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Forest Protection and Conservation Skills Required by Secondary School Graduates in the Niger Delta Region for Securing Sustainable Employment in Forestry Occupation

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Abstract
The study examined the forest protection and conservation skills required by secondary school graduates in the Niger Delta Region of Nigeria for securing sustainable employment in forestry occupation. Three research questions and three null hypotheses guided the study. The descriptive survey research design was adopted for the study. The target population for the study comprised 238 agricultural graduates, 48 agricultural teachers and 62 extension agents; totaling 348 respondents. Due to manageable size of the population, the entire 348 respondents were used for the study, hence the study adopted the census sampling technique. The instrument for data collection was a 40-item structured questionnaire on a 4-point rating scale. The Cronbach Alpha reliability test was used to test the instrument which yielded a reliability coefficient of 0.78. The data collected were analyzed using weighted mean while Analysis of Variance (ANOVA) was used in testing the null hypotheses at 0.05 level of significance. The study identified ten (10) causes of forest damage, twelve (12) measures for protecting forest from human encroachment and eighteen (18) methods of controlling forest insect pests, parasites, predators and diseases. There was no significant difference in the mean ratings of agricultural graduates, teachers of agriculture and extension agents on forest protection and conservation skills required by secondary school graduates in the Niger Delta Region of Nigeria for securing sustainable employment in forestry occupation. Based on the findings, the study recommends among others, that teachers of agriculture should re-double their efforts in equipping students with forest protection and conservation skills.

Keywords: Forest Protection, Conservation, Secondary School Graduates, Niger Delta, Sustainable, Employment, Occupation.

Introduction

Forest refers to large vegetation that is predominated with trees, shrubs (bushes) and climbers, wild animals and few grasses. In ecological term, it is considered as an ecosystem or community in which trees are dominant with other living organisms and non-living elements. These living organisms consist of species of plant (trees, shrubs, herbs, fungi e.t.c) and wild animals (insects, birds, nematodes, molluscs, reptiles, mammal e.t.c) and the non-living elements comprises the soil, air, water e.t.c. these living and non-living components of the forest ecosystem interact with one another in a dynamic and complex manner under various biotic influences especially those exerted by man and his agencies (Suwari, 2017).

The scientific management of forest resources for the continuous production of goods and services as food, habitat for wildlife and also for recreation and therapeutic values to the surrounding population is known as forestry. It is the art of planting, tending and managing large area of land covered with trees, shrubs, climbers and wildlife. Simply put, forestry is the theory and practice of growing and managing forest resources and the utilization of forestry products. Forestry is a business enterprise while management is a vital organ of a business enterprise. Forest management therefore, is the science, art and practice of prudent utilization of forest resources for mankind. The success or failure of any agribusiness or agripreneurship, to a large extent, depends on the management. Forest management is thus, concerned with acquiring, preserving, developing and utilizing forest and forest related values in the Niger Delta region of Nigeria (Abiola, 2010).

The Niger Delta is one of the 10 most important wetlands and coastal marine ecosystems in the world as it contains several ecological zones: sandy coastal ridge barriers, brackish or saline mangroves, freshwater, permanent and seasonal swamp forests and lowland rain forests. The area is endowed with abundant natural resources; large crude oil and gas deposits, extensive forests, good agricultural land and rich fish resources (Niger Delta Technical Committee Report, 2008). The area is inhabited by more than 3,000 long-settled communities with an estimated size of 112,000 square kilometers (SPDC, 2004). The projected population (in 2005) is 39, 157,000 from the present estimated 31,277,901 million (NPC, 2006). The Niger Delta Region of Nigeria is made up of the following oil producing states: Abia, Akwa-Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers, comprising 188 Local Government Areas and over 40 ethnic groups who speak more than 250 languages and dialects. The main livelihood activities of the people include fishing and agriculture because of extensive coastlines (Ike & Jemimah, 2016).

