



## **Assessment of Perceived Impacts of Livelihood Activities among the Rural Dwellers on the Wetland Areas of Rivers State, Nigeria**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author MENO designed the study and wrote the protocol. Authors MNEO and UEU performed the statistical analysis, and wrote the first draft of the manuscript. Author OMA managed the study and literature searches. Author UEU managed and produced the final manuscript. All authors read and approved the final manuscript.*

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### **ABSTRACT**

Livelihood activities among rural wetlands dwellers in Rivers State, Nigeria were assessed to determine their constraints and impact on the wetlands ecosystem services of Nigeria. The state is one of the 36 states located in the south-south region of Nigeria, and on Latitude 4°45<sup>1</sup> N and longitude 6° 50<sup>1</sup> E. The study was conducted between November 2015, and July 2016, which is constituted the beginning and the end of wetland cultivation in the study area. Multi-stage random sampling based on purposive and simple sampling procedure using a structured questionnaire of both closed and open-ended was used to generate the primary data. Simple descriptive statistics such as means, averages, and percentages were the analytical technique used.

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A total of 340 wetland farmers were randomly selected from 18 communities in six local government area councils of the agricultural zones.

The result showed that of the 340 wetland farmers, 64% were women within the age bracket of 31-40 years constituting 34.7%. 26.8% of the farmers were engaged in wetland farming solely for income generation and increased crop productivity occasioned by the observed high fertility of the wetland. The livelihood activities identified in the wetlands as key to the food security and economic growth of the region are wetland dry season farming (32.5%) and fuel wood with 25%, summing up to 58.44% while the rest activity constitute about 41.5%.

These livelihood activities had great negative impacts on the wetland system sustainability and ecosystem services, and contributed to the fish loss and low price of crops during glut. There is also a need to develop an action plan involving all stakeholders in the region, to harness the livelihood benefits of the ecosystem services in the wetlands without damaging the system or impacting on it negatively.

*Keywords: Ecosystem service; impacts; livelihood activities; wetlands; rural dwellers.*

## 1. INTRODUCTION

Wetlands also known as floodplains or low-lying areas are underlined by shallow aquifers and are found along Nigeria's river system [1]. According to them, floodplain or fadama lands are regarded as very rich agricultural areas; they encompass land and water resources natural or artificial, permanent or temporary that could easily be developed for irrigation agriculture. According to [2], wetlands are referred to as swamps or marshes, and are among the most important ecosystems in the world. They are essential for providing many ecosystem services, such as food control, maintenance of biodiversity, fish production, carbon storage, aquifer discharge and flood control as well as providing habitat for many endangered species. It includes fresh, brackish or salt, including areas of marine water and the depth of which at low tide does not exceed 6 m" [3]. Wetlands have been estimated to cover 5-10% of the earth surface, about 1280 million hectares [3,4] .

The total wetland area in Africa amounts to about 5.6 million km<sup>2</sup> (i.e. about 16% of the total area of the continent) [5]. The wetlands in tropical sub-Saharan Africa cover a total area of 2.4 million km<sup>2</sup> (24 Mha) and are divided into four categories: coastal wetlands (1,165,000 km<sup>2</sup>); inland basins (1,070,000 km<sup>2</sup>); river floodplains (300,000 km<sup>2</sup>); and inland valleys (850,000 km<sup>2</sup>) [5]. Africa, which represents one-fifth of the world's land, and that wetland soils occupies about > 0.1% which is quite small compared to the total. The Nigerian Niger Delta is the largest wetland in Africa and the third largest mangrove forest in the world, and is known for its richness in biodiversity as well as its oil and gas resources [6]. The Niger Delta is one of the largest wetlands in the world with three sites

listed as Ramsar Wetlands of International Importance.

