Plant Science Review

PLANT SCIENCE REVIEW

Original Research Article

Journal homepage: https://psr.crcjournals.org/

ISSN No: 3041-7279

Check for updates

Evaluating Knowledge intensification for improved agriculture production in Edo State-Nigeria

Amodu, Umoru Simeon[1], **Wali, Chigozie**[2], **and Oji, Lynda Chizube**[2]

[1]*Department of Crop Science, Faculty of Agriculture, University of Uyo, 532105, Akwa Ibom, Nigeria*
[2]*Advanced Space Technology Applications Laboratory, University of Uyo, 532105, Akwa Ibom, Nigeria*

17 January 2026: Received | 13 February 2026: Revised | 16 March 2026: Accepted | 12 April 2026: Available Online

*Corresponding Author: **Umoru Simeon** | Email Address: **simeonumoru@gmail.com**

Citation: Amodu, Umoru Simeon, Wali, Chigozie, and Oji, Lynda Chizube (2026). Evaluating Knowledge intensification for improved agriculture production in Edo State-Nigeria. ***Plant Science Review***.
DOI: https://doi.org/10.51470/PSR.2026.07.01.46

Abstract

The specter of declining food production has long been associated with agriculture in Nigeria, and the disturbing recent report of world Food Security Index, 2019 which ranked Nigeria 96th out of 113countries of the world. The challenge of accelerating growth in agricultural production in Niger-Delta started from uncoordinated land use and the failure to give proper attention to the socio-economics consequences of agricultural intensification. The development of agriculture in the global world today emphasizes knowledge-intensity; therefore, the agricultural practice change in the developing world will have to be re-organized to take advantage of emerging technology to achieve diverse goals of food availability and job creation. The objective of the studies was to evaluate the land use and land cover of Edo State and to determine the level of farmers' adoption of Space Science and Technology in agricultural practices in Edo State. The LandSat8 sensor of 2024 Satellite image obtained September the same year was used (with a map projection of UTM_ zone 32N, and datum WGS_ 84) to evaluate change detection in the State. Investigation of eighteen local council's areas of the State was carried out, with 100 farmers /respondents in each Local councils in 2023. A total of 1800 farmers were contacted. Research questions were distributed through the extension officers' resident in each of the local council areas. The results shows 14.22% is farm land, 19. 20% is a built-up area, 9.65% is a-bare land, 10.55% is plantation, 19.45% is light vegetation, while 16.92% is dense vegetation, and 13.79% is a water body. Additionally, the results 41.00 % of farmers are aware of space technology, and 34.00 partially adopt the technology, with no farmers adopting the complete space technology, and 25 % of farmers are unaware of the technology. Agricultural intensification without adequate knowledge intensification will lead to a decline in the productive capacity of soil in the long run.

Keywords: *Low yield, hunger, productivity, intensification, space technology.*

Introduction

Mineral extraction and many other anthropogenic activities has resulted in severe environmental damage of the Niger-Delta and farm land of the people has been rendered unproductive with no profitable agricultural activities in many local communities. The Delta region of Nigeria is highly populated and covers about 12 % of the total land mass of Nigeria, with a land area of about 70,000 $km^{2,}$ out of which 2,370 km^2 consists of rivers, creeks, and estuaries, while stagnant swamp covers about 8,600 km^2 [22]. Niger-Delta is blessed with fertile land that is suitable for crop production [10]. Specter of declining food production has long been associated with agriculture in Nigeria, and the recent world food availability index, 2019, rate Nigeria 96th out of 113 countries. Additionally, a report by the Food and Agriculture Organization, UNICEF, and the World Health Organization indicated that the year 2016, an estimated 32.4% Nigerians were malnourished [1]. Based on the 2006 National Population Census, the population of the Niger Delta is estimated at 31 million inhabitants and predominantly depends almost exclusively on crop and fisheries agriculture for their source of livelihood [6]. Additionally, the National Bureau of Statistics (2004) indicated that 50% of the available workforce in the Niger Delta generally grow staple crops such as vegetables, yam, maize, cassava, plantain and cocoyam. Grim reality is that the Delta lands are severely damaged because of the extensive exploitation of mineral resources which resulted to erosion, flooding, land degradation, gas

© 2026 by the authors. This is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author(s) and source are credited. To view a copy of this license, visit http://creativecommons.org/licenses/by/4.0/.