The role of forestry to mankind abounds: forest offers protective covering to soil, wildlife, organisms and act as wind-break to control wind erosion. It is also a source of quality timber trees such as Iroko, Mahogany, Abura, Obeche, Gmelina, Teak, Afara, Ebony e.t.c. used in diverse ways by man for lumber and as fuel for heating home and cooking (Okafor, 2010). Chemically and mechanically processed wood products such as wood-pulp leads to paper on which books, magazines, newspapers e.t.c are obtained. Other products obtained when timber is treated with chemicals include: Rayon, plastics, lacquers or cosmetics, synthetic rubber, cellophane, celluloid, photographic film, animal feeds, paints, dyes, turpentine, liquid resins, gums, wood, alcohol, man-made tannin (Umoh & Bassir, 2020).

Forest provides food. Many edible fruits and wild animals in the forest are sources of food to man. Forest plants have barks, laves, roots and stems, carvings that are of immense medicinal value. The lint of silk cotton is used in making pillows and mattresses which are quite soft and comfortable. The soil surface covered by leaves and branches of trees is protected from heavy rain, the roots of forest plants have a binding effect on soil particles, and more so help in soil aeration and water absorption. Forest trees also offer ground cover, intercepting

raindrops and preventing their direct impact on soil surface. Besides, forest helps to conserve the soil (Eugene, 2015), it recycles nutrients by dropping their old leaves, shedding their barks and wastes into the soil. This decay can add to the nutrient status of the soil, which can be taken up by the plants again. The tap roots of the big trees penetrate deep into the soil and absorb nutrients leached for beyond the reach of other plants thereby enabling such nutrients to rejoin the nutrient cycles going on in nature. Plant roots and trunks obstruct the free flow of run-off water thereby allowing it more time to infiltrate into the soil. The leaf litter on the soil surface and openings created by penetrating roots also enhance water infiltration into the soil (Osinem & Mama, 2008).

Forests are homes for wild animals such as snakes, elephants, monkeys, antelopes e.t.c. Hunters and tourists hunt and kill these animals for meat, sport and laurels like eagle feathers, elephant tusks and leopard skins. Forest influence rainfall pattern by intercepting moisture-laden winds and causing them to rise thereby losing some heat energy during motion. This cooling down can make the moisture in the wind to condense and fall as rain. Water loss from the ground and plants (evapotranspiration) into the atmosphere increases cloud formation. Forest trees also shade off direct ray of the sun and keep the environment cool, thereby modifying the micro climate. Forest also provides beautiful sight and the flowers of some trees like flamboyant and acacia, help to beautify the environment. The animals inhabiting the forest also provide good tourist attraction, providing a pleasant and ideal environment for recreation. Forest provides employment for guards, hunters and lumbermen to timber contractors. Licenses are issued for exploitation and this is a source of huge revenue to the people and government. From the foregoing, it becomes imperative to protect and conserve existing forests through good management (Schmithusen, 2016, Ekele (2019).

Forest management is the application of business methods and technical principles to the operation of a forest property (Suwari, 2017). It entails the computations of income from forest lands; the establishment of cutting cycles, the conservation of cover land and water, and the formulation and conduct of long-range plans of operation (Brewbaker, 2010). Forest management involves forest protection and conservation among others. In other to maintain and preserve these natural resources in the forest, regulations were made by the government to serve as a guide in the use of forest. These include:

1. No unauthorized person will enter forest reserves to fell trees or for firewood collection.
2. It is an offence to set the bush on fire.
3. Indiscriminate hunting by unauthorized persons is not allowed.
4. Engaging on afforestation for production of industrial raw materials for industries should be encouraged.
5. Wildlife conservation through rehabilitation of endangered species of both flora and fauna.
6. Reforestation should be encouraged.
7. Harvesting of only matured trees should be encouraged.

8. Non-utilization of forest reserves (Singh, 2010).

Adeyeye, Akinyemi and Ayodele (2010) averred that due to the earlier mentioned problems, there is the need for forest to be protected and conserved for future generations. Forest protection is aimed at achieving the following objectives:

1. To preserve biodiversity as source of products and industrial tree plantations.
2. To provide resources for sawn timber, pulp, fuel, fodder.
3. To provide shelterbelts and wind breaks.
4. To conserve and protect the environment, including soil, water, fauna and flora.
5. To protect the forest from damaging phenomena such as fire, flood and illegal grazing.
6. To minimize forest depletion and curtail farming practices, which threaten the continued supply of goods and services.

