

URBAN AGRICULTURE, CITIES AND CLIMATE CHANGE

Edited by
Remi Adeyemo

UNIVERSITY OF IBADAN LIBRARY



Cuvillier Verlag Göttingen
Internationaler wissenschaftlicher Fachverlag

Bibliografische Information der Deutschen Nationalbibliothek
Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der
Deutschen Nationalbibliografie; detaillierte bibliografische Daten
sind im Internet über <http://dnb.d-nb.de> abrufbar.
1. Aufl. - Göttingen : Cuvillier, 2011

978-3-86955-813-4

Printed with assistance by the Humboldt-Foundation.

© CUVILLIER VERLAG, Göttingen 2011
Nonnenstieg 8, 37075 Göttingen
Telefon: 0551-54724-0
Telefax: 0551-54724-21
www.cuvillier.de

Alle Rechte vorbehalten. Ohne ausdrückliche Genehmigung des Verlages ist
es nicht gestattet, das Buch oder Teile daraus auf fotomechanischem Weg
(Fotokopie, Mikrokopie) zu vervielfältigen.
1. Auflage, 2011
Gedruckt auf säurefreiem Papier

978-3-86955-813-4

Contents

PREFACE	
1 Urban Governance And Resource Management: Revisiting The 1976 Local Government Reform in Nigeria Akin L. Mabogunje	
2 The Role of Primary Agriculture in Processing and Nutrition in Urban Food Security in Developing Countries: The Nigerian Experience Isaac Adebayo Adeyemi.....	
3 Climate Change and Building Green Productive Cities Adeniyi Gbadegesin	2
4 Recent Trends in Agricultural Growth in African Countries: A Case for Leveraging Urban Agriculture Femi Olubode-Awosola	34
5 Environmental Hazards, Public Health and Food Safety Ifc Adewumi.....	44
6 Analysis of Climatic Data of Ibadan Metropolis: Implications for Green City P.O. Adesoye	51
7 Farmers Perception of Climate Change and their Effects on Arable Crop Production in Oyo State O.R. Adeniyi and A. Ayandiji	58
8 Rainfall Pattern And Adaptive Strategies: A Case Study of Two Cities in North-West of Nigeria Oke, I. A.; Adewusi, S.R.A; Babatola, J.O; M.A. Asani ; Okeke V.; Oyakhrome, F and Olatunji S.A.	67
9 Determinants of Farm Income in the Peri-Urban Agriculture of Ile-Ife, Osun State, Nigeria E. O. Idowu and R. Kassali	75
10 Effective Solid Waste Management among Peri-Urban Households in Egbeda and Oluyole Local Government Areas of Oyo State, Nigeria Fajimi F.O, Omonona B.T And Obisesan A.A.	81

DETERMINANTS OF PUBLIC WILLINGNESS TO FUND URBAN TREE PLANTING IN LAGOS METROPOLIS, NIGERIA

Ajewole Opeyemi Isaac (Ph.D)

Department of Forest Resources Management
University of Ibadan, Nigeria

Email: dropeajewole@gmail.com, oi.ajewole@mail.ui.edu.ng

Abstract

This study examined the public willingness to finance urban tree planting in Lagos metropolis, Nigeria and the associated factors capable of influencing the willingness. Descriptive statistics and Tobit model at 5% level of significance were used to analyse data obtained from multi-stage randomly sampled 873 Lagos metropolitan residents.

The results revealed that 84% of the respondents were willing to contribute funds to Urban Tree Planting (UTP) in Lagos metropolis with ₦1000 being the modal value of what they were willing to contribute annually. Furthermore, 78.92% of the respondents expressed interest in tree planting, 81.67% were living or working in a green environment and 91.18% were aware of environmental issues. Also 18.10%, 22.45%, 23.25% and 30.24% had made use of Nature Park, Botanical Gardens, Zoological Gardens, and Street Trees respectively, while 20.73%, 12.83% and 12.83% had made use of urban forest for religious purposes, provision of medicinal plants and solitude respectively. Fourteen of the 25 regressors were found to significantly affect both the willingness to fund and the prospective contributory amount for UTP in Lagos metropolis.

The large proportion of the respondents who expressed interest in tree planting and were willing to contribute funds to urban tree planting portends a great potential for community funding of urban tree planting in Lagos metropolis.

INTRODUCTION

Sustainable urban forestry development calls for a regular and consistent funding both for the establishment and management of the urban trees and forests.