flares and oil spills [2]. Edo state is naturally an area located in the plains of the coast and lies in the southernmost axis, south of the Western plains and ranges, west of the lower Niger Valley, and a topographical unit which lies north of the Niger Delta [23]. The state is replete with tilled and well drain plain in the South-western axis [1]. The region is delineated into the sea (riverine and swampy areas), which is characterized by extensive creeks and water bodies, where fishing and aquaculture supersede crop farming as the major type of the rural occupation and a drier landward part where growing staple crop dominant agricultural activity 18]. Occupational duties of people in the Edo State are derived from the land and water and the water dependent fishing are fish farming and other aquatic ventures while among the land depended agriculture include forest resources utilization (such as game and raffia) animal farming, collection and processing of palm fruits and trading of agricultural goods[21]. The predominant farming activities in the region are okra, palm oil, rubber, cocoa, plantain, cassava, melon and yam, in addition to rearing of farm animals such as goats, pigs, poultry, sheep, snail, rabbit and fishery products [18]. Crude oil mining activities have degraded agricultural lands with attendant low yield, which has precipitated the high level of poverty, while hitherto fertile land is turning into unproductive lands in the Delta region of Nigeria. Worthy of note is the supposed wealth of the region has not really translated to the common benefits of the people in the region due to pervading poverty in the midst of humongous natural human resources [20]. It is expedient to discuss food availability in the light of healthy living because food availability is indispensable for active, energetic and productive life among the farmers [20]. Food sustainability is not only about the existence of food, but more about affordability and psychological values must be taken into perspective as well, particularly quality in both physical and nutritional value [20]. While many families in the region still practice farming activities like growing crops and fishing, unfortunately, they work more without commensurate yield. [8][9]. Majority of the Niger Deltas that live on natural resources such as cropping and fishing are now changing their occupations [13]. Moving from the crop farming will detrimentally affect food availability and cost in the region. Unchecked land and water pollution as a result of anthropogenic activities will adversely limit agricultural productivity in the region, thus worsening farmers' well beings [8]. Protracted environmental pollution in the region has led to poor yield in most of the indigenous crop varieties that resulted to food shortages and high cost, making food unaffordable for the vast majority of the villages [6] [16] [7]. Several farmers noticed that staple foods, particularly varieties, now produce poor yields when compared with past harvest. As the population human continued, competition for limited land resources has steadily increased over recent years and most communities experienced conversion of reserved forest into cultivation land [13].

Sustaining crop farming in ever decreasing farm lands is to adopt land use intensification which include practices such as producing more per unit area [24]. According to [2], the food shortage in the Niger Delta is worsened by the failure of the government to put in place adequate proactive measures to prevent environmental degradation in the region [6] [16] [7].

Justification

The challenge of agricultural development in many developing countries commences from uncoordinated land use and the failure to pay sufficient attention to the productive capacity of the land which is the fallout of agricultural intensification [18]. To this end, the yields of some crops varieties have now started to decrease, and the reserves forest are decreasing, thereby resulting tin most land loss their productive capacities [6] [16]. No doubt, intensive use of land for agricultural production is now the alternative in the absence of no fallow land [6] [16]. Agricultural intensification is the philosophy of maximizing output per hectare [18]. Features of agricultural intensification are seed intensification, labor intensification, fertilizer /manure intensification and crops intensification [6] [16]. All agricultural intensification practices in the developing country, and indeed Nigeria, knowledge intensification is really lacking. The development of agriculture in the global world today emphasizes knowledge-intensity alongside with other intensification; therefore, the agricultural practice change in the developing world will have to be re-organized to take advantage of emerging technology to achieve diverse goals of income generation, food availability, and jobs-creation [19] [3]. Agricultural activities have a lot to benefit from the emerging technology, such as Space Science and Technology. Space science and technology are veritable tools for environmental management and could be leveraged for enhancing agricultural productivity. Remote sensing provides a means of timely detecting and demarcating various field conditions, actions that would be herculean and time-wasting using normal ground surveys [11] [4]. The Global Positioning System latitude and longitude data can be used with GIS technology to geo-reference challenge location on a farm or region and has important implications for effective cost effective management in the field ([11] [3]. Successful adoption of these strategies will improve agricultural production as it guides farmers on intelligent decision-making that will favor the farmer and the farming communities. Management of fertilizer and pest could be more effective if nutrient deficiencies and pest incidence within fields can be monitored in a timely manner, and treated locally [3]. The objective of the studies was to evaluate the land use and land cover of Edo State and to determine the level of farmers' adoption of Space Science and Technology in agricultural practices in Edo State.

