ASSESSMENT OF CARBON FOOT PRINT OF STUDENS IN CROSS RIVER UNIVERSITY OF TECHNOLOGY, OBUBRA CAMPUS, NIGERIA

[1]Esor, P. E., [2]Ebu, V. T., [1]Igri, M. R and [1]Ogar, N. E.

[1]Department of Forestry and Wildlife Management, Faculty of Agriculture and Forestry, Cross River University of Technology, Cross River State, Nigeria.
[2]Department of Forestry and Wildlife Resources Management, Faculty of Agriculture, Forestry and Wildlife Resources Management, University of Calabar, PMB, 1115, Calabar, Nigeria.
Corresponding Author's email: esorpeterekpo@yahoo.com, 08065341159

ABSTRACT

Natural events are believed to have contributed to an increased global temperature. This is caused primarily by increase in greenhouse gases effect, such as carbon dioxide (CO_2). This study evaluated assessment of carbon foot prints in 3 out of the 5 Departments in the Faculty of Agriculture and Forestry, Cross River University of Technology, Obubra Campus. Purposive sampling methods was adopted to involve students studying Animal Science, Agronomy and Forestry base disciplines within the Faculty. Carbon foot print online calculator developed by (WWF, 2016) was used for the assessment. The calculator had well-structured questions to monitor carbon foot print generated by each student activities through food, home, travel and stuff. The results were analyzed using Analysis of Variance (ANOVA). Tables were used to compare with the global average planet of 3.06 tones for human existence on the earth surface. The Department of Animal Science recorded the highest carbon foot print of 614.18 tonnes requiring 6.53 tonnes planets to cohabit. The lowest carbon foot print of 469.0 tonnes was obtained in the Department of Forestry requiring 6.52 tonnes planets to exists. 500 level students generated the highest carbon foot print 356.48 tonnes requiring 7.22 tonnes of global average planets. While, the least foot print was observed in 200 level students 307.54 tonnes. The male and female students produced the same average carbon foot print of 625.3 tonnes. Investigation revealed high carbon foot print in food consumption, travel and home required more planets to sustain our lives in the environment we all live. It is therefore imperative that, awareness and enlightenment should be carried out on the impact of carbon foot print reduction, through driving less, walking, biking, carpooling, mass transportation and combining trips will results in burning less fuel and releasing few emission into the atmosphere to save the planet which we all live.

Keywords: Carbon, Foot print, University, Obubra.

INTRODUCTION

Daily lifestyle like mobility driving, flying and small amount from public transit shelter electricity, heating, construction and food are the most important consumption categories determining the carbon foot print of a person (Tukker and Jensen, 2006; LPR, 2014). Therefore, carbon foot prints is the measure of the total amount of carbon dioxide (CO_2) and methane (CH_4) emissions of a defined population, system or activity, considering all relevant sources, sinks and storage within the spatial and temporal boundary of the population, system activity of interest, calculated as carbon dioxide equivalent using the relevant 100-year global warming potential GWP100 (WWF, 2008). All these activities carried out on the earth surface gradually or ultimately lead to global warming. Global warming is the average temperature of the earth's atmosphere and its oceans (Tukker and Jansen, 2008). The change that is permanently changing the earth's climate forever (LPR, 2014). Global warming is caused by increase in the emission of GHCs through the burning of fossil fuels (oils natural gas and coal), burning of wood, wood products and solid wastes, raising of livestock and the decomposition

of or organic wastes, combustion of solid wastes and fossil fuels in industrial and agricultural activities; bush burning; and deforestation. All these human activities contributes to alter the balance of the equilibrium between the natural GHGs (water vapor, carbon dioxide, methane and nitrous oxide) and the man-made GHGs sulfur hexane fluoride (SF_6); hydro fluorocarbons-HFCs; and perfluorocabons (PFCs) in the earth's atmosphere's thus promoting the warming of both the atmosphere and the ocean since they are heat-trapping gases. The high rate of these GHGs has increased beyond natural level (WWF, 2008). There is an agreement that the average temperature of the Earth has risen between $0.4\,^{0}C$ and $0.8^{o}C$ in the last 100 years (LPR, 2014). The increasing rate of (anthropogenic) human activities deforestation, agriculture and other human impacts are sources of global warming that have occurred in the last 50 years (LPR, 2014). GHGs are good absorbers of heat radiation coming from earth's surface acting like a blanket over its atmosphere, allowing it warms than it would have been. Enhanced GHGs effect however, is not natural as it acts to destabilize earth's radiation balance due to anthropogenic accumulation in earth's atmosphere of

radioactive GHGs (Tuker and Jansen, 2006). However, if the current trend of our lifestyle GHG emissions continue through 2030 the earth is likely to experience an average rise in temperature ranging from 1.5^0 C to 4.5^0 C (Porter and Brown, 1991).