Like any other public service, the establishment and management of urban trees are largely dependent on government funding which are basically prone to changes in political priorities. Therefore, sustained government funding of urban forestry development is fraught with great challenges because of competing demand for government funds and the little immediate direct money benefits accruable to urban forestry development, particularly in developing countries. Consequently there is an urgent need to explore all possible sources of private funding for urban forestry development and subsequently set up appropriate mechanisms to harness such funding opportunities. Lagos state government effort in urban forestry development started in 1985 with the planting of *Delonix regia* and *Azadiracta indica* (Neems) on some of the streets adjoining the state's secretariat.

However, progress in urban forestry development has been very slow, until 2001 when government commenced to solicit for private participation in the development of the state through the private support initiative (PSI) programme. The PSI has inadvertently brought some progress to the development of urban forestry in the state through the participation of some companies in the development of nature parks and beautification of roundabouts. Nevertheless, it is still very imperative to look into other possible private based innovative funding for urban forestry development in the state. The objective of this study therefore is to investigate the Lagos residents' willingness to fund tree planting programme in the metropolis.

DATA COLLECTION AND ANALYSIS

The data for this study were obtained from a questionnaire survey of 900 residents of Lagos metropolis, using contingent valuation method. Adapting Aluko's (1996) socio-economic stratification of Lagos metropolis according to property values, a multi-stage random sampling procedure was adopted to stratify the metropolis into three socio-economic communities, viz. high, medium and low class communities. Thereafter, each of the three (3) communities was then stratified into neighbourhoods. Five (5) neighbourhoods were subsequently randomly sampled from each of the communities. Names of major streets in each of the resulting neighbourhoods were collected from the metropolitan planning authority. Using a table of random numbers, three streets were picked from each of the fifteen neighbourhoods. Twenty respondents were sampled in each of the three selected streets of the fifteen neighbourhoods. This gave a total sample size of 900 respondents. In all 873 questionnaires were used for the analysis, having discarded 27 for inconsistency. Data obtained were analysed with descriptive statistics and Tobit model at 5% level of significance.

The Analytical Model

Willingness to fund Lagos metropolitan tree planting programme is conceptualised to involve a two step simultaneous decision by the respondents. This entails:

- whether or not to participate in funding the project; and
- the amount of money the decision maker is willing to contribute after the initial decision has been made.

Tobit model (a hybrid of probit and multiple regression models) is appropriate in capturing such a decision process (Tobin, 1958).

Model Specification

The one limit Tobit model for this study is specified as follows:

$$WF = \begin{cases} WF^* = X_i\beta + e_i & \text{if } X_i\beta + e_i > 0 \\ = 0 & \text{if } X_i\beta + e_i \leq 0 \end{cases} \quad \text{equation (1)}$$

Where;

- X_i = the vector of explanatory variables.
- WF = limited dependent variable
- WF^* = continuous dependent variable which is observed only when it is positive.
- β = vector of unknown coefficients
- e_i = error term : $-N(0, \sigma^2)$

Following McDonald and Moffit (1980), the expected value of WF in the model is:

$$E(WF) = \lambda\beta f(z) + \sigma f(z) \quad \text{equation (2)}$$

Where $z = X\beta/\sigma$,

$f(z)$ = the unit normal density,

$F(z)$ is the cumulative normal distribution function.

σ = standard error of the estimate of the dependent variable WF .

X and β are as previously defined in equation (1).

Furthermore, the expected value of WF for those willing to participate in contributing funds to tree planting programme in the metropolis (i.e. prospective contributory amount) is given as

$$EWF^* = X\beta + \sigma f(z)/F(z) \quad \text{equation (3)}$$

Consequently, the basic relationship between the expected value of all observations; EWF , the expected value conditional on willingness to contribute funds to urban tree planting in the metropolis; EWF^* (i.e. the expected contributory amount), and the probability of contributing; $F(z)$ is

$$EWF = F(z) EWF^* \quad \text{equation (4)}$$

If we consider the effect of a change in the i^{th} explanatory variable 'X' on WF :

$$\delta EWF / \delta X_i = F(z)(\delta EWF^* / \delta X_i) + EWF^*(\delta F(z) / \delta X_i) \quad \text{equation (5)}$$

Equation (5) shows the total change in WF being disaggregated into two parts: (1) the change in WF of those that are willing to contribute money (expected value of amount to be contributed weighted by the probability of contributing money), and (2) the change in the probability of contributing money weighted by the expected value of the amount of money to be contributed.