Material and Methods

The satellite image used to carry out this analysis is Landsat 8 imagery.

This was designated to produce a Land Use Land Cover (LULC) and a shape file of Edo state, which stands as the study area. This was carved from the Nigeria shape file, which was imported as an input parameter for a model in this study. The core geographic information model was organized into spatial inform of thematic layers and spatial representations. The two types of geodatabase are Personal Geodatabase and Multiuser Geodatabase. The geodatabase was implemented to store the necessary data that could be applicable to the final analysis for the designed objectives. Satellite images of the Landsat 8 sensor of the year 2024, were acquired on September 13: (with a map projection of UTM_ zone 32N, and datum WGS_ 84) were used for the land use/land cover mapping and change detection processes. Qualitative research questions were utilized to generate data for the study of objective two, including interviews with key individuals, focus groups, and naturalistic (direct) observations. The study was carried out to evaluate the extent to which the farmer in Edo State adopt Space Technology in agricultural production in Edo State, Nigeria. The study carried out from November 20 to24 March 2025 in Edo State. This research was carried out by references to the different works done in Edo State. Information was obtained from books, journal articles, fieldwork, observations, measurements and taking photographs Edo State can be broadly categorized into three forest zones, based on the vegetation and geographical characteristics. Here's a categorization of the 18 Local Government Areas (LGAs) in Edo State by forest zones:

Rainforest Zone

1. Ovia North-East headquartered in Okada
2. Ovia South-West headquartered in Iguobazuwa
3. Uhunmwonde headquartered in Ehor
4. Oredo: headquartered in Benin City
5. Orhionmwon: headquartered in Abudu
6. Ikpoba-Okha: headquartered in Idogbo
7. Egor: headquartered in Uselu

Derived Savanna Zone

1. Esan West: headquartered in Ekpoma
2. Esan Central: headquartered in Irrua
3. Esan North-East: headquartered in Uromi
4. Esan South-East: headquartered in Ubiaja
5. Igueben: headquartered in Igueben

Tropical Savanna Zone

1. Etsako Central: headquartered in Fugar
2. Etsako East: headquartered in Agenebode
3. Etsako West: headquartered in Auchi
4. Owan East: headquartered in Afuze
5. Owan West: headquartered in Sabongida Ora
6. Akoko-Edo: head quartered in Igarra

These forest zones have distinct characteristics, including vegetation, climate, and soil types, which influence the local economies, cultures, and livelihoods. The study of the entire 18 Local Council Areas of Edo State was conducted.

The eighteen Local Council of the State were selected for investigation with 100 farmers in each Local Government in 2023. A total of 1800 respondents were used. Questionnaires were distributed through the extension agents in charge of each local government areas. Investigations were conduct as follows: A) How many farmers in Edo state know about Space technology b. How many farmers adopt Space technology in the State. B) Sources of information/train on new knowledge. i) Extension agent ii) friend/other farmers iii) Newspaper/magazines iv) and v) Radio. The data obtained were calculated as percentage.

Results

The identified features are (1) water bodies (2) built-up areas (3) built-up areas with flood (4) Farmlands (all types of farm visible on the imagery); (5) Light Vegetation (vegetables, open fields and grass/ parks) (6) Dense Vegetation (Tall trees, Palm plantations, rubber plantations). The overall classification accuracy was 85%.

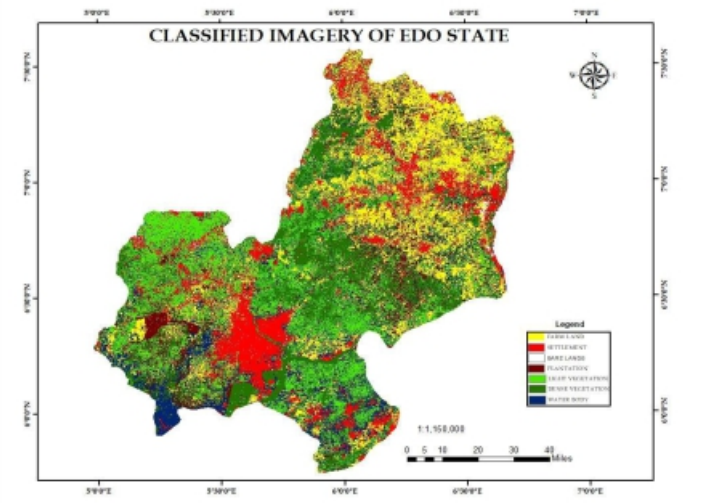

Fig 1. Classified Imagery of Edo State

Table 1: Features identified

S/N	Classes	Area covered %
1.	Farmland	14.2
2.	Built-up	19.2
3	Bare land	9.65
4	Plantation	10.55
5.	Lighter Vegetation	19.45
6.	Dense Vegetation	16.92
7.	Water body	13.79

Table 1 shows 14.22% is farm land, 19. 20% is a built up area, 9.65% is a bare land, 10.55% is plantation, 19.45% is light vegetation, while 16.92% is dense vegetation and 13.79% is water body.