Wetlands harbour abundant natural resources that are of immense benefit and value to the livelihoods of millions of people living within the wetland ecosystems. The livelihoods of the majority of the wetland dwellers depend on the dynamics of the system and its biodiversity [7]. The ecosystem services provided by the wetlands are very important for managing poverty and the development of the people of the area. Knowingly or unknowingly however, the livelihood activities of the rural dwellers of the wetlands are damaging and degrading the natural resources of the system. This trend if unchecked may lead to dire consequences and perhaps the loss of the system and livelihood source of the rapidly growing population of the rural people whose survival depends on it. The economic importance of the wetlands cannot be overemphasized. They are the repository for food for the humans, and site for habitat and breeding for numerous aquatic organisms. Therefore they are considered as economically viable system in lieu of her ecosystem services to man [8]. In spite of the economic values of the wetlands, it has always been misrepresented as wasteland that must be drained according to users' preference, and damning the consequences. This singular attitude has put a lot of questions on the sustainability of the systems. Although there have been a lot of challenges and constraints in quantifying the amount of loss of the wetlands, estimates puts it at  $\geq 50\%$  for the developed countries (US and Europe), and other wetlands losses aggregated from various countries have been put at 88% [9]. Losses in Nigeria especially in wetland areas of Lagos have been put at about 90% or more for the past 40 years [10] and this has been attributed mainly

to population growth and development. Similarly [11], have reported a continuous loss of the wetland resources for forested wetlands were crop cultivation is a major threat. There have been several threats to the wetlands, but the primary activities of importance that endanger the wetlands are agricultural production, development due to population and urban expansion, pollution and climate change [12]. Also, clearing and draining for agricultural expansion among others have been the major reason behind degradation of inland wetlands [13]. Similarly [14], opined that population pressure is the driving force for the conversion of coastal wetlands for crop cultivation and aquaculture to meet the rising demand for food. In Rivers States also, livelihood activities that impacts on the wetlands systems have been identified. Of all the activities identified in Rivers State, farming as a livelihood activity was prominent. In the reports of Adegoke [15], the primary and direct drivers of degradation and loss of the wetlands include: land conversion, overexploitation, pollution, water withdrawal and overharvesting of the resources. It has been estimated that about 60% inland and coastal marshes have been drained for intensive agricultural activities in Europe and North America,  $\geq 20\%$  in Asia and less 10% in South America and Africa [10]. To save the wetlands there must be an integrated plan that will enable the sustainable use of the wetland, in order to halt its degradation and loss. Currently in Africa there no government specific policies that governs the specific use of the wetlands for either its resources or for a particular reference to its exploitation for agricultural purposes. In Nigeria today no law has specifically been promulgated to deals with the use and extraction of the resources of the wetland area [10]. The major agricultural activity of the wetlands in Nigeria is crop cultivation especially during the dry season.

Cultivation of crops in the wetland is a popular livelihood activity among the farmers in the wetland zones of Rivers State. Majority of the farmers who produce crops in the wetland area of the state are dry season farmers. Crop grown here are also for various reasons according to farmers preferences ranging from food security, to additional income for family economic growth. The choice of growing crops is also influenced by some of the socioeconomic factors that affect farmers' livelihood activities. [16] in their earlier study observed that farmers' age and years of formal education were significant determinants of

choice of crops grown among the farmers in the floodplain of Rivers State. Farmers produce crops especially vegetables during the dry season in the low land areas. Food production in the wetlands of Nigeria especially in the Niger Delta had been regarded as a viable business. Despite several efforts towards research and guard scaling to document the benefit and the impacts of the wetlands on the livelihood of rural farmers whose lives depend on the wetland systems services especially in Rivers State. This is yet to receive the much desired attention in terms of valuation. Secondly, it is important to determine the farming practices that will enhance sustainable productivities and income of the wetland dwellers and at the same time not compromise the wetland ecosystem's sustainability. It is with this background that the study was initiated to assess the perceived impacts of livelihood activities in the wetland area among the rural dwellers in Rivers State, Nigeria.