Also the change in the probability of contributing funds to urban tree planting in Lagos metropolis as independent variable X_i changes is;

$$\delta F(z) / \delta X_i = f(z) \beta_i / \sigma \quad \text{equation (6)}$$

And the change in contributory amount with respect to a change in an explanatory variable among the participant is

$$\delta E(WF^*) / \delta X_i = \beta_i \{1 - z f(z) / F(z) - f(z)^2 / F(z)^2\} \quad \text{equation (7)}$$

β and σ were obtained from the maximum likelihood estimates (MLE) and used to compute each of the terms in equations (5) (6), and (7).

RESULTS AND DISCUSSIONS

Analysis of Willingness to Contribute Money to Urban Tree Planting in Lagos Metropolis

The results in Figures 1 and 2 show that 84% of the respondents were willing to contribute funds to UTP in Lagos metropolis with a modal value of N1000 per annum.

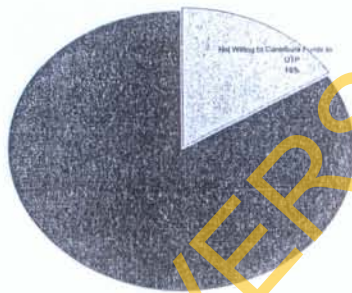


Figure 1: Percentage Distribution of Respondents Willing to Contribute Funds to UTP in Lagos Metropolis

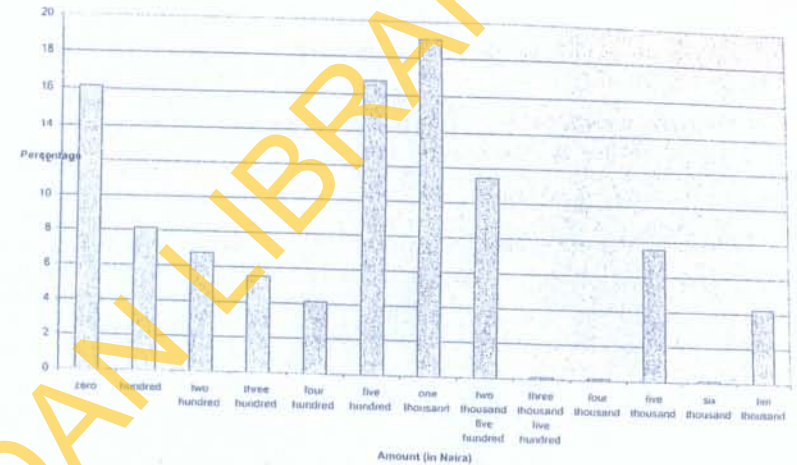


Figure 2: Percentage Distribution of Prospective Contributory Amounts to UTP

The MLE coefficients of the Tobit model used to investigate factors affecting the probability of contributing money to urban tree planting in Lagos metropolis and the prospective contributory amount are shown in Table 1 below.

Table 1: Tobit Model Estimates for Evaluation of Public Willingness to Finance Urban tree planting in Lagos Metropolis