Table 2 shows 41.00 % of farmers are aware of space technology and 34.00 partially adopt the technology with no farmers adopting the complete space technology and 25 % of farmers are unaware of the technology. Friend/other farmers are the major source of training/information for the farmers (67.00 %) followed by extension agent (20.58 %) while radio/TV (8.82 % and Newspaper/Magazines (3.00 %).

Table III shows 52.63 % female and 17.54 % male of age 46 and above adopting the technology followed by age 31-45 of male (12.30 %) and female (17.54 %) adopting the technology. Similar trend was observed in non-adoption of the technology where 26.50 % female and 61.00 % male of 46 years and above with 8.80 % female and 2.70 % male of age 31-35. Educational level of the technology adopters shows 43.86 % female in tertiary, 17.54 % secondary and 8.77 % primary while in male 26.32 %, secondary 3.51 % primary and non in tertiary.

Table 2: Distribution of respondents to adoption of Space Science and Technology and information sources in Edo State

Category	Frequency	Percentage
Farmers aware of Space Technology	700	41.00
Farmers adopting Space Technology partially	570	34.00
Farmers adopting complete Space Technology	000	000
Farmers unaware of Space Technology	430	25.00
Information source	N	P
Extension group	350	20.58
Friends/colleagues	1150	67.60
Newspapers	150	3.00
Radio	50	8.82
	N	P

n = 1700; p = 100%

The non- adopter's male shows 44.25 % non-educated, followed by 17.67 % for male and female primary and non-educated female and 2.65 % secondary for male category. Table IV shows 52.60 % of farmers utilize rain regime forecast followed by 35.10 % practice manipulating planting time and 12.21 % followed daily weather forecast. Table V shows 43.86 % of farmers have field map for fertilizer and herbicide, followed by 35.10 % of farmers have flood prone map while 17.54 % of farmers have pest incidence map and 3.50 % of farmers have irrigation map.

Table 3: Age distribution of farmers and educational qualifications

		Accepted		Rejected	
Sex	Age category	Distribution	Percentage	Distribution	100%
Male	18 -30	-	-	-	-
	31 – 45	70	12.30	30	2.70
	46 >	100	17.54	700	61.90
Female	18 -30	-	-	-	-
	31 – 45	100	17.54	100	8.80
	46 >	300	52. 63	300	26.50
		n_1	*P*	n_2	*P*
Level of education					
Male	Primary	20	3.51	200	17.67
	Secondary	150	26.32	30	2.65
	Tertiary	-	-	-	-
	None	-	-	500	44.25
Female	Primary	50	8.77	200	17.67
	Secondary	100	17.54	-	-
	Tertiary	250	43.86	-	-
	None	-	-	200	17.67
		n_1	*P*	n_2	*P*

$n_1 = 570, p = 100\%, n_2 = 1130$

Table 4: Distribution of farmers according to the utilization of meteorological forecast

Category	Frequency	Percentage
Rain regime and distribution	300	52.60
Manipulating Planting time	200	35.10
Daily weather forecast	70	12.21
	N	*P*

n = 570, p = 100%

Table 5: Spread of respondents to the use of Geoinformatic System

Category	Frequency	Percentage
Farmer having field map for fertilizer & herbicide	250	43.86
Farmer having field map for irrigation	20	3.50
Farmers having pest incidence map	100	17.54
Farmer having flood prone map	200	35.10
Total	**570**	**100**