The projected impact on the earth's environmental stability and hence changes in global climate would include, disruption of temperature, distribution of cloud, air – current precipitation, vapor- transportation, melting of polar ice-caps, rise in sea level affecting low lying areas and the synergy among there discrete effect. All these have grave consequences for fresh water resources, agriculture and food supply, natural ecosystems, biodiversity and human health (IPCC, 2002).

Global warming with state variation has the capacities for increases and decreases in rainfall resulting in floods, landslides and droughts, melting of polar ice – caps, thermal expansion, surges and acidification oceans with resultant ocean front flooding. The adverse effect of hurricanes, bush fires, ocean surges and landslide cause economic losses, population displacements, communal crises, forced migration, promoting ecological refugees, desertification and widespread soil erosion devastation effects. In order to manage the foot prints, reduce emission over a period of time and report the foot prints accurately (IPCC, 2002), individual generating high carbon foot print in their daily activities which are not accounted for and these has contributed to climate change with adverse effects that are threatening human existence on earth. Tracking carbon will ensure carbon accountability and reduce greenhouse gas emissions. (Berger, 2010). It has to be noted that, recycling waste and paper products for example will save trees and ensure them continue to sequester carbon by removing carbon from the atmosphere. This study therefore, examine the carbon foot prints generated by students in the Faculty of Agriculture and Forestry, Cross River University of Technology, Obubra Campus.

MATERIALS AND METHODS

Study Area

The study was carried out in the Cross River University of Technology, Obubra Campus which was established in August 2002 by Cross River State Bill No.9 recently amended as Bill No 6 of 2004. The Cross River University of Technology is a merger of three former tertiary institutions (The Polytechnic Calabar, The College of Education, Akamkpa and the Ibraham Babangida College of Agriculture, Obubra owned by the Cross River State Government, Nigeria. Cross River University of Technology Obubra Campus is located on Latitude 4^0. 28^i and 5^0 , 6^i North of the Equator and Longitude 5^0 , 7^i and 9^0 ,28^i East of the Greenwich meridian. The Faculty has five Departments namely; Agronomy, Animal Science, Agricultural Economics and Extension, Forestry and Wildlife Management, Fisheries and Aquatic Science with estimated population of 200 students. The faculty is bounded in the North by Ofatura Community, in the East Ofodua Community, South Adun Beach and West Ikom- Calabar highway. CRUTECH Obubra Campus occupies a total areas of about 11.47 hectares of land.

The study area experienced two season, rainy and dry season. Dry season begins in late March and end in October with a break in August. Mean annual rainfall ranging between 2000 mm – 2500 mm with a maximum and minimum temperature of about 21^0 C-30^0 C (NIMET, 1996.). The soil types is sandy loam which favors the growth and establishment of *Gmelina arborea and Tectona grandis* plantations, oil palm plantation, rice, yam and cassava production within the Faculty land.

Sampling Techniques

The research was carried out in 3 out of 5 Departments in (CRUTECH) Obubra Campus. Purposively sampling methods was selected to involve students studying Agronomy, Animal Science and Forestry based disciplines within the Faculty of the University. Five 5 males and 5 females students each from 200-500 levels were engaged for the research giving a total of 120 students.

Data Collection

Data for the research was collected using a well structure ontline carbon foot print calculator developed by World Wide Fund (WWF, 2016). The online carbon calculator had well-structured questions to track carbon foot prints generated by the student activities through home, travel, stuff and food consumption. At the end of each assessment or interview, the calculator displayed the amount of carbon foot prints generated by the students. The results showed foot prints by category and the total carbon generated for each student and gave the number of planets needed to maintain the respondents attitudes. The categories covered were; buying habits, home covering energy, food covering diets, food waste, presence of energy saving measures, travel, personal and public transport, usage for leisure and work, and stuff covering and measuring the purchased of consumable items. The average time taken for the online interview was between 5-10 minutes each. The data obtained was analyzed using Analysis of Variance (ANOVA).