In other to possess the requisite skills in forest protection and conservation, and ultimately achieve the above mentioned aims and objectives, secondary school graduates should re-double their efforts through engagement in forest protection and conservation workshops, conferences, field trips and related scholarly programmes. Skill means the ability to do something well; a particular ability or type of ability. Skill refers to the ability to perform an act expertly. It is expertness, practised ability or proficiency displayed in the performance of a task. It is well established habit of doing something. It involves the acquisition of performance ability through repetitive performance of an operation in a given occupation (Osinem & Nwoji, 2005). In the context of this study, skill is conceptualized as the ability of secondary school graduates to expertly manage, protect and conserve forest resources so as to secure sustainable job in forestry occupation.

Occupation, in the view of Osinem and Nwoji (2005), is any type of job, business, career or trade that individuals undertake to earn a living. The secondary school graduates must acquire employability forest protection and conservation skills so as to secure sustainable employment in forest protection and conservation occupation. Secondary school graduates, in the context of this study, are youths that have completed six (6) years of secondary school education. A few of the secondary school graduates have obtained admission into higher educational institutions while majority of them lack basic forest management, protection and conservation skills, hence they are jobless. The reason for their unemployment is not far-fetched as the secondary schools are not equipped with forest management, protection and conservation skills in schools. Besides, some teachers of agriculture could not complete the agricultural curriculum. Worst still, the secondary school curriculum is theory bias, in lieu of practice being a vocational subject, which consequently had culminated into graduate unemployment menace in the study area. The unemployed graduates prefer to travel to the cities in search of white collar jobs that is a mirage. Consequently, many youths in the area resort to anti-social activities such as robbery, fraud, kidnapping, maiming, pipeline vandalism and oil theft among others.

It is in the furtherance of the above menace that informed the study to identify forest management skills required for securing sustainable employment in forest protection and conservation occupation in the Niger Delta Region of Nigeria. Specifically, the study sought to:

1. identify the causes of forest damage;
2. determine measures for protecting forest from human encroachment; and
3. determine methods of controlling forest insect pests, parasites, predators and diseases.

Research Questions

The following research questions guided the study.

1. What are the causes of forest damage?
2. What are the measures for protecting forest from human encroachment?
3. What are the methods of controlling forest insect pests, parasites, predators and diseases?

Null Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

Null Hypothesis 1: There is no significant difference in the mean ratings of agricultural graduates, teachers of agriculture and extension agents on the causes of forest damage.

Null Hypothesis 2: There is no significant difference in the mean ratings of agricultural graduates, teachers of agriculture and extension agents on the measures for protecting forest from human encroachment.

Null Hypothesis 3: There is no significant difference in the mean ratings of agricultural graduates, teachers of agriculture and extension agents on the methods of controlling forest insect pests, parasites, predators and diseases.

Methodology

The study was carried out in the Niger Delta Region of Nigeria comprising: Abia, Akwa-Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers State. The study adopted the descriptive survey research design. Three research questions guided the study while three null hypotheses were formulated and tested at $p \leq 0.05$ level of significance. The target population for the study comprised, 238 agricultural graduates, 48 agricultural teachers and 62 extension agents; totaling 348 respondents. Due to manageable size of the population, the entire 348 respondents were used for the study, hence the study adopted the census sampling technique. The instrument for data collection was a 40-item structured questionnaire on a 4-point response options of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree

(SD) with a corresponding numerical value of 4, 3, 2 and 1 respectively. The instrument was face-validated by three experts. For purposes of determining the internal consistency of the instrument, the instrument was trial tested on 40 similar respondents in Enugu State, Nigeria and the data collated were analyzed using Cronbach alpha reliability technique which yielded a reliability coefficient of 0.86. To ensure quality data collection, nine trained research assistants joined the researcher, totaling ten (10) enumerators in collecting the data from the respondents. Each of the research assistant covered their respective state in the Niger Delta Region viz: Abia, Akwa-Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers. Out of the 348 copies of the questionnaire administered to the respondents, 327 copies were completely filled and returned which were used for the analysis; representing 93.9% rate of return. The data collated were analysed, using weighted mean while Analysis of Variance (ANOVA) was used for testing the null hypotheses at 0.05 level of significance. The cut-off point value of 2.50 on 4-point rating scale was used to interpret the result as Agree or Disagree. Therefore, any skill item with a mean value of 2.50 to 2.49 was considered as Agree while any skill item with a mean value of 0.5 to 2.49 was considered as Disagree. Also, any skill item with a standard deviation between 0.00 and 1.96 attested to the fact that the respondents were close to the mean and the opinion of one another, in which case, the skill item was adjudged valid.