n = 570, p = 100%

Discussion

The ever increasing human population has sparked land management crises in Edo state and has resulted to acute shortage of food supply in the State [14]. Agricultural production is practiced on land, thus a disruption in its availability and composition is deemed to have unimaginable effects on the sector. Virgin /thick forest has been depleted globally and is limiting various agricultural production processes among the farmers [14]. Agricultural intensification without adequate knowledge intensification will lead to decline in the productive capacity of soil in the long run [3]. The bare land (9.65%) is an indication that the practice of continuous agricultural intensification without proper planning has depleted the soil capacity to grow vegetation [20]. The aggregate impact of human activity on the environment such as deforestation, heavy and continuous application of fertilizer and chemical pesticides has had unpleasant consequences on agricultural ecosystem in the State [2]. Finding revealed that in adequate farm land after a prolonged practice of land intensification. Tons of sand to fill the large water logged area could cost the farmer a lot and that may add to the cost of production. Knowledge intensification is not yet playing important role in the agricultural intensification practice in Edo state as no farmer adopt full practice of the technology and only 34% partially adopt the technology. Innovation in agriculture is usually champion by the agricultural extension agents but their involvement in farmers' education is rather low (20.58%). This result is in agreement with many researchers that agricultural extension activities in Nigeria has nosedived in recent years [12] [5] [17]. There are many technological innovations, scientific discoveries and strategies that can resolve most pest situation and boost crop yields without having environmental consequences but cannot be available to farmers without the services of agricultural extension. The reliance of farmers on their fellow farmers for source of agricultural innovations and education is good development but could be dangerous if it is based on anecdotal application [3].

Women are the major adopter of most agricultural innovation and technology (52.63%) and if adequately motivated could lead to major food production success in Edo state [15]. The finding shows low participation of youth in agriculture in Edo state and knowledge intensification is the sure way to gravitate youths back to agriculture [19] [3]. The work have provided ample evidence on the level of adoption of knowledge intensification by farmers in Edo state-Niger Delta region of Nigeria. This work has provided important data for the stakeholders on the policy and program thrust to expose farmers to various agricultural innovations and technological advancement that will boost farmers' production capacity in the region. Food shortage challenges in the Niger Delta can be reduced through active involvement of space based technology for increase in productivities in Edo State [7]. Space Science and technology put emphasis on precision application of fertilizer and pesticide and other technologies that reduce agrochemicals use as oppose to conventional blanket and uniform applications of agrochemicals will be the path way to agricultural productivity in Edo state [4].

Summary

The study analyzed the level of adoption of Space Science and Technology in agricultural practices in Edo State in the Niger Delta region of Nigeria using data collected from 1800 farmers from the 18 local government of the states. The study strongly support innovative research in the development of appropriate land use technologies that will ensure sustainable food production in the Niger Delta region, should be strengthened among others. The protection of the environmental resources, livelihood, and food culture is crucial for the protection of the social and economic wellbeing of the people in Edo State-Niger Delta region. Agricultural intensification without knowledge intensification will be counterproductive as most of the environmental resources may be deformed and negatively affect the productive capacity of the agricultural land. Information and Communication Technologies (ICTs) are increasingly recognized as powerful complements to drive novel and innovative technologies to farmers using tools such Mobile apps, SMS hotlines, and radio programs which disseminate information timely and cost-effectively. Space technology, which put premium on precision application of fertilizer and pesticide, remote sensing of soil fertility and pest population development and other technologies that reduce agrochemicals use relative to conventional blanket and uniform applications of agrochemicals will be the path way to agricultural productivity in Edo state.