The broad objective of the study was designed specifically to:

- (i) Examine the socioeconomic characteristics of rural wetland dwellers in Rivers State, and how it affects some of the identified livelihood activities that they are engaged in as well as the major constraints in assessing these livelihood resources.
- (ii) Evaluate farmers perception of impacts of livelihood activities on the wetland ecosystem services.
- (iii) assess the driving forces for the wetland crop cultivation and production engagement

## 2. METHODOLOGY

### 2.1 Study Area

This research was carried out in Rivers State in the Niger Delta, Nigeria. It is one of the 36 states of Nigeria. It is located on Latitude  $4^{\circ} 45' N$  and longitude  $6^{\circ} 50' E$  [17]. It is has boundary with Atlantic Ocean to the south, Imo, Abia and Anambra States to the north, Akwa Ibom State to the east, and with Bayelsa and Delta states to the west. Rivers State is in the tropical rainforest ecology, and is blessed with vast aquatic resources of water and vast areas of arable land, that enabled the people to engage in agricultural activities such as fishing and farming [17]. The population of Rivers state is presently 5,199,716

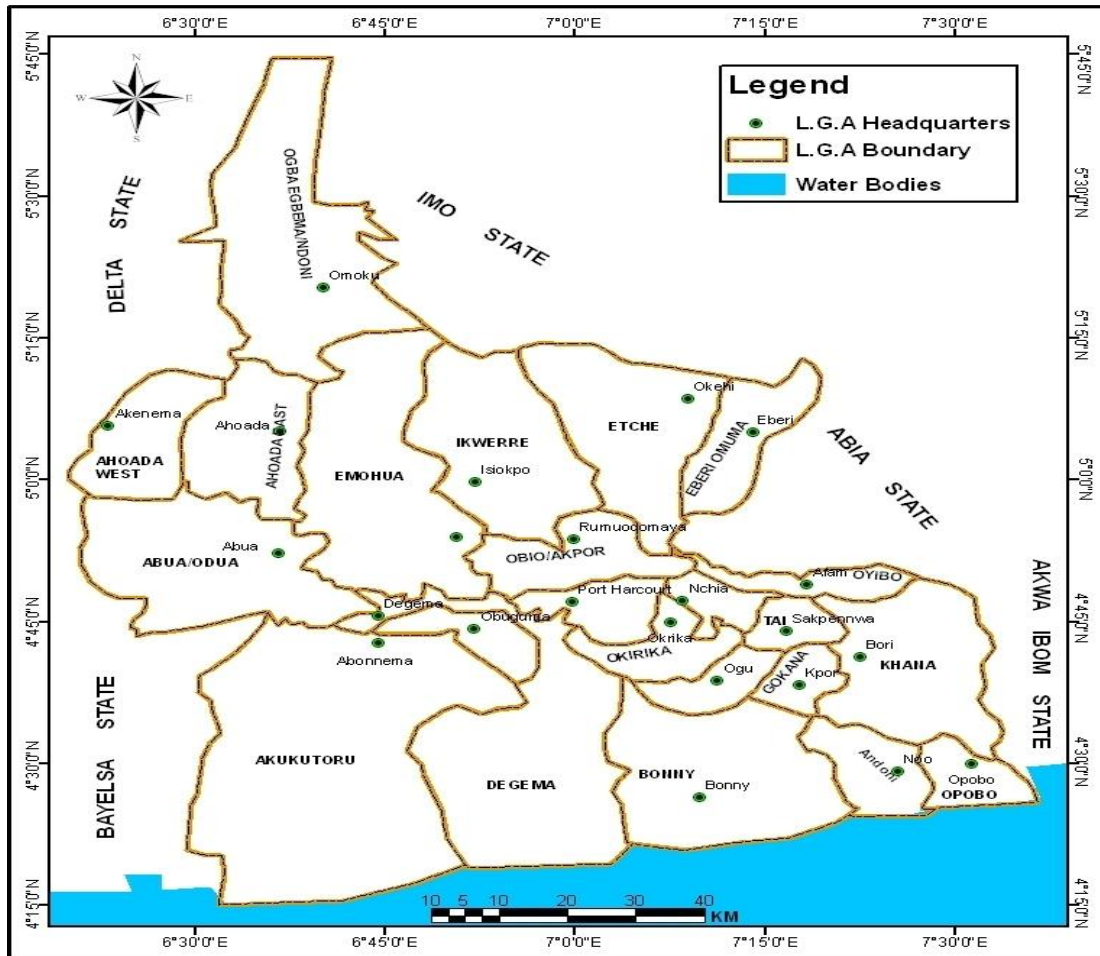


Fig. 1. Map of rivers state showing the local government areas

million people having 2,673,026 males and 2,525,690 females, with a population density that is roughly 284 person's sq. km [18]. The state is divided into 23 Local Government Areas Councils. Rivers State can be grouped into three main ecological zones namely: the fresh water, the mangrove swamps of Akuku-Toru, Abual/Odual, AsariToru, Degema, Okrika, Ogu-Bolo, Bonny, Andoni and Opobo Local Government Areas; and the Coastal Sand ridges zone. The freshwater zone is the plain that extends north wards from the mangrove swamps, and is generally less than 20 m above sea level. This lower Niger floodplain has a greater silt and clay foundation and is more susceptible to perennial inundation by river floods [17]. Fourteen out of the twenty three LGAs of the state are located on the upland with varying elevation between 13 to 45 m above sea level [17]. The drier upland area of Rivers State covers about 61% while riverine area, with a

relief range of 2 m to 5 m, covers about 39% of the state. The entire topography of the State is also characterized by a maze of effluents, rivers, lakes, creeks, lagoons and swamps crisscrossing the low-lying plains in varying dimensions [17].

## 2.2 Sampling Procedure

The study adopted a multi-stage sampling procedure with the use of purposive and simple sampling procedure for the selection of the respondents. The choice of the study area was purposive because of the high activity of floodplain cassava farming in the area. Selection of the floodplain cassava farmers in the sample area was through simple random sampling of the farmers from the 479,170 farming families in Rivers State [19]. The first selection process was choosing Local Government Areas (LGAs) from each of the agricultural zones of the state. In Zone 1 Emuoha LGA, Gokana LGA and Tai