In testing the hypotheses, the hypothesis of no significant difference was accepted for forest protection and conservation skill items whose p-value were greater than 0.05 level of significance. In contrast, the hypothesis of no significant difference was rejected for forest protection and conservation skill items whose p-values were less than 0.05 level of significance with 148 degree of freedom.

Results

The results for this study were obtained based on the research questions answered and hypotheses tested.

Research Question 1: What are the causes of forest damage?

Table 1: Mean ratings of the responses of Agric. graduates, agric. teachers and extension agents on the causes of forest damage

Item No.	Causes of forest damage	$\bar{X}_{AG}$ (40)	$\bar{X}_{E}$ (61)	$\bar{X}_{T}$ (226)	$\bar{X}_{G}$ (327)	SD	Remark
1.	Wildlife (animals)	3.60	3.53	3.62	3.60	0.55	Agree

2.	Human Encroachment	3.53	3.47	3.57	3.52	0.63	Agree
3.	Light	3.18	3.42	3.47	3.46	0.60	Agree
4.	Fire	3.35	3.36	3.37	3.36	0.48	Agree
5.	Erosion	3.67	3.60	3.59	3.62	0.50	Agree
6.	Heat	3.33	3.36	3.70	3.46	0.62	Agree
7.	Pathogen	3.35	3.33	3.37	3.35	0.54	Agree
8.	Drought	3.52	3.48	3.58	3.53	0.59	Agree
9.	Flood	3.60	3.53	3.62	3.60	0.55	Agree
10.	Climate change	3.53	3.47	3.57	3.52	0.63	Agree

Key: $\overline{X}_{AG}$ = Mean of Agric. graduates; $\overline{X}_{T}$ = Mean of Agric. Teachers;
$\overline{X}_{E}$ = Mean of Extension Agents; $\overline{X}_{G}$ = Grand Mean; SD = Standard Deviation;
N = No. of Respondents 327

From the data presented in Table 1, it was revealed that the ten (10) items had their mean ($\bar{X}$) values ranged from 3.18 to 3.70 and were all above the cut-off point of 2.50. Thus, they were interpreted as Agreed. This implied that the respondents agreed that the ten (10) items were the causes of forest damage. The standard deviation values ranged between 0.48 and 0.63 which were below 1.96, indicating that the respondents were close to one another in their responses; meaning that the items were valid.

Null Hypothesis 1: There is no significant difference in the mean ratings of agric. graduates, teachers of agriculture and extension agents on the causes of forest damage

.**Table 2:** Analysis of Variance (ANOVA) of the responses of Agric. graduates, teachers of agric. and extension agents on the causes of forest damage

Item No.	Causes of forest damage	Total Sum of Square	Mean Square	P – Values	Remark
1.	Wildlife (animals)	175.259	0.33	0.34	NS
2.	Human Encroachment	129.172	0.44	0.31	NS
3.	Light	232.688	0.14	0.60	NS
4.	Fire	194.770	0.40	0.91	NS
5.	Erosion	119.650	0.52	0.83	NS
6.	Heat	123.627	0.17	0.20	NS
7.	Pathogen	149.650	0.51	0.94	NS
8.	Drought	139.621	0.80	0.68	NS
9.	Flood	175.259	0.33	0.34	NS
10.	Climate change	129.72	0.44	0.31	NS

Key: S = Significant; NS = Not Significant; Level of Sig. = 0.05*

The data presented in Table 2 on hypothesis 1 revealed that the P-values of the ten (10) items ranged from 0.20 to 0.94, which are in each case greater than 0.05 level of significance. This implied that there were no significant differences in the mean ratings of agric. graduates, teachers of agriculture and extension agents on the ten (10) causes of forest damage. Therefore,

the null hypothesis of no significant difference in the mean ratings of the three groups of respondents was accepted on the ten (10) causes of forest damage.

