenges the present study was carried out in the study area to achieve the following objectives:

1.Describe the socioeconomic characteristics of the respondent rural farmers.

2.Examine the agrobiodiversity conservation techniques practiced by the respondent rural farmers.

3. Identify the major plants and animals that have been in existence as a result of the use of agrobiodiversity conservation techniques.

4. Examine the challenges faced in the practice of agrobiodiversity conservation techniques.

2. Materials and methods

Kware is a Local Government Area in Sokoto State, Nigeria andis located on latitude 13^0 13' 5" N 5^0 16'2" E and longitude 13.21806^0N 5.26722^0 E having an area of $554km^2$.According to 2006 population census in Nigeria, the area has a population of 133,899 inhabitants. It experiences an annual average temperature of 28.3 ^{0}C with a minimum of 17^0C. The warmest months are February to April, when day temperatures can exceed 45^oC. The area's lifeline for growing crops is the flood of the Sokoto Rima river which is covered with rich alluvial soil (SSG, 2011). This permits crops such as millets being the most abundant, complimented by maize, rice, other cereals, and beans. Apart from tomatoes, few vegetables grow in the area. It is an open tsetse fly free grassland suitable for cultivation of grain crops and animal husbandry. Rain starts late and ends early with mean annual rainfall ranging between 500mm and 1300mm. There are two major seasons in Kware, namely; wet and dry. The dry season starts from October, and lasts up to April or June in some cases. The wet season on the other hand, begins after the dry season and lasts up to September or October.

A multistage sampling technique was used in the study. First, three (3) districts were purposively selected based on the commonality of the practice of agrobiodiversity conservation. Second, one (1) village from each of the chosen districts was selected based on the said reason. Finally, 40 farmers were randomly chosen from each village to make a total of one hundred and twenty (120) farmers as sample size for the study.

Interview schedule was used to generate primary data relative to the study objectives, while textbooks, journals, proceedings and other internet

sources were used to generate secondary information. The data collected were subjected to simple descriptive statistical analysis in form of frequency and percentage.

3. Results and discussion

Table 1 shows that 13.3 percent falls within the age bracket of 18-30 years, 25.0 percent within 31-40 years, 23.3 percent within 41-50 years, 19.2 percent each for 51-60 years and 60 years above, while 13.3 percent were 18-30 years. This implies that farmers in their mid-adulthood (that is 31-40 years) participate more in agrobiodiversity conservation in the study area, which may be due to physical ability and knowledge on the relevance of conservation. While more mature adult (i.e. 51 years and above) participate less in agrobiodiversity conservation, which may be due to the inability to engage in strenuous activities. Youthful age is the most critical age for human productivity in the present millennium; old age might not be able to contribute as youth can. However, David *et al*. (2009) also reported that 15-65 years is economically productive in a population.

All (100%) the respondent farmers were male. This implies that, only male farmers in the study area were obtained and might be as a result of the cultural norms. In Northern Nigeria, women participate less in discussions and decision making especially with the opposite sex. However, Ojo (2002) affirms that women are fewer than men in certain socio-economic activities.

Almost all (90%) the farmers were married, 6.7 percent were single, while 2.5 percent were divorced. This means that marriage is not a barrier to participation in agrobiodiversity conservation in the area. Furthermore, it confirmed the belief that marriage is highly cherished in the rural communities. The higher percentage of married farmers in the study area may be attributed to the socio-cultural and religious beliefs of the community members where marriage is encouraged and termed as a sign of responsibility and one of the religious obligations of the farmers (Abubakar *et al.,* 2011).

As regards education, Qur'anic education was 31.7 percent, primary education was 31.7 percent, and secondary education was 33.3 percent, while tertiary education was 3.3 percent. This reveals that majority of the farmers were literate in Qur'anic and western education, though a few had tertiary education. The more educated a community is, the more enlightened and the more members partake actively in agricultural activities in their area.For instance, in a study by Godoy and Contreas (2001) it was estimated that between 4 and 21.5 percent less annual area of old-growth forest was cut per household for each additional year of education that the household head received.

