Greener Journal of Agricultural Sciences
ISSN: 2276-7770; ICV: 6.15
Vol. 2(5), pp. 180-187, September, 2012

http://gjournals.org/GJAS

Research Article

Utilization of Niger Delta Basin Coastal Fresh Water Swamps for Meaning Agricultural Production

Imogie A.E.[1]*, Udosen C.V[1], Airede C. I.[2] and Enonuya D.O.M.[3]

[1]Agronomy Division, NIFOR, Benin City, Edo State.
[2]Raphia & Other Palms Res. Dept. NIFOR, Benin City, Edo State.
[3]Raphia Sub Station, Onuebum. NIFOR, Benin City, Edo State.

ARTICLE INFO

Article No.: *08011231*
DOI: *10.15580/GJAS.2012.5.08011231*

Submitted: *11/08/2012*
Accepted: *19/08/2012*
Published: *30/08/2012*

Corresponding Author
Imogie A.E.
E-mail: *imogie@yahoo.com*
Phone: *08066464124*

Keywords:
Potential, Favourable, Cropping, System Benefit.

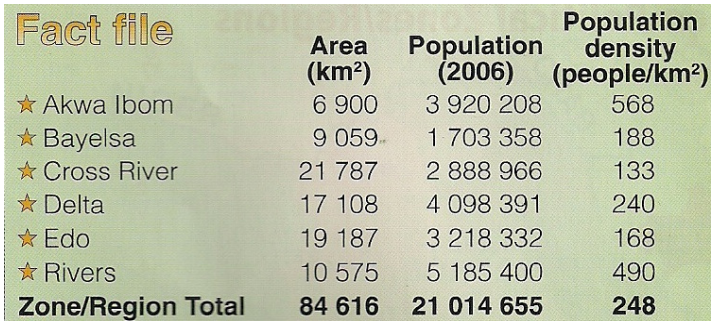
ABSTRACT

The study was designed to assess the potential and utilization of the Fresh Water Swamp of Onuebum, Bayelsa State in Niger Delta Basin for meaningful agricultural production. The results of the study shown that Onuebum Fresh Water Swamp soils have hydromorphic properties which have great potentials for agricultural production. The favourable climatic parameters (rain fall, temperature, sunshine, relative humidity), natural vegetation and vast hectareage of land in these Fresh Water Swamp favoured the cultivation of both arable and perennial crops such as Cassava, Maize, Yam, Cocoyam, Plantain, Paddy Rice, Sweet potatoes, Pumpkin, Coconut, Oil palm, Rubber, e.t.c. Apart from the dominant crop Raphia palms which thrives in this soils, in addition, the natural occurring of ponds throughout the year also favoured integrated Raphia fish farming and also bee keepings. Generally, from the finding, the Onuebum Fresh Water Swamps provide great potential for extensive large scale agricultural production, thus the Federal, State and Local Government should seized this opportunity provided by this clearly identified potential of Onuebum Coastal Fresh Water Swamp of the Niger Delta Basin for massive agricultural production in order to reduce the growing pressure on food self sustainability natural imposed on the area for increased food production to meet the needs of the ever increasing human population.

Introduction

Food security in a general content can be defined as the ability of countries, regions or households to meet their required level of food consumption. Nigeria is one of the developing countries that face the challenges of feeding; sustaining its people as a result of increasing population growth and urbanization, lack of improved technologies and inadequate utilization of land for agricultural purposes has contributed to reduce efficiency in food production, inspite of the suitability of the environments.

The Niger Delta Basin consists of the coastal fresh water and marine swamps of the River Niger. This occupies an areas of about 65,783 km^2 or 7.2 % of the Nigeria total land area of 911,020 km2 (Isirimah, 2003) Table 1. It lies within latitude 4^o N 7" N and 4.5^o 9'' E and the regions includes Akwa-Ibom, Rivers, Bayelsa, Cross River, Delta, Edo in the South South and Ekiti State in the South West (Emielu, 2000) Fig.1. The average annual temperature ranges between 22^o – 38^{o}C and the mean relative humidity is 80 – 90 % (Ndon, 2003). The heavy rainfall regime in these areas naturally results in severe flooding and the major portions of the land lie under water for the better parts of the year and these section became dry and after the cessation of the raining season and this is usually between November to June when they can be effectively cultivated.