LGA were selected, Abua/ Odual LGA was selected in Zone 2 while Ahoada West LGA and Ogba/ Egbema/ Ndoni LGA were selected in Zone 3 making a total number of six Local Government Areas in Rivers State. The choice of the Local Government Areas was based on the locations where wetland crop cultivation is presently practiced. The next stage was the random selection of three (3) communities from each local government area giving a total of 18 communities in Rivers State. 19 farmers were selected giving 342 but 2 questionnaire were discarded, the study therefore utilized 340 respondents.

### 2.3 Sources and Methods of Data Collection

**Primary Source:** includes data generated from wetland farming activities among farmers in the wetland areas of Rivers State. Observation, personal interview and structured questionnaire were administered to the respondents (Appendix 1). The instrument used in collection of relevant information asked questions about the socio-economic characteristics of the respondents, land area cultivated, reasons for growing crops in the wetland, type of technology adopted in the system of farming, quantity and value of crops harvested.

**Secondary Sources:** Literature was reviewed from secondary sources, which include the use of electronic and non-electronic materials in the library; it also involved the use of journal and conference articles as well as books and related materials. The internet facilities were also used to review the existing literature for the study.

### 2.4 Methods of Data Analysis

The objectives were analyzed using descriptive statistics such as mean, averages, and percentages.

## 3. RESULTS AND DISCUSSION

The result of the socio-economic characteristics of wetland farmers in the Rivers State is presented as Table 1.

The result on Table 1 showed the age distribution of wetland farmers in the study area which indicated that 34.71 percent of respondents were in the age group of 31- 40 years, while 2.35 percent of them were in the age

group of 15-20 years. The mean age of farmers was 44 years. This shows that the farmers were mainly active men and women who possess the type of energy required for cassava production in the floodplain areas. It is also implied that most of the farmers were still in the productive age and could contribute more in the future to the productivity of wetland crop production in Rivers State, the Niger Delta region. This result underscores the importance of age in the sustainable production activities of an individual and it is in agreement with the study of [20] which found that age is an important factor in fluted pumpkin (*Telfaria occidentalis*) production among farmers in Nigeria, indicating farmers in the age range between 21 and 40 years were productive. Similarly [21] in their study observed that age is a latent feature in decision making to bear risk and be innovative, and this decreases with age. The present study has also confirmed this earlier finding, as majority of the farmers involved in the wetland activities were within the age bracket 31 and 50 years.