Variable	Coefficients	Standard Error	Mean	P(Z >z)	Total change $\delta EWF / \delta X_i$	Change in the probability of contributing money $\delta F(z) / \delta X_i$	Change in the contributory amount $\delta EWF' / \delta X_i$
Constant	-1920.85***	385.07	-	0.0000	-8.7738	-0.0154	-162.39
LIWOGRENT	488.93**	243.28	-0.3272	0.0445	2.2333	0.0027	41.33
AWENVTIS	993.80***	359.69	-0.2323	0.0057	4.5393	0.0054	84.02
MEMISORG	-511.79	396.71	-1.0915	0.1970	-2.3377	-0.0028	-43.27
NATUPARK	-88.96	234.85	-0.9622	0.7048	-0.4063	-0.0005	-7.52
BOTGARD	169.43	208.34	-0.9188	0.4161	0.7739	0.0009	14.32
ZOOGARD	1.10	1.76	-3.1968	0.5318	0.0050	0.000006	0.09
SOLITUDE	-74.80	259.59	-1.0149	0.7732	-0.3417	-0.0004	-6.32
PICNIC	188.52	258.09	-1.0092	0.4651	0.8611	0.0010	15.94
MEDPLANT	584.25**	254.90	-1.0149	0.0219	2.6686	0.0032	49.39
INTREP	711.98***	234.54	-0.3547	0.0024	3.2521	0.0039	60.19
URWOOL	529.78**	215.38	-0.9359	0.0139	2.4198	0.0029	44.79
STRTREES	592.64***	191.66	-0.8410	0.0020	2.7070	0.0033	50.10
RESDOWN	357.09*	183.65	-0.5904	0.0518	1.6311	0.002	30.19
EMPLOYED	237.15	215.60	-0.4954	0.2714	1.0832	0.0013	20.05
PENSIONER	1072.26***	353.84	-1.0858	0.0024	4.8977	0.0059	90.65
STUDENT	396.44*	227.02	-0.9027	0.0808	1.8108	0.0022	33.51
TEREDU	139.33	288.10	-0.3741	0.6287	0.6364	0.0008	11.78
SECEDU	-111.77	337.12	-1.0126	0.7402	-0.5105	-0.0006	-9.45
PRIMEDU	869.47*	455.64	-1.1041	0.0564	3.9714	0.0048	73.50
GENDER	0.98	1.75	-2.8844	0.5759	0.0045	0.000005	0.08
INCOME	0.01***	0.003	22572.22	0.0022	0.00005	5.49x10 ⁸	0.00085
HICLAN	243.84**	110.43	-8.8078	0.0272	1.1138	0.0013	20.61
MECLAN	-244.53**	110.43	-8.8318	0.0268	-1.1169	-0.0013	-20.67
AGE	-1.52	2.30	28.33	0.5099	-0.0069	-0.000008	-0.13
Sigma	2431.25	64.42	-	0.0000			
Number of samples					= 873		
Number of positive observation					= 733		
Proportion of positive observation (%)					= 83.96		
Z-score					= -2.61		
f(z)					= 0.005		
Log likelihood function					= -6857.13***		

Note: NS= Not Significant; * = significant at p<0.1; ** = significant at p<0.05; *** = significant at p<0.01.

Results from Table 1 show that 14 of the 25 regressors had significant influence on *WCM* (the probability to contribute money to urban tree planting in Lagos metropolis and the prospective contributory amount). The intercept value of -8.7738 which is the autonomous total change in willingness to contribute money to UTP in Lagos metropolis as can be observed from Table 1 is significant and has negative sign. This is decomposed to 0.0154, the autonomous probability of contributing money to UTP in Lagos metropolis, and 162.39 the autonomous prospective contributory amount to UTP in Lagos metropolis.

Results from Table 1 further show that "living or working in green environment" (LIWOGRENT) significantly and positively influence *WCM*. The coefficient of the intercept dummy of the respondents who are living or working in green environment and are willing to contribute money to UTP in Lagos metropolis is 41.33. This implies that relative to those who

are not living or working in green environment; the prospective contributory amount to UTP in Lagos metropolis is expected to increase by ₦41.33 for those living or working in green environment than that of those who are not working or living in green environment. Similarly, the coefficient of the intercept dummy for those who are living or working in green environment but are not willing to contribute money to UTP is 0.0027. This also implies that relative to those who are not living or working in green environment; the level of autonomous probability (0.0154) of contributing money to UTP in Lagos metropolis will increase by 0.0027 for those living or working in green environment. Summarily put the probability of a person who is living or working in green environment to contribute money to UTP in Lagos metropolis is 0.0181 (1.8%), while that of a person not living or working in green environment is 0.0154 (1.5%). Also the individual living or working in a green environment is expected to contribute ₦41.33 above the amount the person who is not living or working in green environment will contribute to UTP in Lagos metropolis. Following the same procedure for the interpretation of decomposed coefficients for all the other significant dummy variables in the model, the following results were achieved.

Awareness of environmental issues (AWENVTIS) has significant and positive influence on *WCM*. The probability of a person who is aware of environmental issues to contribute money to UTP in Lagos metropolis is 0.0208 (2.1%) as compared to 0.0154 (1.5%) for those who are not aware of environmental issues. Such an individual is expected to contribute ₦84.02 above what the person who is not aware of environmental issues will contribute to UTP in Lagos metropolis. These results reinforce the need for effective information dissemination on environmental issues, particularly with reference to the invaluable role of the urban forests in mitigating climate change.