Fact file	Area (km²)	Population (2006)	Population density (people/km²)
★ Akwa Ibom	6 900	3 920 208	568
★ Bayelsa	9 059	1 703 358	188
★ Cross River	21 787	2 888 966	133
★ Delta	17 108	4 098 391	240
★ Edo	19 187	3 218 332	168
★ Rivers	10 575	5 185 400	490
Zone/Region Total	**84 616**	**21 014 655**	**248**

Fig 1: The wetland land mass and population of the six States that make up the south-south Zones

Importance

The Niger Delta Coastal and Swampy lands are the most important ecosystem in the world besides being rich in minerals and organic matter that support plant growth, the Niger Delta Coastal Swamp environments produced and preserved many fossil fuels on which we now depend upon. In advance countries coastal and swampy environments chemical, biological and genetic materials (Sutton, 2003). According to Isirimah (2003) the Niger Delta Coastal and Swampy lands could be describe as "as the kidney of the land scope" because they function as the down steam receiver of water and waste from both naturally and human resources. Thus these lands stabilize water supplies; ameliorate both floods and droughts by cleansing polluted water, produce shorelines and recharge ground aquifers. The freshwater swamps characterized by periodic flooding supported the growth of

Raphia palms Onwubuya *et al* (1991) had listed some food crops among which were maize, yam rice, cassava, sugar cane and plantain as major crops which farmers cultivates in associated with Raphia palm in the Niger Delta basin. In addition pineapples vegetable could be cultivated in the Niger Delta Coastal and Swampy environment under Fudama system being practiced in the North and in Sierra Leone (Sutton, 2003). The presence of natural pool of water in some parts of the swamps all year round provides the basis for integrated fish farming and bee keeping.

Current Level of utilization

Currently exploitation of the wild Raphia and harvesting of the flood area for food crops and fish production occur at subsistence level at Niger Delta Basin. The fundament problem in the world today lies not in the feeding of its teeming population, but also the existing lack of adequate protein requirements. In Nigeria, the pressure from a rapidly expanding population and the comitant increasing demand for food necessitates a rational exploitation of limited land resources for production of food. The swampy coastal wetland soils of South South Nigeria are part of the resources available for such purposes. These types of land in Nigeria are grossly underutilized despite the great economic, cultural scientific and recreational role of these lands.

According to Okusami (2003), a contributory factor to low food production in Nigeria is the very low ratio of used to unused available lend in Nigeria especially wetland with hydromorphic properties. In Sierra Leone wetlands are about 1,115,400ha and these are used for large scale agricultural production of rice, vegetables, groundnuts, sweet potatoes, okra, lettuce, cabbage, onions, pepper, etc The farming system of intercropping aimed mainly to reduce the risk of crop failure and optimize production with utilization of improved technology, this practice has been shown to raise yield in the farmer's plots. The practice of farming system in the coastal area has been found very useful to the people because of the following reasons:

Avoiding the total risk of crop failure especially due to pest damages, provision of employment and income, maximization of land use and diversity of farm portfolio.

Although the hydromorphic soils of wetlands shows a wide variation in natural fertility in Nigeria and elsewhere but are potentially very useful for agricultural production (Aghimien, 1982, Okali *et al*., 1999, Udem *et al*. 2007). However, the coastal swamps of the Niger Delta Basin are still grossly underutilized for agricultural purposes both in terms of the fraction of available land under cultivation, cropping and sustenance management.

The underutilization of the Niger Delta Costal and Swampy land may be attributed to lack of understanding of the agricultural potential of this vast hectarages of land and also lack of developed technology for effective management of the flooded soils. Ossom (2003) reported that this potential is realizable only if improved soil fertility management techniques are imposed and appropriately adapted crops and varieties are chosen to mature and fruit within the available planting period-between annual seasonal floods from one section to another, is an effectively synchronised knowledge–base system. In view of the potential posses by this soil, this study was designed to investigate and review the possibilities of massive utilization of Niger Coastal Basin land for agricultural production with Onuebum as a case study with the view of demonstrating that Onuebum soil can support meaningful agricultural production apart of the dominant crop Raphia palms.