The result also indicated that 63.5 percent of the farmers were women while male farmers constituted about 36.5 percent of the farming population in the wetland indicating that women dominates the farming population in Rivers State. Although issues related to involvement of men and women in agricultural production, and perhaps technology adoption have been investigated for a long time. However, women constituted a good proportion of those who engaged in crop production activities in most cases especially, in Africa [21]. This agrees with the present study, and therefore not surprising as the most dominant livelihood activity in the wetland is farming and majority of the farmers are women.

The result further showed that 43.4% of the respondents had 6-10 persons in the household, while 0.3% of them had 21 members and above. It was also observed that majority of the respondent about 44.1 percent were able to attend primary school while 0.3 percent of the respondents had first and higher degrees. On average, each farmer spent at least 8 years on formal education implying that a typical farmer in the area had a Junior Secondary Certificate. This also implied that majority of the farmers were literate. Such level of education would be supportive to the farmer in enhancing reading and comprehension of new technologies available in form of books, electronic or print media. The farmers literacy level showed that

they were capable of benefiting from extension services provided in the area. This result is in agreement with earlier finding that farmers who had formal education had advantage over those who had not in adopting improved practices for vegetable cultivation [22]. The study also showed that average farming experience during the study was 13 years in the area, and about 32.94 percent of farmers had spent between 6-10 years in cropping in the wetlands of Rivers State. This indicates that most of the farmers had ample experience in wet land farming. It was also revealed that out of the 250 rural dwellers that involved in crop farming in the wetland area of the region, 48.40 percent of cultivated farm size of less than 0.4 hectare of land, 26.40 percent cultivated between 0.5 to 0.9 hectare, 12.80 percent had farm size of 1 to 1.4 hectares while only 3.20 percent had 3 hectares of farm land and above. This is an indication that majority had small size of farm land.

The result in Table 2 showed various livelihood activities rural dwellers were engaged in the wetland areas of Rivers State (Appendix 2). It was found that 32.47% of the rural dwellers were involved in wetland dry season farming which involves cultivation of crops such as vegetables and cassava, and 25.97% depend on the wetland region for the collection of fuel woods. This explains that the rural populace depends on the use fuel wood as a source of cooking energy. It was also found that 16.88% of them carry out fishing activities in the wetland area of Rivers State. It was further observed that 15.58% of the respondents depend on the wetland ecosystem for the provision of non timber forest products such as snails, water birds etc. Finally, it was found that 9.09% of the people produce and harvest palm wine from the wetland ecosystem service. From the result here it is clear that dry season farming and fuel wood collection were the dominant livelihood activities in the wetlands and altogether constitutes about 58% of the total livelihood activities identified. These activities have great effect on the resources of the wetlands and their sustainability. Other wetland resource researchers like [23], have also observed that crop production activities and others that depletes the resources of the wetland may impact negatively on the sustainability of the system. Similarly [24], have reported that fish production, food supply, fibre and fuel wood provision were some of the ecosystem services identified that are beneficial to the livelihoods of the wetland dwellers.

**Table 1. Socio-economic characteristics of the farmers in Rivers State**

Age in years	Frequency	Percent
15-20	8	2.35
21-30	35	10.29
31-40	118	34.71
41-50	105	30.88
51-60	57	16.76
61 & above	17	5.00
Total	340	100.0
<b>Sex</b>		
Male	124	36.47
Female	216	63.53
Total	340	100.0
<b>Household size in persons</b>		
1-5	124	36.47
6-10	147	43.23
11-15	56	16.47
16-20	11	3.23
21 & above	2	.59
Total	340	100.0
<b>Educational level of farmers</b>		
No Formal Education	38	11.17
Primary	150	44.12
Secondary	126	37.06
NCE/Diploma	24	7.06
First degree	1	.29
Higher degree	1	.39
Mean	8	
Total	340	100
<b>Farming experience (years)</b>		
1-5	63	18.53
6-10	112	32.94
11-15	82	24.12
16-20	36	10.59
21-25	14	4.12
26-30	13	3.82
31 & above	20	5.88
Total	340	100.0
Mean	14	
<b>Farm size in hectares</b>		
< 0.4	121	48.40
0.4 - 0.9	66	26.40
1.0 - 1.4	32	12.80
2.0 -2.4	23	9.20
3 & above	8	3.20
Mean	1	
Total	250	100.0