Research Question 2: What are the measures for protecting the forest from human encroachment?

The data for answering research question 2 are presented in Table 3.

Table 3: Mean ratings of the responses of agric. graduates, teachers of agriculture and extension agents on the measures for protecting the forest from human encroachment.

Item No.	Measures for protecting forest from human encroachment	$\bar{X}_{AG}$ (40)	$\bar{X}_{E}$ (61)	$\bar{X}_{T}$ (226)	$\bar{X}_{G}$ (327)	SD	Remark
1.	Adoption of reforestation.	3.76	3.73	3.70	3.73	0.46	Required
2.	Adoption of afforestation	3.57	3.55	3.56	3.56	3.56	Required
3.	Prohibition of indiscriminate hunting.	3.18	3.13	3.53	3.28	0.51	Required
4.	Prohibition of bush burning.	3.54	3.53	3.55	3.54	0.54	Required
5.	Prohibition of entry to forest reserves.	3.65	3.66	3.70	3.67	0.50	Required
6.	Prohibition of indiscriminate farming activities	3.20	3.32	3.71	3.41	0.51	Required
7.	Regulation of tree felling activities.	3.57	3.55	3.56	3.56	0.31	Required
8.	Adoption of sustainable harvesting system.	3.76	3.73	3.70	3.73	0.46	Required
9.	Adoption of controlled burning system.	3.57	3.55	3.56	3.56	0.31	Required
10.	Prompt use of well-equipped forest rangers to fight fire outbreak.	3.18	3.13	3.53	3.28	0.51	Required
11.	Adoption of modern Taungya cropping.	3.20	3.32	3.71	3.41	0.51	Required
12.	Encouragement of communal forestry development project.	3.18	3.13	3.53	3.28	0.51	Required

Key: $\bar{X}_{AG}$ = Mean of Agric. graduates; $\bar{X}_{T}$ = Mean of Agric. Teachers; $\bar{X}_{E}$ = Mean of Extension Agents; $\bar{X}_{G}$ = Grand Mean; SD = Standard Deviation; N = No. of Respondents 327

The data presented in Table 3 revealed that the mean ratings of the respondents on the twelve (12) items in the table ranged from 3.13 to 3.76 which are all greater than the cut-off point value of 2.50. They were therefore, interpreted as required skills for protecting the forest from human encroachment. This implied that the respondents agreed that the twelve (12) statements were skills required by secondary school graduates for protecting the forest from human encroachment. The standard deviation values of the twelve (12) items ranged between 0.31 and 0.54 which are below 1.96, indicating that the respondents were close to one another in their responses; meaning that the items were valid.

Null Hypothesis 2: There is no significant difference in the mean ratings of agric. graduates, teachers of agriculture and extension agents on the measures for protecting forest from human encroachment.

Table 4: Analysis of Variance (ANOVA) of the responses of agric. graduates, teachers of agriculture and extension agents on the measures for protecting forest from human encroachment

Item No.	Measures for protecting forest from human encroachment	Total Sum of Square	Mean Square	P – Values	Remark
1.	Adoption of reforestation.	129.703	0.39	0.31	NS
2.	Adoption of afforestation	169.429	1.07	0.62	NS
3.	Prohibition of indiscriminate hunting.	140.484	0.41	0.91	NS
4.	Prohibition of bush burning.	169.172	0.29	0.83	NS
5.	Prohibition of entry to forest reserves.	136.770	0.49	0.68	NS
6.	Prohibition of indiscriminate farming practices.	180.484	0.20	0.44	NS
7.	Regulation of tree felling activities.	169.484	1.07	0.62	NS
8.	Adoption of sustainable harvesting system.	129.703	0.39	0.31	NS
9.	Adoption of controlled burning system.	136.770	0.49	0.31	NS
10.	Prompt use of well-equipped forest rangers to fight fire outbreak.	180.484	0.41	0.91	NS
11.	Adoption of modern Taungya cropping.	140.484	0.41	0.91	NS
12.	Encouragement of communal forestry development project or establishment of private forestry.	120.705	0.39	0.31	NS

Key: S = Significant; NS = Not Significant; Level of Sig. = 0.05*

The data presented in Table 4 on hypothesis 2 revealed that the P-values of the twelve (12) items ranged from 0.31 to 0.91, which are in each case greater than 0.05 level of significance. This implied that there were no significant differences in the mean ratings of the responses of agric. graduates, teachers of agriculture and extension agents on the twelve (12) measures for protecting forest from human encroachment. Hence, the postulated null hypothesis of no significant difference in the mean ratings of the three groups of respondents was accepted on the twelve (12) measures for protecting forest from human encroachment.