Collection of medicinal plant (MEDPLANT) has significant and positive influence on *WCM*. The probability of a person who has collected medicinal plants from an urban forest in the metropolis is 0.0189 (1.9%), while such an individual is expected to contribute ₦49.39 above what the person who has never collected medicinal plants from the metropolitan urban forests. The importance of medicinal plants as benefits obtained from the urban forest was corroborated by Popoola and Ajewole (2001) and Ajewole and Aiyelaja (2004) who reported that medicinal plants ranked, second in importance among the benefits from the urban forest. Previous use of urban woodlot for religious purpose (URWOOL) also has significant and positive influence on *WCM*. The probability that an individual who has made previous use of an urban woodlot for religious purpose will contribute money to UTP is 0.0183 (1.8%), while such an individual is expected to contribute ₦44.79 above what the person who never used an urban woodlot for religious purpose would contribute.

Furthermore, previous use of street trees (STRTREES) has significant and positive influence on *WCM*. The probability that an individual who has made previous use of street trees will contribute money to UTP is 0.0187 (1.9%), while such an individual is expected to contribute ₦50.10 above what the person who has not made previous use of street trees would contribute to UTP in the metropolis. The significance and the signs of the three foregoing variables conform with the findings of Ajewole (2003) which found out that being a past beneficiary of the urban forests of Ibadan metropolis had positive and significant influence on willingness to contribute finances to the rehabilitation of the degraded forest reserves of Ibadan metropolis.

Interest in planting trees also has significant and positive influence on *WCM*. The probability that such an individual will contribute to UTP is 0.0193 (2%), while the individual is expected to contribute ₦60.19 above what the person with no interest in tree planting would contribute to UTP in Lagos metropolis. This information is very germane to UTP programme in the metropolis bearing in mind that 79% of the respondents indicated interest in tree planting. This suggests that with appropriate presentation, many members of the public will be ready to buy tree seedlings for amenity planting, which can also be a form of financing of urban forestry development in the metropolis.

Owning one's residence (RESDOWN) has significant and positive influence on *WCM*. The probability that the person who owns his/her residence will contribute money to UTP is 0.0174 (1.7%), while such an individual is expected to contribute ₦30.19 above the amount that an individual who does not own his/her residence would contribute to UTP in Lagos metropolis. This group of people can be effectively used to mobilise support for urban tree planting, since in many neighbourhoods in Nigeria, there is often an association of owners of residence ("Landlords") which has community development as one of its major objectives.

Being a pensioner and being a student have positive and significant influence on *WCM*. The probabilities that a pensioner or a student will contribute to UTP in Lagos metropolis are 0.0213 (2.1%) and 0.0176 (1.8%) respectively. An average pensioner and student are expected to contribute ₦90.65 and ₦33.51 respectively above what a job seeker would be willing to contribute to UTP in Lagos metropolis. Having primary education is the only educational variable that is significant with positive influence on *WCM*. The probability that a person with primary education will contribute to UTP in Lagos metropolis is 0.0202 (2%), while such an individual is expected to contribute ₦73.50 above the amount the people without formal education would be willing to contribute to UTP in Lagos metropolis. Although income has positive and significant influence on willingness to contribute money to UTP in Lagos metropolis and the prospective contributory amount, the values of its influence on *WCM* are so negligible.

Living in high class neighbourhood (HICLAN) has significant and positive influence on *WCM*. The probability of a person living in high class neighbourhood to contribute money to UTP in the metropolis is 0.0167 (1.7%), while such a person is expected to contribute ₦20.61 above the amount the person that is living in low class neighbourhood would be willing to contribute to UTP in the metropolis. However, living in medium class neighbourhood (MECLAN) has a significant but negative influence on willingness *WCM*. The probability of a person living in medium class neighbourhood to contribute to UTP in Lagos metropolis is 0.0141 (1.4%), while such a person is expected to contribute ₦20.67 less than the amount the person living in low class neighbourhood would be willing to contribute to UTP in Lagos metropolis.