Source: Field survey, 2016

The result on Table 3 showed the reasons why farmers cultivate crops in the wetland. The result revealed that most farmers cultivated crops in wetland in the region to earn additional income for the family which accounted for 26.80 percent.

This is observed as the farmers grow different crop types in the farm. Another major reason which was observed why farmers cultivate in the wetland was because of the fertility of the soil. Wetland soil is fertile for production of crops and the reason accounts for about 24.05%. It was also observed that a lot of farmers grow several crops which they hardly cultivate in the upland farms. The result further indicated that the goal of meeting family food needs was responsible for 21.31% of the reason. Wetland rent was 11.24%, meeting food shortage was 8.63% and upland farmland is becoming scarce 7.97%. The result clearly shows that farmers cultivate crops in the wetland mainly to earn additional income, higher yields and to meet the family food needs.

The result on Table 4 shows farmer's perception about the impact of wetland farming on the ecosystem services in the study area. The result indicated that the farming in the wetland location

had some negative impacts on the people. The wetland areas in the region accommodate various biodiversity resources needed for the farm family livelihood and economic growth. Farmers as well depend on various resources in the area to meet their food and income needs. At the same time, the collection of the resources constitutes a major means of livelihood activities for the people. The study found that farmers agreed that decreasing volume of fish catch in the area as result of wetland cultivation was estimated as 26.88%, decreasing provision of other eco systems services like traditional food supplies such as snail, water birds, Non Timber Forest Products (NTFPs) was 19.84%, reduction in quantity of energy sources (fuel woods) was 19.76%, decreasing food prices during harvest period mainly due to glut in production from wetlands was 18.74 percent, increasing cost of wetland cultivation was 12.01 percent and shrinking of wetlands areas was 2.77 percent.

**Table 2. Livelihood activities identified among rural dwellers in the wetland areas**

Types of livelihood activities	Frequency	Percent
Wetland dry season farming	250	32.47
Harvesting of non timber forest products (NTFPs) like snails, birds	120	15.58
Fishing activities	130	16.88
Collection of fuel woods.	200	25.97
Tapping of palm wine	70	9.09
Total	770**	

*Multiple responses\*\*. Source: Field survey, 2016.*

**Table 3. Driving forces for cultivating crops in the wetlands of Rivers State**

S/No	Reasons for wetlands cultivation	Frequency	Percentage
1	Soil is fertile for production of food crops	184	24.05
2	Meeting food shortage	66	8.63
3	Earn additional income	205	26.80
4	Wetland rent is cheap	86	11.24
5	Upland farm land is scarce	61	7.97
6	Family food needs	163	21.31
	Total	765**	100

*Multiple responses\*\*. Source: Field survey, 2016*

**Table 4. Farmers' perception of the impact of the livelihood activities on the wetlands**

S/No	Impact of wetland cultivation	Frequency	Percent
1	Decreasing volume of fish catch in wetland	340	26.88
2	Reduction in quantity of energy sources (fuel woods)	250	19.76
3	Increasing cost of wetland cultivation	152	12.01
4	Shrinking of wetlands areas	35	2.77
5	Decreasing food prices during harvest period	237	18.74
6	Decreasing provision of other eco systems services like traditional food supplies such as snail, water birds, NTFPs	251	19.84
	Total	1265**	100