Research Question 3: What are the methods of controlling forest insect pests, parasites, predators and diseases?

The data for answering research question 3 is presented in Table 5:

Table 5: Mean ratings of the responses of agric. graduates, teachers of agriculture and extension agents on the methods of controlling forest insect pests, parasites, predators and diseases.

Item No.	Methods of controlling forest insect pests, parasites, predators and diseases.	$\bar{X}_{AG}$ (40)	$\bar{X}_{E}$ (61)	$\bar{X}_{T}$ (226)	$\bar{X}_{G}$ (327)	SD	Remark

A (1)	**PHYSICAL METHODS** – Use of creosote, tar, lime e.t.c as barrier by banding them on the trees to prevent pests from attacking the trees.	3.76	3.73	3.70	3.73	0.46	Required
2.	Application of water to prevent insects like ant.	3.65	3.60	3.61	3.62	0.53	Required
3.	Application of sticky banding materials such as cotton or glass wool to prevent insects from citrus trees.	3.61	3.68	3.69	3.66	0.47	Required
4.	Application of moats round the forest.	3.50	3.49	3.54	3.57	0.50	Required
5.	Application of plastics and tins to prevent termites' attack.	3.29	3.78	3.37	3.48	0.52	Required
6.	Application of traps with chemical attractant light that release carbon iv-oxide to attract insect pests.	3.44	3.42	3.45	4.43	0.46	Required
7.	Cultivation and destruction of host plants that are heavily infested by the insects.	3.42	3.82	3.42	3.55	0.60	Required
8.	Adoption of sustainable harvesting system.	3.76	3.73	3.70	3.73	0.46	Required
B (1)	**CHEMICAL CONTROL** – Use of insecticides in the form of sprays, dusts, granules, baits, fumigants and seed treatment.	3.60	3.58	3.56	3.58	0.80	Required
2.	Application of insecticides like rotenone, pyrethrin.	3.11	3.24	3.67	3.34	0.79	Required
C (1)	**BIOLOGICAL CONTROL** -Application of microbial insecticides such as *Bacillus thuringienis* to control caterpillars.	3.44	3.42	3.45	4.43	0.46	Required
2.	Application of parasitoids (parasitic insects).	3.42	3.82	3.42	3.55	0.60	Required
3.	Application of phytophageus insects	3.65	3.60	3.61	3.62	0.50	Required
4.	Application of dung beetles	3.60	3.68	3.69	3.66	0.47	Required
5.	Application of predators	3.11	3.24	3.67	3.34	0.79	Required
6.	Use of insect pathogens like viruses, fungi, protozoa, nematodes.	3.42	3.82	3.42	3.55	0.60	Required
D (1)	**Methods of Controlling Forest fungal diseases** – Application of Bordeaux paste or Bordeaux mixture.	3.60	3.58	3.56	3.58	0.80	Required
2.	Soil fumigation with methyl bromide at 0.45 Kg/12.94 m^2	3.11	3.24	3.67	3.34	0.79	Required
3.	Wound dressing with Asphaltum, coal tar, grafting wax and rubber latex.	3.60	3.58	3.56	3.58	0.80	Required

Key: $\bar{X}_{AG}$ = Mean of Agric. graduates; $\bar{X}_T$ = Mean of Agric. Teachers; $\bar{X}_E$ = Mean of Extension Agents; $\bar{X}_G$ = Grand Mean; SD = Standard Deviation; N = No. of Respondents 327

From the data presented in Table 5 above, it shows that the eighteen (18) statements had their mean values ranged from 3.11 to 3.82 and were all above the cut-off point of 2.50. Therefore, they are interpreted as required control methods of forest insect pests, parasites,

predators and diseases. This implied that all the respondents agreed that the eighteen (18) statements are methods of controlling forest insect pests, parasites, predators and diseases. The standard deviation values ranged between 0.46 and 0.80 which are below 1.96, indicating that the respondents were close to one another in their responses; meaning that the items were valid.