Materials and Methods

The study was conducted at the Nigerian Institute for Oil palm Research (NIFOR) Raphia Sub Station, located at Onuebum, Yenagua, Bayelsa State. The study sites lies within latitude 9^{o}N. Remarkably, these areas have relatively high rainfall which ranges from 1,500 mm to 4000 mm annually. The average monthly temperature ranges from 25 ^{o}C to 34 ^{o}C with average relative humidity of 80-90 %. Bayelsa State is one of the six States that make up the South-South Geopolitical zones and its has a total land area of 9,059 Km^{2} with population of about 1,703,358 and population density 188 people / Km^{2}. Figure 1.

A comprehensive reviewed was done on the soil physical and chemical properties as investigated by Aghimien, 1982, and Imogie *et al* 2008, the topography, vegetation, demographic issue, farming system and the dominant crops in the study area. This was done through on the spot assessments. Data generated were analysed using descriptive statistics and pictorial representation.

Results and Discussion

Soil physical and chemical properties: Extensive research and documentation carried out on soil supporting *Raphia hookeri* at Onuebum in Bayelsa by Aghimien, 1982, Imogie *et al* 2008 shown wide variability in soil physical composition Table 1. However, they have great potential for multifarious uses. The soil texture is demonstrated by the sand fraction which accounted for and average of 76.5%. This reflects the dominance of quartz in the soils parent materials. The soil clay is high, with low silt value. This is an indication that it can retain
enough water to support fish pond establishment and also with proper management, the soil can also used for cultivation of coconut, oil palm apart from Raphia and food crop crops such as cassava, yam, rice, plantation e.t.c.

The soil chemical properties are presented in Table 2. Result of the chemical analysis shown that the soil is acidic. The pH ranges from 4.6 to 5.3 and this is suitable for oil palm, coconut, plantain, pineapple and sugar cane production, since these crops thrive in acidic soils. The soils have generally low nutrient status because organic matter level is only adequate in surface soils, while nitrogen, potassium and magnesium levels are usually quite low. The soils are fragile, being subject to extended leaching from frequent heavy rainfall and annual flooding cycle; high prevailing temperatures coupled with rapidly decompose otherwise exposed soil organic matter. The soils are also subject to vary poor drainage and aeration. These delicate soils according to Imogie et al 2008, Edem, *et al* 2007 are amenable and responsive to appropriate fertilizer application regimes and effective soil management techniques. Thus, if the area is properly managed could be used for cultivation of both food crops and perennial tree crops.

Table 1: Physical properties of wetland soil at Onuebum in Bayelsa State.

Location		Dept. (cm)	Sand %	Silt %	Clay %	Texture
Upper	Fringe/dry land	0-15	88.9-91.2	5.9-7.2	4.9-5.2	SL
	Not waterlogged	15-30	75.1-88.6	10.7-20.3	4.2-8.7	LS
Middle	Moderate	0-15	85.1-89.1	7.7-5.7	1.7-8.2	S
	waterlogged	15-30	83.6-90.6	0.7-10.7	2.2-6.7	SL
Lower	Completely	0-15	86.1-87.6	4.9-5.6	4.9-5.2	SL
	waterlogged	15-30	80.5-90.5	6.5-8.0	4.2-8.7	S

Source: Aghimien, 1982, Imogie et al, 2008.
S - Sand
SL - Sandy Loamy
LS - Loamy Sandy

Table 2: Soil Chemical Properties of wetland soils at Onuebum Bayelsa State.

Properties	Upper Fringe		Middle Moderate Waterlogged		Lower Completely Waterlogged	
Depth (cm)	0-15	15-30	0-15	15-30	0-15	15-30
pH	4.6	4.8	4.7	4.9	4.7	5.3
Org C (gkg-1)	0.65	0.29	0.49	0.50	0.15	0.17
Total N (gkg-1)	0.09	0.39	0.1	0.08	0.15	0.12
Avail. P (mgkh-1)	10.53	10.91	17.80	19.62	18.85	12.46
Exchangeable Casio (cmo1 gkg-1)						
Ca	178	3.04	1.93	1.60	1.48	1.78
Mg	0.081	1.07	1.00	1.24	1.16	0.85
K	0.24	0.17	0.24	0.25	0.27	0.25
Na	0.787	0.696	0.651	1.25	0.732	0.764
EA	1.86	1.40	1.75	1.20	1.14	1.14
ECEC	5.47	6.41	5.55	6.34	4.75	4.78
B %	66.0	77.6	68.5	81.1	76.0	76.2

Source: Aghimien, 1982, Imogie et al, 2008.