RESULTS

Carbon Foot Prints of Department Animal Science Departments recorded the highest carbon foot prints (614.18 tonnes), Agronomy (512.87 tonnes), while, the least carbon foot print was recorded in Forestry (469.0 tonnes) respectively. Food category recorded the highest carbon foot prints of 234.65 tonnes representing (26.89 %) from the Department of Animal Science, closely followed by Agronomy 201.40 tonnes representing (39.26 %) requiring 6.55 tonnes of global average planets. The least category from food was obtained from the Department of Forestry 173.13 tonnes representing (37. 98 %). Home recorded the highest value 165.21 tonnes, from the Department of Animal Science representing (35.25 %) Agronomy Department obtained 133.15 tonnes. The least category was obtained from the Department of Forestry 86.25 tonnes representing (18.39 %) respectively. Travel obtained the highest value from Animal Science Department 155.60 tonnes representing (9.57 %) closely followed by Forestry 141.8 tonnes representing (30.23 %).The lowest category for travel was recorded from the Department of Agronomy 103.20 tonnes representing (20.12

%). The Department of Animal Science required the highest number of planets 6.53 tonnes followed by Forestry 6.52 tonnes, while the lowest number of planets required by the

Department to exist was obtained in Agronomy 5.65 tonnes (Table 1).

Table 1: Carbon foot prints of Departments

Departments	Category	Number of Respondents	Total carbon foot prints (tones)	Percentage foot prints (%)	Carbon foot print per respondents (tones)	No of planets Required per Department.
Agronomy	Food	30	201.40	39.26	6.71	
	Home	30	133.15	25.97	4.43	5.65
	Travel	30	103.20	20.12	3.44	
	Stuff	30	75.12	14.65	2.50	
	Total	30	**512.87**	**100**	**17.08**	
Animal Science	Food	30	234.65	26.89	7.82	
	Home	30	165.21	25.34	5.50	
	Travel	30	155.60	9.57	5.18	6.53
	Stuff	30	58.72	38.20	1.95	
	Total	30	**614.18**	**100.0**	**20.45**	
Forestry	Food	30	178.13	37.98	5.93	
	Home	30	86.25	18.39	2.87	6.52
	Travel	30	141.8	30.23	4.72	
	Stuff	30	62.9	13.4	2.0	
	Total	30	**469.0**	**100.0**	**15.52**	18.72

Carbon foot prints of study level in the faculty

500 level students recorded the highest carbon food prints (356.48 tonnes), followed by 400 level students (342.34 tonnes), 300 level students recorded (327.66 tonnes) respectively. The least foot prints for study level was observed in 200 level students 307.54.. The food category recorded the highest values in 300 level students (165.72 tonnes) representing (50.57 %), followed by 200 level students (157.21 tonnes) representing (51.11 %). 400 level students observed (146.35 tonnes) representing (41.06 %). The least food category was observed in 300 level students (144.35 tonnes) representing (42.67 %) respectively. Among

the study level, 400 level and 500 level students observed the same average values (74. 35 tonnes and 74.86 tonnes) representing (21.03 %and 21.87 %). The least category for food was recorded in 200 level students (65.10 tonnes) representing (21.17 %). 500 level students recorded the highest value (45.75 tonnes) representing (12.83 %) from stuff, closely followed by 400 level students (35.71 tonnes) respectively. The highest number of planets required for human existence per study level was obtained in 200 level students (8.25 tonnes), followed by 300 level students (7.26 tonnes). The least number of planets require per study level was obtained in 400 level students (6.57 tonnes) requiring a total planets of (29.3 tonnes) for study levels (Table 2).

Tables 2: Carbon food prints of study level in the Faculty

Study level	Category	No of resp.	Total carbon food print (tones)	Percentage of foot prints per resp. (%)	Carbon foot print per resp. (tones)	No of planet require per study levels
	Food	30	157.21	51.11	5.24	
200	Home	30	65.10	21.17	2.17	8.25
	Travel	30	52.11	16.95	1.73	
	Stuff	30	33.12	10.77	1.10	
	Total	30	**307.54**	**100**	**10.24**	
300	Food	30	165.72	50.57	5.52	
	Home	30	72.35	22.08	2.41	7.26
	Travel	30	6.5.74	20.7	2.19	
	Stuff	30	23.85	7.28	0.79	
	Total	30	**327.66**	**100**	**10.91**	
400	Food	30	144.35	42.67	4.81	
	Home	30	7.4.86	21.87	2.49	
	Travel	30	87.42	25.53	2.91	6.57
	Stuff	30	35.71	10.43	1.19	