Most (38.3%) of the farmers' households had 6-10 family members, 26.7 percent had 1-5 family members, 15 percent had11-15 family members, 13.3 percent had 16-20 family members, while 6.7 percent had 20 above family members. This implies that majority of the respondents have less family members which also indicates less burden that might hinder their practice of agrobiodiversity conservation. This seems to be contrary to common characteristic of rural household size in Northern Nigeria where polygamy is mostly practiced.

Majority (81.67%) of the respondents were primarily farmers, 16.7 percent were traders, while 1.7 percent were civil servants. However, rural people (especially in Nigeria) earn livelihood through farming, fishing and forestry or related activities. According to Mgbado (2010) and Akpabio (2005) farming is known to be the major livelihood activity engaged by occupants of rural areas in Nigeria.

Majority(80.8%) of the farmers owned a farm size of less than 1 hectare, 18.4 percent owned farm size of 1-2 hectares while, 0.8 percent owned farm size of more than 2 hectares. This implies that majority of the farmers owned small farm and none of the farmers possessed a farm size of more than 2 hectares. Generally, Nigeria land tenure system survey shown that the per capita land holdings of small farmers has reduced from 1.53 hectares in 1968 to 0.8 hectares in 2010 (Olayiwola and Adeleye, 2006).

There's not much clear difference in the annual income level of the farmers in the study area. Table 1 indicates that 7.49 percent of the farmers had #10,000 - #100,000 per annum, 20.0 percent had #101,000 - #200,000 per annum, 18.3 percent had#201,000 - #300,000 per annum, 18.3 percent had #301,000 - #400,000 per annum, 18.3 percent had #410,000 -500,000, while 17.5 percent had #500,000 above. This also goes further to show equal opportunities and homogeneity among farmers in the study area. It is not a surprise because better economic status can enhance participation and contribution in agrobiodiversity conservation.

Most (31.7%) of farmers had 1-10 years of experience, 30.0 percent had 11-20 years, 14.2 percent had 21-30 years, 15.0 percent had 31-40 years, while 9.1 percent had40 years aboveof experience. This testifies that majority of the farmers had 1-10 years of experience in agrobiodiversity conservation while; only a few had an experience of over 40 years.

Table 1. Distribution of the respondents based on socioeconomic characteristics

Variables	Frequency	Percentage
Age		
18-30	16	13.3
31-40	30	25.0
41-50	28	23.3
51-60	23	19.2
61 and above	23	19.2
Sex		
Male	120	100
Female	0	0.0
Marital status		
Married	109	90.8
Single	8	6.7
Divorce	3	2.5
Educational Attainment		
Qur'anic education	38	31.7
Primary education	38	31.7
Secondary education	40	33.3
Tertiary education	4	3.3
Household size		
1-5	32	26.7
6-10	46	38.3
11-15	18	15.0
16-20	16	13.3
20 and above	8	6.7
Primary occupation		
Farming	98	81.7
Civil service	2	1.7
Trading	20	16.6
Farm Size		
Less than 1 hectare	97	80.8
1-2 hectare	22	18.4
2 hectare Above	1	0.8
Annual Income		
10,000-100,000	9	7.5
101,000-200,000	24	20.0
201,000-300,000	22	18.3
301,000-400,000	22	18.3
401,000-500,000	22	18.3
500,000 Above	21	17.5
Years of Experience		
1-10	38	31.7
11-20	36	30.0
21-30	17	14.2
31-40	18	15.0
40 Above	11	9.1
Total	120	100.0

Table 2. Distribution of the respondents based on plant conservation techniques practiced

Variables	Frequency	Percentage
Collection and preservation of seeds	52	43.3
Adoption of planned grazing and browsing pattern	7	5.83
Establishment of sacred groves	4	3.33
None	57	47.5
Total	120	100.0

The result on Table 2 shows that 43.3 percent of farmers practiced collection and preservation of seeds, 3.33 percent practiced establishment of sacred groves, 5.83 percent practiced adoption of a planned grazing pattern, while 47.5 percent did not engage in the practice of any of the plant conservation techniques. Farmers that engage in plant conservation in the study practice collection and preservation of seeds more than other plant conservation techniques. It could however be due to the fact that farmers that engage in plant conservation find collection and preservation of seeds as less stressful, less demanding and promising.