According to Onwubuya *et al* (1991) food crops presently cultivated here are maize, yam, and plantain, rice, sugar cane, cassava in association with Raphia in the wet land of Onuebum and also Aisueni (1985) reported that the soil also favours the production sugar cane, swamp rice and a number of fibre crops.

Topography and vegetation:

The topography of the wetlands and freshwater coastal swaps of Onuebum rises gradually from the South Western towards the east. The topography could be divided into three categories Upper (fringe land), Middle (moderately waterlogged) and Lower zones (completely waterlogged). The upper zone (fringe land) is flat and this area are usually not flooded except towards the end of the raining season, while the Middle (moderately waterlogged) usually undulated with depression here and there. This area usually flooded bit not completely because the topography is undulated, there is always accumulation of water in the depressed valley or region.

The Lower zones (completely waterlogged) the topography decreases sharply and here as soon as the rain commenced, this zones is flooded and the water usually lasted for 8-9 months of the year. Based on the topography, the land could be put into meaningful agriculture. In the fringe area cultivation is possible throughout the year, while in the middle and lower zones cultivation is also possible through timing of operation. Swamp rice (paddy rice), sugar cane and fish pond could be cultivated in the middle and lower zones, while maize, cassava, yam, sweet potatoes, cotton, oil palm, coconut, cocoyam could be cultivated in the fringe land (upper zone).

The natural vegetation of the freshwater coastal swamps consist of dense forests of mostly perennial trees with a few deciduous species including tropical hard woods and softwoods trees such as mahogany, iroko, irvingia, gabonensis, Raphia spp, numerous shrubs, woody vines and lianas, various spices, oil palms, coconut, rubber, doccanut, e.t.c. Raphia palms dominate the vegetation with Raphia thriving in the water parts. Raphia palms characteristically grow in the freshwater swamps and on dry lands in the wild or semi wild groove (Moore, 1973). Its exploitation for numerous products such as palm wine, leaf fibre, piassava, edible grubs, bamboo and mats for home and furniture construction (Otedoh, 1972). The vegetation favours the growth of Raphia palms especially Raphia hookeri along with food crops such as cassava, plantain, oil palm, coconut, , sugar cane, maize etc

Demographic Issues

The total population of the State is about 1.7 to 2.3 million as at 2008 in a land area of 9059 km^2 with a population density of 188 people / km^2 Fig. 1. The ever increasing population of the area requires a commensurate increase in food production to provide the bulk of its food consumption requirement, especially staples food such as rice, maize, cassava, yams, plantain, bananas, sweet potatoes as well as fish and meat including poultry. Currently about 78% of the population is involved in subsistence agriculture. This subsistence exploitation of the wild *Raphia* and harnessing of the flood areas for food crops and fish production cannot provide food for the ever increasing population of the area, however, the pressure from a rapidly expanding population and the concomitant increasing demand for food necessitate a rational exploitation of limited land resource for production of food. The swampy coastal wetland soils of Bayelsa state are the part of land resources available for such purposes. In order to propagate this idea extensively, an integrated model farm has been developed at NIFOR Experimental Station Onuebum in Bayelsa State plate 6. The integrated farming concept in this project resides in the combination of food crops and fish production to meet the complete nutritional requirements of the population. This will also make business more lucrative and attractive to the youth, thus discourage urban drift off over able body men and youths to seek white collar job in the city.

Ecological Habitat:

Onuebum, Bayelsa State, is located with South of latitude 9°N. The average annual rainfall is between 1500 to 4000 mm Fig. 2, with mean annual temperatures relative humility is between 80-90% (Non, 2003). The area expressed two rainfall patterns namely the wet, humid rainy season which usually start in March and end around mid November and this is followed by the dry, hot and humid dry season from late November and end about late March annually. Sunshine hours per day average 5-7 hours with wide variations between the rainy season of frequent, heavy dark clouds and virtually cloudless dry season days when the intensity of sunshine is very high.