Null Hypothesis 3: There is no significant difference in the mean ratings of agric. graduates, teachers of agriculture and extension agents on the methods of controlling forest insect pests, parasites, predators and diseases.

Table 6: Analysis of Variance (ANOVA) of the responses of Agric. graduates, teachers of agriculture and extension agents on the methods of controlling forest insect pests, parasites, predators and diseases

Item No.	Methods of controlling forest insect pests, parasites, predators and diseases.	Total Sum of Square	Mean Square	P – Values	Remark
A (1)	**Physical Methods** – Use of creosote, tar, lime e.t.c as barrier by banding them on the trees to prevent pests from attacking the trees.	154.140	0.98	0.74	NS
2	Application of water to prevent insects like ant.	175.466	1.14	0.26	NS
3	Application of sticky banding materials such as cotton or glass wool to prevent insects from citrus trees.	166.000	0.20	0.57	NS
4	Application of moats round the forest area.	195.432	0.51	0.17	NS
5.	Application of plastics and tins to prevent termites' attack.	202.488	0.19	0.59	NS
6.	Application of traps with chemical attractant light that release carbon iv-oxide to attract insect pests.	195.432	0.51	0.17	NS
7.	Cultivation and destruction of host plants that are heavily infested by the insects.	145.521	0.47	0.20	NS
B (1)	**Chemical Control** – Use of insecticides in the form of sprays, dusts, granules, baits, fumigants and seed treatment.	166.000	0.20	0.57	NS
2.	Application of insecticides like rotenone, pyrethrin.	154.140	0.98	0.74	NS
C (1)	**Biological Control** -Application of microbial insecticides such as *Bacillus thuringienis* to control caterpillars.	172.172	0.15	0.55	NS
2.	Application of parasitoids (parasitic insects).	175.466	1.14	0.26	NS
3.	Application of phytophageus insects	195.432	0.51	0.17	NS
4.	Application of dung beetles	143.521	0.47	0.20	NS
5.	Application of predators	175.466	1.14	0.26	NS

6.	Use of insect pathogens like viruses, fungi, protozoa, nematodes.	202.488	0.19	0.59	NS
D (1)	**Methods of Controlling Forest fungal diseases** – application of Bordeaux paste or Bordeaux mixture.	195.432	0.51	0.17	NS
2.	Soil fumigation with methyl bromide at 0.45 Kg/12.94 m^2	143.521	0.47	0.20	NS
3.	Wound dressing with Asphaltum, coal tar, grafting wax and rubber latex.	166.000	0.20	0.57	NS

Key: S = Significant; NS = Not Significant; Level of Sig. = 0.05*

The data presented in Table 6 on hypothesis 3 revealed that the P-values of all the eighteen (18) items in the table 6 ranged from 0.17 to 0.94, which were in each case greater than 0.05 level of significance. This implied that there were no significant differences in the mean ratings of the responses of agric. graduates, teachers of agriculture and extension agents on the methods of controlling forest insect pests, parasites, predators and diseases. Thus, the postulated null hypothesis of no significant difference in the mean ratings of the three groups of respondents was accepted on the eighteen (18) methods of controlling forest pests, parasites, predators and diseases.

Discussion of Findings

The discussion of the findings of this study followed the order of the research questions. From the analysis of the data in Table 1, the study identified the following causes of forest damage|: wildlife, human encroachment, fire, light, erosion, heat, pathogen, drought, flood and climate change. The findings of this study is in line with the evidence given by Brewbaker (2010) who decried on the high rate of forest damage in the tropics occasioned by pathogenic agents, erosion and human indiscriminate activities. It was on this premise that Abiola (2010) advocated for sustainable utilization of forest resources and effective implementation of: forestry laws and regulations, silviculture, afforestation, reforestation, Taungya system and agro-forestry programmes. Furthermore, the study revealed that there was no significant difference in the mean ratings of agricultural graduates, teachers of agriculture and extension agents on the causes of forest damage. The findings of this study is in tandem with the evidence given by Suwari (2017) who affirmed that the mean ratings of agric. educators, agric. graduates and extension workers, on the factors responsible for forest damage, are synonymous.