Table 3. Distribution of the respondents based on animal conservation techniques practiced

Variables	Frequency	Percentage
Domestication species	28	23.3
Adoption of natural breeds	24	20.0
Random mating	37	30.8
Pedigree mating	6	5.0
None	25	20.8
Total	120	100.0

Table 4. Distribution of the respondents based on plants conserved

Variables	Frequency	Percentage
Cassiaoccidentalis (*Sanga-Sanga*)	9	7.5
Commelinabenghalensis (*Bullasa*)	5	4.2
Borassusaethiopum (*Giginya*)	6	5.0
Vitexdoniana (*Dunya*)	6	5.0
Vitellariaparadoxa(*Kade*)	8	6.7
Ximeniaamericana (*Tsada)*	1	0.8
Commiphoraafricana (*Durumi*)	2	1.7
Tamarindus indica (*Tsamiya*)	1	0.83
Acacianilotica (*Bagaruwa*)	1	0.83
Psidium guajava (*Gwaiba*)	74	61.67
Adansoniadigitata (*Kuka*)	7	5.83
Total	120	100.0

Table 5. Distribution of the respondents based on animals conserved

Variables	Frequency	Percentage
Donkey (*Jaki*)	13	10.83
Horse (*Doki*)	5	4.2
Camel (*Rakumi*)	4	3.33
Goat (*Akuya*)	58	48.33
Poultry (*Kaji*)	10	8.33
Sheep (*Tumaki*)	30	25.0
Total	120	100.0

Result on table 3 shows that 23.3 percent of the farmers practiced domestication of live population of animal species, 20 percent practiced adoption of natural breeds, 30.8 percent practiced random mating, 5.0 percent practiced pedigree mating, while 20.8 percent of farmers did not engage in the practice of any of the animal conservation techniques. Farmers that engage in animal conservation practicerandom mating more than other animal conservation techniques. This might be influenced by ease of practiceand more economical nature of the random mating.

Result on Table 4 shows that *Gwaiba* (guava) was the major conserved plant (61.67 percent) by farmers in the study area was, while the least (0.8%) of the plants conserved by the farmers in the study area were *Tsamiya, Tsada* and *Bagaruwa*. This result explains that farmers in the study area conserve more of Guava to all other locally available plants. This however, may be due to its medicinal or economic value, and high demand in the study area.

Table 5 shows that goat constitutes high percentage of the conserved animals with 32.5 percent while; the least animal conserved was camel with 3.3 percent. Others were donkey (10.8%), horse (4.2%), fowl (8.3%), and sheep (22.5%). The high conservation of goat might be as a result of low cost of management, fast growth and high parturition rates, and high demand of goats and its products in the study area.

Table 6 reveals that farmers in the study area were faced by some challenges. The major challenge was insufficient capital (43.3%), while least was unfavourable government policies (4.2%). Other challenges were restriction in the use of common property resources (15%) poaching (18.3), and insufficient agricultural land (19.2%). Insufficient capital being the major could be true because, on several occasions, local communities have been expelled from their settlements without adequate provision for alternative means of work and income (Colchester, 1994).

Table 6. Distribution of respondents based on major challenges experienced

Variables	Frequency	Percentage
Restriction in the use of common properties resources	18	15
Poaching	22	18.3
Insufficient capital	52	43.3
Unfavorable government policies	5	4.2
Insufficient agricultural land	23	19.2
Total	120	100.0

4. Conclusion and recommendations

Based on the findings of this study, conclusions were drawn as follows:

1) Most of the farmers in the study area engaged in it as a primary occupation, have an appreciable level of education (Secondary downward), within an active age and earn less or equal 200,000 Naira annually.

2)Farmers in the study area practiced animal conservation more than plant conservation. Similarly, random mating was the animal conservation technique mostly practiced by the farmers.

3) *Psidium guajava* (Gwaiba) and Sheep (*Tumaki*) are the major agrobiodiversity that have been conserved by the farmers in the study area.

4) Insufficient capital was the major challenge in agrobiodiversity conservation. Thus, farmers who practice agrobiodiversity conservation need to be educated, enlightened, and provided with all necessary support on agrobiodiversity conservation and the techniques involved.

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