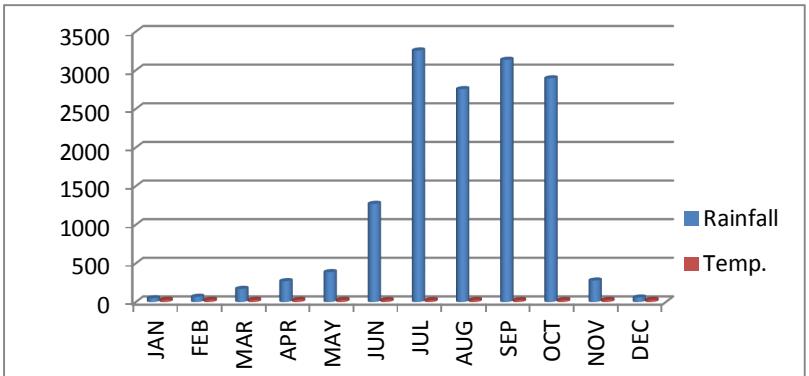


Fig 2: Rainfall and temperature of the study area.

Nigeria agriculture is rain field and majority of foods and perennial crops required adequate amount of rainfall, adequate sunshine humidity to thrive. Looking at the prevailing climatic conditions in this area, virtually all crops could be cultivated here Table 3. The heavy rainfall occurring in this area naturally results in severe flooding especially in the middle and lower zones of the topography. The major portions lie under water for the better part of the year, sections of which may because dry only few months after cessation of the major raining season. The presence of this natural pool of water in some parts of the swamps all year round provides the basis for fish farming, plate 5. Earthen pond could be constructed within the spacing distance of *Raphia hookeri* and harness for fish farming.

Farming System and Cropping Pattern

Ojanuga *et al* (2003) observed that the coastal swamps of the Niger Delta Basin are grossly underutilized for agricultural purposes both in terms of the fraction of available land under cultivation and effectiveness of cropping and sustenance management. However at Onuebum, no major efforts or policies have been developed by the State and Local Government to harnessed the opportunity provided by this clearly identified potential for meaningful agricultural production in order to reduce the growing pressure on food self sustainability naturally imposed on the area for increase food crop production to meet the needs of the ever increasing human population.

The farming system operates here is on subsistence levels with small farm sized ranges from 1 to 2 acres of land. The crops grown by limited number of small scale and numerous subsistence farmers include swamp rice (paddy), sugar cane, yams, maize, oil palms, pepper, melon, ogbono (Irwingia spp), cocoyam, taro, cassava, plantain / banana, pineapple, vegetables and sweet potatoes. The mean potential annual yield of various crops in the coastal wetlands of the Niger Delta as reported by Adedipe *et al*. 1996 is presented in table 4. Adepipe *et al*. (1996) also

projected estimates of the 2010 yields for some crops and fish in the South-West agro ecological zones as follows.

Utilization of Onuebum wetland soils for multiple cropping integrated farming system.

Subsistence multiple cropping and fish farming is currently being practiced under Wild *Raphia* palm grooves in some localities in Onuebum, Bayelsa State. This demonstrate that where the water table is low / high or coupled with water supply, *Raphia* based mixed cropping and integrated fish farming is profitable option in the coastal freshwater swamp of Onuebum.

Report from literature shown that integrated farming of crops and livestock such as poultry farming utilized droppings from the poultry farm effectively to enriched the soil nutrients. This arrangement can be profitably integrated into *Raphia* plantation. Snails also thrive well, much rapidly and this abounds naturally in *Raphia* plantations where the quiet, cool and dam environment and abundance of vegetable matter is most conducive for their survival.

Effective snail farming techniques have been developed for small, medium or large scale productions and small colonies can be located in sections of a Raphia plantation where devices can be installed to restrict movement of the snails within a defined enclosure to percent losses. Large populations of honey bees (*Apis melifela*) are associated with mature *Raphia* plantations where they routinely forage for the pollen and nectar of the massive inflorescences and are also attracted by the strong aroma of palm sap during palm wine tapping.

This strong association arising from the preference of bees from Raphia plantations can be gainfully exploited by establishing several carefully manager bee-lives within *Raphia* plantations – Recently increased awareness of the nutritional and therapeutic properties of honey, is now more desirable than cane sugar and there is a ready market exists for pure good quality natural honey.

Table 3: Mean Potential Annual Yields of Food Crops in the Coastal Wetlands of Niger Delta Basin.