	Total	30	**342.34**	**100**	**11.4**	
500	Food	30	146.35	41.06	4.87	
	Home	30	74.96	21.03	2.49	7.22
	Travel	30	89.42	25.08	2.98	
	Stuff	30	45.75	12.83	1.52	
	Total	30	**356.48**	**100**	**11.86**	29.3

Carbon foot prints of male and female students (Gender)

The male and female students obtained the same average total carbon food prints (625.3 tonnes) for male and (625.59 tonnes) for female. The male recorded the highest category for food (325.95 tonnes) representing (52.02 %), while, the lowest category for food obtained was (320.40 tonnes) representing (51.19 %) was recorded from the female students. However, (108.45 tonnes) from home representing (17.34 %) was recorded from the male students, while the female students obtained (103.50 tonnes) representing (16.54 %).The number of planets requiring per gender recorded (4.15 tonnes) for male, while, (4,22 tonnes) was obtained for female, requiring a total planets (9.28 tonnes) for gender to occupy the existing planets (Table 3).

Table 3: Foot prints of male and female students in selected Department of the Faculty

Gender	Category	No of Resp.	Total carbon prints (tones)	Percentage food prints (%)	Carbon food prints per Resp.	No of planets required per gender
Male	Food	30	325.30	52.02	5.42	
	Home	30	108.45	17.34	1.80	4.15
	Travel	30	131.20	20.98	2.18	
	Stuff	30	60.35	9.66	1.00	
	Total	<u>30</u>	**625.3**	**100**	**10.4**	
Female	Food	30	320.40	51.19	5.34	4.2
	Home	30	103.50	16.54	1.72	
	Travel	30	115.05	18.38	1.91	
	Stuff	30	87.0	13.89	1.45	9.28
	Total	30	**625.95**	**100**	**10.42**	

DISCUSSION

Carbon Food Prints of Department

Carbon foot prints of the Departments was compared to that of other Departments outside Nigeria, it was found that the footprints of the Department were significantly low. For example, a study done in IMT, found the estimated annual GHG emission to be 200. 00 tonnes (Groode and Haywood, 2004). In South Africa, it was noted by Letete *et al.*, (2011), that the carbon foot prints of the University of Cape Town (UCT) was about 83.40tonnes annually. While India, the carbon foot prints of Rajiv Grandhi South Campus Banaras Hindu University (RGSU) was estimated to be 69,727tonnes (Sadhanna *et al* ., 2012). It was estimated that (CRUTECH) Obubra Campus recorded the highest carbon footprints of 29.3tonnes, higher than the average global planets of 3.06tonnes for human existence, while that of MIT, UCT RGSU were 17,7tonnes, 4tonnes and 53. 7tonnes respectively. The higher carbon footprints recorded by these Departments outside Nigeria is due to the fact that these departments are situated in technological advanced and more affluent nation than Nigeria, as such their carbon footprints energy consumption are naturally higher than that of Cross River University of Technology (CRUTECH) Obubra

campus. The Department of Animal science had the highest carbon foot prints 6.53 tonnes above the average global planet of 3.06 tonnes for human existence. This however implies that, the Department required 3.06 tonnes to sustained their current behavioral pattern if everyone consumes the same carbon expenditure with them.(LPR,2014) Noted that, if this behavioral pattern continues or exist, the arithmetical progression of the growing population will makes it more difficult to meet the demand of human need as well as space for other living things. Food consumption alone requires 7.82tonnes above the global average planet. This may be connected to the students consuming more protein food in most diets or wasting of excess food with little or no storage facilities. This is in line with the findings of (USEPA, 2013) who noted that citizen are responsible for at least 20 tonnes of heat trapping atmospheric emission on the earth surface. Stuff recorded lower values requiring 1.95tonnes of planet. It therefore means that, the student preferred food and pets to other items displaced by the calculator. According to Tembe *et al.,* (2016), the students ranks food and movement within and outside the campus as the most relevant items to their targets as students in time of difficulties.