*Multiple responses\*\* Source: Field survey, 2016*

**Table 5. Constraints to wetland livelihood activities in Rivers State**

Type of Problems	Frequency	Percent
Rapid weed growth	159	9.03
Climate change effect such flooding, early commencement of floods	175	9.94
Reduction in the quantity of fish catch	148	8.41
High losses of food crops to flooding	119	6.76
Inflammation wetland areas during the dry season by fire outbreak	118	6.70
Inadequate storage facilities for the products	114	6.48
Over harvesting of the forest products	112	6.36
Decline in the quantity of NTFPs in the wetland areas	180	10.23
High transportation Cost	140	7.95
Deforestation of the forest lands	150	8.52
Non implementation of laws and regulations that control the use of wetland resources	125	7.10
Absence of regulatory bodies to supervise the use of wetland resources	60	3.41
Indiscriminate sales of wetland areas for residential purposes.	160	9.09
Total	1760***	100

Source: Field survey, 2016 \*\*\*Multiple Responses

It was obvious that wetland cultivation adversely affected the availability of bio resources of the ecosystems services in the study area.

The problems of using the wetlands for source of livelihood activities in Rivers State, it was indicated that decline in the quantity of NTFPs in the wetland was 10.23%, that climate change effects was 9.94 percent, indiscriminate sales of wetland areas for residential purposes was 9.09%, rapid weed growth was 9.03%, deforestation of the forest lands estimated as 8.52%, reduction in the quantity of fish catch was 8.41%, high transportation cost was 7.95%, non implementation of laws and regulations that control the use of wetland resources was 7.10%, loss of crops to flooding was 6.76%, inflammation wetland areas during the dry season by fire outbreak was 6.70%, over use and harvest of the wetland resources was 6.36% and lastly absence of regulatory bodies to supervise the use of wetland resources in the state was 3.41%.

Therefore, it is concluded from the analysis that decline in the quantity of NTFPs, climate change effects, rapid weed growth, indiscriminate sales of wetland for residential purposes, deforestation of the forest lands, reduction in the quantity of fish catch, high transportation, non implementation of laws and regulations that control the use of wetlands, fire outbreak among others are majors challenges of using the wetland areas as means of livelihood activities. The impacts that will be due to these constraints, if unchecked will lead to dire consequences on the wetlands. The negative impacts of these

constraints have also been documented by various researchers and scholars of the wetland systems and its ecosystem services, valuation and sustainability [25,26,27]

#### 4. CONCLUSION

The study assessed perceived impacts of livelihood activities among the rural dwellers on the wetland areas of Rivers State. The age ranges 31-50 years dominated the farming population and were mainly female folk. Majority of the farmers had mainly primary and secondary education with average farming experience of about 15 years. The major livelihood activities identified among the rural dwellers of the wetland areas are dry season farming, fishing, fuel wood harvest and collection of NTFPs. Additional farm income, soil productivity and food security were the given reasons for engaging in wetland livelihood activities. The perceived negative impacts of activities on the wetland system such as low volume of fish catch, reduction in fuel wood availability, increasing cost of cultivation, low price of produce during glut in production and decreasing ecosystems services were noted as the impact wetland cultivation. Finally, major constraints to the wetland livelihood activities observed were decline in NTFPs, early commencement of flooding, rapid weed growth and flora diversity. Therefore, it is recommended that livelihood activities such as intensive farming, deforestation and lumbering, burning and poaching perceived as negative impacts on the wetland ecosystem should be reduced in order to sustain the system service to the rural dwellers. The limitation of this is the lack of



alternative means of livelihood for the dwellers of this system, who have been living in the wetlands system since their birth. Secondly, the issue of population growth and limited income generation activities in the rural area that will sustain the growing population. Thirdly, the rural wetlands dwellers are not fully aware of the negative impact of their activities on the system and the effects on them, their immediate environment and generation thereafter. Therefore participatory evaluation and inventory of the merits and the demerits of their activity on the system must be visited with their full participation. Future research should focus on the education and sensitization of the dwellers on alternative means of livelihood and income activity that does little harm to the environment. If possible issues related to environmental protection are included in the curriculum of schools in the wetland zones, so that the people will live with it as a culture.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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## APPENDIX 1

### Questionnaire

**University of Port Harcourt, Faculty of Agriculture, Department of Agricultural Economics & Extension, Rivers State, Nigeria**