Food Crops	Mean Yields Metric Tonnes/hectare
Cassava	13.0
Yam	12.1
Cocoyam	5.5
Maize	1.6
Paddy Rice	1.7
Cowpea	0.7
Tomatoes	2.8
Pepper	1.2
Melon	0.41
Okra	0.94
Leafy Vegetable	1.04
Plantain	12.3

Source: Adedipe *et al*., 1996

Table 4: Estimated Yields and Demand for some Agricultural products for 2010.

Crops	Supply '000'MT	Demand '000'MT	Deficit '000'MT
Maize	1774	4602	-2,828
Cassava	14,897	24,413	-9,516
Yam	12,462	24475	-12,013
Plantain	3,385	8,473	-5,788
Vegetables	7,766	13,554	-5,788
Fruits	8,752	14,839	-6,087
Fish	1,687	4,373	-2,686

Poverty remains entrenched in Nigeria where over seventy percent of the people in the rural areas live below the poverty line. The Niger Coastal Region is still under developed in all aspect and the population here is increasing density with poverty and shortage of food abound. The soils in the Onuebum Coastal Freshwater Swampy hydromorphic properties and support the growth of Raphia palms. The freshwater swamp is characterized by periodic flooding which last for 6 – 8 months with few month of dryness. The climatic data especially rainfall, temperature and sunshine hours shows that the climatic parameters favoured the cultivation of other crops apart the dominant crop *Raphia hookeri*.

The results of the soil physical and chemical properties as presented in Table 1 and 2 show that the wetland soils has great agricultural potential, if properly managed. The soil is rich in mineral resources, and

large production is possible, if some degrees of land reclamation, choice of crops, season of planting and flooding are taken into consideration. Crops that can be cultivated here are oil palm, coconut, cane sugar, pumpkin, cassava, ducanut, rubber, maize, cocoyam, sweet potatoes, vegetables, swamp rice (paddy rice), plantain/banana, okra, pineapples, e.t.c.

Economic benefits of utilization of Onuebum Coastal Freshwater Swamp for agricultural production.

Multiple cropping farming systems technology with Raphia palms as base tree crops employing several complementary food crop options which include integrated fish farming and bee keeping, would strategically and significantly increase food production in the area and in turn increase incomes of the people and deduced drastically rate of poverty of the people. Secondly, the utilization of Coastal Freshwater Swamps especially of the Niger Delta Region would provide increased opportunities or food assurance or sufficiency, employment of various types, income generation and generally improve the quality of life of the people, most of whom are small scale subsistence farmers. Udom (2000) showed that gross monthly income from Raphia palm tapping was higher than that of the Federal Government Minimum Wages and hence advocated that it should be encouraged in the context of poverty alleviation. Analysis of costs and returns of *Raphia* production by Ohajianaya and Mgbeda (2006) in upland environment also showed that the mean gross revenue per Raphia palm was N44, 286. 40 while the mean variable cost was N22, 359.42 per *Raphia* palm. The difference between means gross revenue and mean variable cost gave the mean returns of N21, 086.15 per *Raphia* palm, indicating that the cultivation of Raphia palm is worth encouraging with the availability of improved high yielding variety of *Raphia hookeri*.

Conclusion

Although large portion of the vast expanse of Coastal Freshwater Swamps of Onuebum, Bayelsa State is subjected to seasonal water-logging for good part of each year, most of it is accessible for food production for 4-6 months when the flood recede after the end of raining season. The ecological conditions such as annual rainfall, temperatures, solar radiation, relative humidity, soil nutrient status, topography and vegetation are favourable for the production of large varieties of food crops both arable and perennial tree crops. At present a wide variety of food crops are currently produced on small scale by subsistence (peasant) farmers on only a small fraction of the total available land. Thus it is necessary, however to drastically increase the total land area under cultivation for increased food production to meet the rising food consumption requirement of ever growing population of the region and attain food security whilst maximizing utilization of the substantial land resource most of which currently lies idle.

Acknowledgement.

The authors are grateful to the Executive Director of the Nigerian Institute for Oil palm Research (NIFOR) for his support in kind and cash for the success of the work. Important to thank two is the Plantation Manager and all

Staff of NIFOR Raphia Sub Station, Onuebum for their high sense or duties, commitment and dedication for the successful collection of data needed for this work to be a success.