Carbon Food Prints of Study Level

500 levels students recorded the highest carbon food prints of 356.48 tonnes in 120 respondents. This figure is lower than the results obtained in (Tembe *at al*., 2016), who interviewed 180 respondents and recorded 606.3 tonns in 500 level, while (Mshelia *et al*., 2020), recorded the campus carbon foot prints of 7.914tones from the Bayero University, Kano new Campus Nigeria. The differences in the result may be attributed to the different lifestyle exhibited by the students from south-south zone of Nigeria compared to their counterpart from the North-Central and North West zones of the country.

Gender Carbon Foot Prints

This study revealed that male and female student observed the same average lifestyle, generating carbon foot prints for food, home, travel and stuff recording an average 4.2 tonnes of planet per gender . This result differ comparatively from the result obtained in (Tembe *et al*., 2016) from the University of Agriculture Makurdi Benue State, Nigeria, recorded a similar carbon foot prints for food, home, travel and stuff requiring 7.1 tonnes of planet per gender. This implies that male and female gender have no effect on carbon foot prints generated by the students in the University. Their living habits required at least 3.06tonnes planets to accommodate human and other living things on the earth surface. Both needs to practice a good behaviour of balancing carbon foots prints and adopting less carbon generating option for sustainable living in the single planet that we all share.

CONCLUSION

Our habits characterize the state of our environment, carbon foot print and for a future where people are expected to survive, it's become imperative for every one or group of persons to contributes to the world's carbon expenditure. The study revealed high carbon foot prints in their food consumption, home, travel and stuff activities, requiring more planet to live if every citizens is conscious with the way and manner the deteriorating state of climate change in our environment is worsening. This can be attributed to lack of sensitization on the impact of high carbon foot prints generating activities among the students. Therefore, there is a need to educate the students and the general public on the need to monitor their living habits on carbon foot prints generation, and ensure appropriate action on ways to reduce their carbon foot prints.

REFERENCES

Berger, M. (2010). Water foot printing: How to address water use in the life cycle assessment *Sustainability,* 2 (4): 19-44.

Intergovernmental panel on Climate Change (IPCC, 2002). Climate change contribution of working group iii to the fourth assessment report of the intergovernmental panel on climate change. Edited by Metz, B., Davidson, O. R., Bosch, P. R., Dave, R. and Meyer, L. A. Cambridge University press, Cambridge, United Kingdom and New York, NY, USA.

Groode, T.A., and Haywood, J.B. (2014). *A Methodology for Assessing MIT''s Energy Use and Greenhouse Gas Emissions Cambridge.* Retrieved htt://ifee.mit.edu/publications/report

Living Planet Report : LPR (2014). species and place people and place Mc lella R Jeffries B, Oerlemans N, (Eds). WWF Gland, Switzerland; 2014.

Letete,T.C.M., Mungwe, N.W., Guma, M., and Marquard, A. (2011).2011- carbon foots of the University of Cape Town, *Journal of Energy in Southern Africa*,22(2)),2-12.

Nigeria Metrological Agency (NIMET, 1996). Ikom.

Mshelia, R.B., Diso, I.S., Jibatswen, T. Y.(2020).Assessment of Greenhouse Gases Emission Sources in A Typical Nigerian University Campus: Case Study of Bayero University Kano, New Campus. *Bayero Journal of Engineering and Technology (BJET) VOL.15 NO.2. pp30-37.*

Porter. G. and Brown, J. W (1991). Global Environment Politics Dilemmas in word
politics. Colarado Washington press.

Sadhana, C.,Vijai, K., Juli, K., Grandhi, M., and Gramodaya, C. (2012). Assessment of Carbon Foot prints of Rajiv Grandhi South Campus Barnaras Hindu University, Mirzapur, India. Journal of Environmental Research and Development, 7(2).

Tembe, E. T., Onah, A. A. and shomkegh, S. A.(2016). Accessing carbon foot prints of
student in University of Agriculture Makurdi, Benue State, Nigeria. *Journal of Scientific Research and Reports.* 12 (1):1-7.

Tuker, B. A. and Janen, S. A. (2006).The Water needed for helianns to eat pasta and pizza. *Agriculture Systems,* 103 (6): 351-60

US EPA Light-duty automotive technology and fuel economy Trends: (1975). Through 2013: 2013;

World Wide Fund for Nature (WWF, 2016). Footprint calculator. Accessed from 2nd –31st March. Available:www.footprint.wwf.org.uk/questionnaires/show/

World Wide Fund (WWF, 2008). African Ecological foot prints and human wellbeing.Gland, Switzerland 2008.