*This questionnaire is intended to obtain information on assessment of perceived impacts of livelihood activities among rural dwellers on the wetland areas of Rivers State, Nigeria. The information will strictly be used for research and will be kept secret. Your detailed and frank answers to the questions will be appreciated.*

*Thank you.*

### Section A: Socio-economic characteristics of the farmers

1. Name of the community where wetland farm is located? .....
2. Name of the LGA where the wetland farm is located?.....
3. Name of the state?.....
4. What is your age (a) 15 - 20 years (b) 21-30 years (c) 31- 40 years (d) 41-50 years (e) 51 - 60 years (f) 61 years and above.
5. Sex: (a) Male (1) female (2)
6. Marital Status: (a) single (0) (b) married (1), (c) separated (2), (d) divorced (3) (e) widow/widower (4)
7. How many years did you spend in formal education: (a) primary school, (6 years) (b) secondary school,(11 or 12 years) (c) NCE / Diploma (13) or 14 years) (d) first degree (15 or 16 years) (e) Higher degree (17 or 18 years) (f) Specify any other.....
8. What is your household size (a) 1-5 persons (b) 6 -10 persons (c) 11-15 persons (d) 16 - 20 persons (e) 21 persons & above.
9. Are you engaged in any livelihood activities in the wetland area in your community? YES (1) NO (2)
10. If question number 9 is YES indicate types of livelihood activities carried out in wetland area; (a) wetland dry season farming (b) harvesting of non-timber forest products (NTFPs) like snails, birds (c) fishing activities (d) collection of fuel woods (e) tapping of palm wine
11. How long have you been involved in livelihood activities in wetlands areas in year.....?
12. If you grow you are engaged in crop farming in the wetlands, indicate types of crop grown (a) cassava (b) maize (c) fluted pumpkin (d) ground nut (e) pepper (f ) garden egg (g) specify others .....
13. Indicate size of the your farm in wetland areas in 2016 cropping season ....., state equivalent in hectare (a) < 0.4 ha (b) 0.4 – 0.9 ha (c) 1-1.4 ha (d) 1.5-1.9ha (e) 2-2.4ha (f) 2.5 - 2.9ha (g) > 3ha, (h) state any other.....

14. Indicate driving forces for cultivating crops in the wetlands of Rivers State (a) Soil is fertile for food (b) family food shortage (c) earn additional revenue (d) scarcity of farm land (e) wetland is cheap (f) family farm land is small (g) indicate any other reasons.....
15. What are your perceptions of the impact of the livelihood activities on the wetland eco system services in your area? (a) decreasing volume of fish catch in wetland (b) reduction in quantity of energy sources (fuel woods) (c) increasing cost of wetland cultivation (d) shrinking of wetlands areas (e) decreasing food prices during harvest period (f) Decreasing provision of other eco systems services like traditional food supplies such as snail, water birds, NTFPs
16. Indicate constraints to wetland livelihood activities in Rivers State

No	Types	Yes	No
1	Rapid weed growth		
2	Climate change effect such flooding, early commencement of floods		
3	Reduction in the quantity of fish catch		
4	High losses of food crops to flooding		
5	Inflammation wetland areas during the dry season by fire outbreak		
6	Inadequate storage facilities for the products		
7	Over harvesting of the forest products		
8	Decline in the quantity of NTFPs in the wetland areas		
9	High transportation cost		
10	Deforestation of the forest lands		
11	Non implementation of laws and regulations that control the use of wetland resources		
12	Absence of regulatory bodies to supervise the use of wetland resources		
13	Indiscriminate sales of wetland areas for residential purposes.		
14	Specify others		

17. Give any other information applicable in livelihood activities in wet land areas in your community.....  
 .....  
 .....

**APPENDIX 2**

**Photo showing various cropping enterprises of the Wetland areas**



**a**



**b**



**c**



**d**



e

f

g

**Plate 1. a,b= cassava, c,d= raffia palm tree, e= groundnut, f= fluted pumpkin, maize; g=fluted pumpkin, cassava**

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