CONCLUSION

The need for a dramatic increase in urban forests in view of their great potential in the mitigation of climate change, contribution to the socio-economic wellbeing of the society, coupled with inadequacy of public funds suggest that private funding will be the most essential component of funding urban forestry development. A creative mix of public and private funds from national, regional (state) and private sources will have to be put in place to achieve sustainable urban forestry development. Interestingly this study has revealed great public potential financial support for urban tree planting in Lagos metropolis. All that is required is to develop effective schemes in harnessing these supportive resources. Some of these may include: collection of entrance fees for parks and herbal arboretum/farms; reduction of company's (land) tax in return for planting and management of urban forests of a specified minimum size; solicitation for philanthropic donations in cash and kind; corporate donations in exchange for publicity; enacting and enforcing laws to ensure that real estate developers allocate and develop a certain percentage of land development for green space (nature's park) as well as sales of souvenirs.

Although Lagos state government is currently making commendable progress in the on-going metropolitan beautification project through its private sector initiative programme, yet some of the aforementioned schemes have to be appropriately adopted in order to achieve sustainable funding of urban tree planting in the metropolis. This study has discovered the significant interest of three major and important groups in contributing finances to urban tree

planting in the metropolis. These are students, pensioners and house owners. The youthful zeal and optimism of students if well harnessed can go a long way in raising funds for urban forestry development in the metropolis. Pensioners in their own case are often interested in spending their resources on community development projects. House owners in the metropolis often belong to the association of house owners, which can be used to mobilise funds for the establishment and management of community nature's park. Each of these groups can be used to mobilise a considerable amount of funds for urban forestry development in the metropolis. However strategies to harness the resources of each of these groups will have to be customised since each of them has its own peculiarity and requires different approach. For instance the package that may be appealing to pensioners may not work for the students.

The importance of effective public education on the significance and safety of trees in and around living and working environment can not be over emphasised since findings from this study show that awareness of environmental issues significantly and positively influences willingness to contribute money to UTP in the metropolis. Moreover, since collection of parts of urban trees for medicinal use is a significant factor positively affecting willingness to contribute money to UTP, it becomes very crucial to incorporate medicinal herbal arboretum into nature parks in the metropolis. Interested visitors to these arboreta will have to pay entrance fees and a token to be able to take some herbs from the arboretum. Since high proportion of the respondents (79%) indicated their interest in tree planting, sales of tree seedlings for amenity planting in houses, neighbourhoods and community open spaces can also be one of the mechanisms to harness the funds. Finally, harnessing this potential fund will require the setting up of a board -comprising individuals with proven integrity from different sectors of the society- that will put in place appropriate mechanism to harness and manage the funds

REFERENCES

- Ajewole O.I. (2003): The Use of Tobit Model in Evaluating Prospective Participatory Financing of Rehabilitation of Ibadan Urban Forest Reserves. *Journal of Tropical Forest Resources*. Vol. 19 (2), pp 1-12
- Ajewole O.I and Aiyelaja A.A (2004): Socio-Economic Analysis of the Benefits of Ibadan Urban Forest Reserves. *Journal of Tropical Forest Resources*: 20: 110-120.
- Aluko, O.E (1996): Location and Neighbourhood Effects on Urban Housing Values. Case Study of Metropolitan Lagos. pp. 47-63. Unpublished Ph.D Thesis. *University of Ibadan, Ibadan, Nigeria*.
- Gujarati, D.N (1985): "*Basic Econometrics*" McGraw-Hill Book Company Inc, 2nd Edition. pp 431-504
- Haemann, W.M. (1994): "Valuing the Environment through Contingent Valuation". *The Journal of Economic Perspectives*, 8(4), 19-43
- Hoehn, J.P. (1992): "Contingent Valuation in Fisheries Management; the Design of Satisfactory Contingent Valuation Format". In Markandaya, A and Richardson, J. (eds.). *The Earthscan Reader in Environmental Economics*. pp 101-111 (London Earthscan Publications Ltd.)
- McDonald, J.F. and R. A. Moffit (1980): "The Uses of Tobit Analysis". *The Review of Economics and Statistics*. Vol. LXII, 2, pp 318-321
- Nkoya, E., Schroeder, T., and Norman, D. (1997): Factors Affecting Adoption of Improved Maize Seed and Fertilizer in Northern Tanzania. *Journal of Agricultural Economics*, 48 (1) 1-12
- Popoola, L. and O. Ajewole (2001): "Public Perceptions of Urban Forests in Ibadan, Nigeria; Implications for Environmental Conservation". *Arboricultural Journal*, Vol. 25: pp. 1-22. AB Academic Publishers
- Tobin, J. (1958): "Estimation of Relationships for Limited Dependent Variables" *Econometrica*; 26, 24-36