References

Adedipe, N.O., Bakshi, J.S., Odegbaro O.A., and Aliyu A. (Eds) 1996. Evolving the Nigerian Agricultural Research Strategy plan, agro-ecological inputs. National Agricultural Research Project (NARP), Ibadan, Nigeria. Pp 486.

Aghimien A.E. (1982): Chemistry and Fertility status of hydromorphic soils supporting Raphia palms (Raphia spp) in Southern Nigerian. Ph.D Thesis Submitted to the Department of Agronomy, University of Ibadan, Nigeria.

Aisueni N.O. (1985): Predicting Nitrogen availability to Raphia palms (Raphia hookeri) under various moisture regimes. Plant and soil 88, 145 – 148.

Emielu S.A. (2000): Senior Secondary geography. Geography Bureau, Ilorin, Nigeria Pp450.

Imogie A.E, Udosen C.V. and M.M. (2008): Fertility indices and management of hydromorphic soils supporting Raphia palm (Raphia hookeri [Mann and Wendland]) plantation at Onuebum, Bayelsa State, Nigeria. Continental Journal of Agronomy 2:19-24.

Iserimah N.O. (2003): Understanding the wetland and their functions for effective management of the wetlands of the Niger Delta of Niger. In wetland soils of Nigeria, State of knowledge and potential (Eds Ojanuga et al.). Monograph No. 2, second Edition Soils Science Society of Nigeria Publication Pp 87 – 106.

Moore H.C. (1973): The major groups pf palms and their distribution. Gentes Herb. 11(2): 127 – 141.

Ndon B.A (2003): The Raphia palm (Economic Palm Series). Concept Publication Limited, Lagos, Nigeria. Pp 156.

Ohajianya D.O. and Mgbeda J.U. (2006): survey on Raphia palm cultivation in Mbaise, Imo State. Data source Pp 16.

Ojanuga A.G., Lekwa G. and Okusami T.A. (2003): Distribution, Classification and potential of wetlands soils. In wetland soils of Nigerian. Status of Knowledge and potentials (Eds. Ojanuga et al.) Monograph No. 2, second Edition, Soil Society of Nigeria Pp 4 – 28.

Okali C, Obeni D, Ajo – Atere T. and Lawson, T. (1979): An evaluation of farmers "knowledge and uses of hydromorphic toposequences in Western State of Nigeria. Farming System Research, IITA, Ibadan, Publication Division, paper No. 3/79.

Olusami, T.A. (2003): a review of the soil water requirement for optimum lowland rice production with reference to West Africa. In wetland soils of Nigeria. In status of knowledge and potential (Eds. Ojanuga et al.). Monograph No 2 second edition Soil Science Society of Nigeria, Pp 143 – 156.

Onwubuya, I.I., Udosen C.V. and Okolo E.C. (1991): Survey of food crops grown in association with Raphia hookeri palms in Eastern Nigeria. Annals of National Sciences 1: 89 94.

Ossom E.M. (2003): some problems of fertilization and production in brakish water and freshwater fish pond. In wetland soils of Nigeria. Status of knowledge and potential (Eds. Ojanuga et al.). Monograph No. 2, second Edition, Soil Science Society of Nigeria, Pp 107 – 110.

Otedoh M.O.(1972): Raphia palms and their utilization in Jeremi Clan of Mid-Western, Nigeria. Nigerian Agricultural Journal 10 (2): 260 – 264.

Sutton P.M. (2003): Use and Management in Sierra Leone: In Wetland soil of Nigeria Status of Knowledge and potential (Eds. Ojanuga et al.). Monograph No 2, Second Edition, Soil Science Society of Nigeria Pp 135 – 142.

Udom D.S. (2000): Investication on wine production from Raphia hookeri varietes and the derivable gross income in Southern Easter Nigeria. Dept of Agricultural Economics and Extension, Universty of Calabar, Calabar Nigeria Publ Pp 23.

Young V.A. (1963): The contribution of chemical protein to the diets of Nigeria. Nigerian Agronomy Journal 2: 18 – 25.

Cite this Article: Imogie A.E., Udosen C.V, Airede C. I. and Enonuya D.O.M. (2012). Utilization of Niger Delta Basin Coastal Fresh Water Swamps for Meaning Agricultural Production**.** Greener Journal of Agricultural Sciences, 2(5): 180-187, http://doi.org/10.15580/GJAS.2012.5.08011231**.**