The findings of the study in Table 3 revealed the following measures for protecting forest from human encroachment: adoption of reforestation and afforestation, prohibition of indiscriminate hunting, bush burning, farming activities and tree felling activities, no entry to forest reserves, use of forest rangers to fight fire outbreak, adoption of Taungya cropping system and encouragement of communal forestry development project. The finding of this study is in agreement with the report of Adegegu, Akinyemi and Ayodele (2010) who expound: reforestation, afforestation, Taungya cropping system, prohibition of indiscriminate hunting,

bush burning and usage of forest reserves among others, as effective measures for protecting forest from human encroachment. Hence Suwari (2017), Ekele (2019) and Umoh and Bassir (2020) corroborated that forestry policies and programmes towards forest protection and conservation should be implemented religiously in the nation.

Analysis of Variance in Table 4 showed that there was no significant difference in the mean ratings of agric. graduates, teachers of agriculture and extension agents on the measures for protecting forest from human encroachment. The findings of this study is in harmony with the works of Osinem and Mama (2008) and Ike and Jemimah (2016) who in their respective works averred that agric. graduates, teachers of agriculture and extension agents adopts one and the same measures for protecting forest from human encroachment. In other words, there is no significant difference in the mean responses of graduates of agriculture, teachers of agriculture and extension agents on the ways for protecting forest from human encroachment.

From the analysis of data, the study identified eighteen (18) methods of controlling forest insect pests, parasites, predators and diseases as contained in Table 5 of this study. The findings of this study as contained in Table 5, is in agreement with the reports of the United Nations General Assembly (2017), Schimithusen (2016) and Singh (2010) who in their separate works outlined physical, chemical, biological and agronomic methods of controlling forest enemies. Hence, Ekele (2019), Osinem (2005) and Vonmoyellel (2006) advised users of the forest to utilize the control methods as contained in Table 5 of this study, to enhance the sustainable development of the forest and ultimately accrue the benefits therefrom.

The result of the hypothesis 3 revealed that there was no significant difference in the mean ratings of agric. graduates, agric. teachers and extension agents on the methods of controlling forest insect pests, parasites, predators and diseases. The findings of this study is in congruent with the opinions of Forrest et al. (2012) and Uzoagulu (2012) who in their respective works expound that the submission of agric. graduates, teachers of agriculture and extension agents on parasites, predators and diseases, is one and the same. Hence, Osinem and Nwoji (2005) advocated for the adoption of modern technically and economic viable methods of controlling forest insect pests, parasites, predators and diseases. The findings of the researchers cited above corroborates the findings of this study and had further improved the validity and reliability of the results.

Conclusion

Agricultural graduates are devoid of employability skills hence remained unemployed and consequently engage in anti-social vices while forest damage rate had reached an alarming dimension in the study area. The study therefore identified ten (10) causes of forest damage, twelve (12) measures for protecting forest from human encroachment and eighteen (18) methods of controlling forest insect pests, parasites, predators and diseases. There was no significant difference in the mean ratings of graduates of agriculture, teachers of agriculture and extension agents on the methods of controlling forest insect pests, parasites, predators and

diseases. Therefore, if the findings of this study are developed in to a training manual and packaged for students, graduates of agriculture, teachers of agriculture, extension agents, farmers, agripreneurs and agribusiness tycoons, it will equip graduates of agriculture; forest protection and conservation skills required for securing sustainable employment in forestry occupation in the Niger Delta Region of Nigeria.

Recommendations

Based on its findings and conclusion, the study recommends that:

1. Teachers of agriculture should re-double their efforts to equip students with forest protection and conservation skills.
2. Extension agents in collaboration with government, should engage unemployed graduates of agriculture in forest protection and conservation training programmes.
3. Starter packs should be provided by government to the unemployed graduates of the training programmes to facilitate their (trained graduates) agripreneurship prowess in forest protection and conservation occupation.
4. Forest protection and conservation facilities should be provided to the graduate trainees at subsidized rates.

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