References

1. Akinro, A.O., Opeyemi, D.A. and Ologunagba, I.B. (2008). Climate Change and Environmental Degradation in the Niger Delta Area of Nigeria: Its Vulnerability, Impacts and Possible Mitigations. *Research Journal of Applied Sciences*, 3, 167-173.
2. Akpokodje, J. and Salau, S. (2015). Oil pollution and agricultural productivity in the Niger Delta of Nigeria. *Environmental Economics*, 6(4), 68-75.
3. Amodu, U.S., Okereke, M.O. & Okeke, C.J. (2022). An expository review of the application of space technologies in Agriculture as a prerequisite for youth involvement in agriculture in Niger-Delta, Nigeria. *Ife Research Publications in Geography*, 21(1), 104-115.
4. Amodu, U.S., Okereke, M.O., Okeke, C.J. and Ibitomi, J.D. (2020). Adopting Integrated Pest Management (IPM) and Space Technology approach for Intelligent Pest Management. *Journal of Agriculture and Food Environment*, 7(3), 7-17.
5. Amodu, U.S. and Bolanle, T.E. (2018). Assessment of utilization of chemical pesticide component of Integrated Pest Management (IPM) by farmers in Kogi State Nigeria. *African Journal of Agriculture Technology and Environment*, 7(1), 38-46.
6. Apata, T.G. (2010). Effects of Global Climate Change on Nigerian Agriculture: An Empirical Analysis. *CBN Journal of Applied Statistics*, 2, 31-50.
7. Babatunde, A.O. (2020). Local perspectives on food security in Nigeria's Niger delta. *The Extractive Industries and Society*, 7(3), 931-939.
8. Cruz, R.V., Harasawa, H., Lal, M., Wu, S., Anokhin, Y., Punsalmaa, B., Honda, Y., Jafari, M., Li, C. and Huu Ninh, N. (2007). Asia. In: Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E., Eds., *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK, 469-506.
9. Egbe, R.E. and Thompson, D. (2010). Environmental Challenges of Oil Spillage for Families in Oil Producing Communities of the Niger-Delta Region. *JHER*, 13, pp. 24-34.
10. Fapojuwo, O.E., Ajayi, M.T. and Abiona, B.G. (2012). *The Roles of Agricultural Education and Training in Nigerian Graduates Employment Situation*. University of Agriculture, Abeokuta.
11. Groves, R.L., Chen, J., Civerolo, E.L., Freeman, M.W. and Viveros, M.A. (2005). Spatial analysis of almond leaf scorch disease in the San Joaquin Valley of California: factors affecting pathogen distribution and spread. *Plant Disease*, 89, 581-589.
12. Haryanto, H. (2017). The Role of Farmer to Farmer Extension for Rice Farmer Independence in Bogor. *Journal of Agricultural Extension*, 7(4), 62–74.
13. Idowu, A.A., Ayoola, S.O., Opele, A.I. and Ikenweiwe, N.B. (2011). Impact of Climate Change in Nigeria. *Iranica Journal of Energy & Environment*, 2, 145-152.
14. Ikehi, M., Onu, F., Ifeanyieze, F. and Paradang, P. (2014). Farming Families and Climate Change Issues in Niger Delta Region of Nigeria: Extent of Impact and Adaptation Strategies. *Agricultural Sciences*, 5, 1140-1151. doi: 10.4236/as.2014.512124.
15. Iskandar, E., Amanah, S., Hubeis, A.V.S. and Sadono, D. (2020). The Prominent Role of Agricultural Extension System on Cocoa Agribusiness Development in Aceh, Indonesia (Peran Utama Sistem Penyuluhan Pertanian dalam Pengembangan Agribisnis Kakao di Aceh, Indonesia). *Jurnal Penyuluhan*, 16(2), 199–212.

16. Joseph, A. and Sheu, S. (2015). Oil pollution and agricultural productivity in the Niger Delta of Nigeria. *Environmental Economics*, 6(4), 68-75. *(Note: This appears to be a duplicate of reference #2 with slight name variations)*.
17. Lestari, U. and Asra, R. (2023). Development of Jernang Non-timber Forest Product in the Bukit Dua Belas National Park Area Jambi can be Jernang (Daemonorops draco (Willd.) Blume) Sunscreen with SPF 15. *Democratic Journal of Farming and Agriculture*, 1(1), 30–35.
18. Michael, E.I., Francis, M.O., Florence, O.I. and Patrick, S.P. (2014). Farming Families and Climate Change Issues in Niger Delta Region of Nigeria: Extent of Impact and Adaptation Strategies. *Agricultural Sciences*, 5(12), 11-23. *(Note: This appears to be a variation/duplicate of reference #14)*.
19. Okafor, G.O. and Malizu, C.F. (2013). New communication and sustainable agricultural development in Nigeria. *New Media and Mass Communication*, 20, 66-73.
20. Oyekale, A.S. (2012). Intensive land use, land management and efficiency of food production in the Niger Delta region of Nigeria. *Electronic Journal of Environmental, Agricultural and Food Chemistry*, 11(3), 1188-1204.
21. Rosemary, N.O., Okoh, P.N., Michael, I., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C. and Osakwuni, E.U. (2012). *Assessment of Impacts, Vulnerability, Adaptive Capacity and Adaptation to Climate Change in the Niger Delta Area, Nigeria*. http://rurallinkage.net/project_details.php?project_id=3&pix_id=4&category_id=2
22. Ugolor, D. (2004). Oil of Poverty in the Niger Delta. *African Network for Environment and Economic Justice*, 24, 243-348.
23. Uyigue, E. and Agho, M. (2007). *Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria*. Community Research and Development Centre (CREDC), Benin, Nigeria. CREDC Press, Benin.
24. Wolfe, D.W. (2007). *Climate Change Impacts on Northeast Agriculture*. Department of Horticulture, Cornell University, Ithaca, New York.